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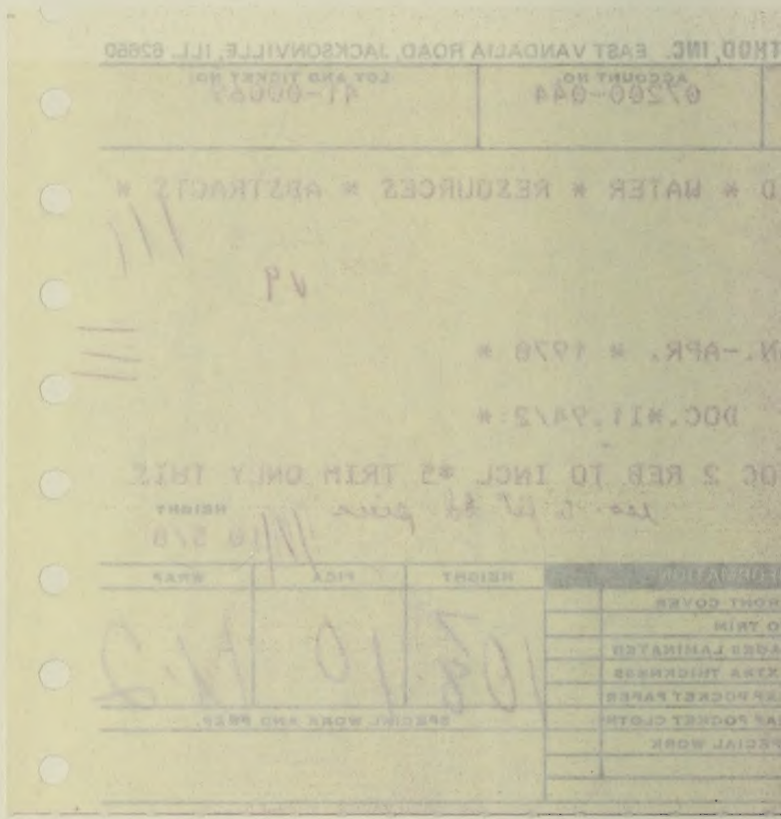

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 1
JANUARY 1, 1978

W78-00001 -- W78-00500

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

PHYSICAL OCEANOGRAPHY OF DEEP-WATER DUMPSITE 106 FEBRUARY-MARCH, 1976,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
J. J. Bisagni.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 87-115, June 1977. 21 fig, 1 tab, 5 ref.

Descriptors: *Waste disposal, *Baseline studies, *Environmental effects, *Oceanography.
Identifiers: *Outer continental shelf, *Physical oceanography, Ocean dumping, Oceanographic data, Environmental conditions.

During February and March 1976, the last in a series of characterization cruises was conducted in and around Deepwater Dumpsite 106, aboard the FRS OREGON II. Physical oceanographic data collected during the cruise consisted of: 121 surface temperature and surface salinity measurements, 121 expendable bathythermograph (XBT) drops, 24 deep hydrocasts using Niskin bottles and reversing thermometers, 11 STD stations and 12 shallow water sapling casts. The baseline data should serve as a frame of reference for environmental impact studies. (Sinha - OEIS)
W78-00315

2. WATER CYCLE

2A. General

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT - WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2C.
W78-00068

A NUMERICAL METHOD FOR THE SIMULATION OF UNSTEADY GROUND-WATER FLOW IN BOTH SATURATED AND UNSATURATED SOILS,
Universitaet Muenster, Muenster (West Germany), Inst. fuer Numerische und Instrumentelle Mathematik.
For primary bibliographic entry see Field 2G.
W78-00093

A MARKOV CHAIN MODEL OF DAILY RAINFALL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2B.
W78-00437

2B. Precipitation

RAINFALL SYNTHESIS WITH SCANTY DATA,
Universidad Catolica de Chile, Santiago. Escuela de Ingenieria.
E. A. Varas, and R. K. Linsley.
Journal of Hydrology, Vol. 34, No. 3/4, p 235-249, August 1977. 8 fig, 2 tab, 11 ref.

Descriptors: *Rainfall, *Model studies, *Mathematical models, *California, Synthesis, Precipitation(Atmospheric), Storms, Seasonal, Annual, Runoff, Synthetic hydrology, Streamflow, Probability, Markov processes, Mathematics, Meteorology.
Identifiers: *Rainfall synthesis.

Presented in this paper were mathematical models for seasonal and storm rainfall synthesis. Also, established in this paper were relationships to estimate model parameters when observed records are scarce. Seasonal rainfall was simulated by a linear model which maintains means, variances and serial correlation at each location, and cross-correlation between stations. Parameters were predicted in terms of longitude, latitude, elevation, slope of air streamlines, barrier height, and distance between stations. Storms were modelled hourly at a key station by a Markov process, and linear relationships were used to transfer the simulated storms to other locations. Predictive relationships were developed for the parameters of the storm model as functions of seasonal characteristics. Application of the model showed that it maintains the principal moments of hourly rainfall rates and of the amounts and durations of storms. The hourly rainfall generated by the model, when used as input to the Stanford watershed model, produces detailed streamflow series similar to observed runoff volumes and peak flows. (Sims-ISWS)
W78-00082

METEOROLOGICAL AND TIDAL EXCHANGES BETWEEN CORPUS CHRISTI BAY, TEXAS, AND THE NORTHWESTERN GULF OF MEXICO,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 2L.
W78-00088

EFFECTS OF THE URBAN ENVIRONMENT ON HEAVY RAINFALL DISTRIBUTION,
Illinois State Water Survey, Urbana.
F. A. Huff.
Water Resources Bulletin, Vol 13, No 4, p 807-816, August 1977. 2 fig, 3 tab, 11 ref. NSF GI-38317, AEN73-07796.

Descriptors: *Rainfall, *Cities, *Missouri, *Distribution patterns, Urbanization, Industries, Effects, Air pollution, Pollutants, Precipitation(Atmospheric), Weather modification, Excessive precipitation, Urban hydrology, Storms, Weather, Meteorology.
Identifiers: *St. Louis(Mo), Inadvertent weather modification, Hydrometeorology, Urban-induced rainfall.

A network of 225 recording raingages was operated over an area of 5200 sq km in the St. Louis region during 1971-1975, in conjuncton with an extensive investigation of urban effects on precipitation. Study of urban-induced effects on the frequency of heavy rainstorms revealed a pronounced increase in the occurrence of storms producing 25 mm (1 in) or more of rain. The increase was greatest in an area that is frequently in the path of storms passing across 2-urban-industrial regions. Analyses of raincells (rain intensity center) within heavy cnvective storms showed a pronounced increase in water yield from cells exposed to potential urban effects, compared with those cells exposed only to the surrounding rural environment. Naturally-occurring heavy cells tend to undergo the greatest enhancement from urban exposure. Other analyses indicated an above-average frequency of excessive rain rates for periods of 5 min to 2 hour downwind of the urban-industrial complex. It was concluded that urban-induced intensification of short-duration rainstorms in sufficient to merit inclusion in the design and operation of urban-area hydrologic systems that control the flow of surplus storm water. (Sims-ISWS)
W78-00091

ICE NUCLEI IN SEAWATER, FOG WATER AND MARINE AIR OFF THE COAST OF NOVA SCOTIA: SUMMER 1975,
National Oceanic and Atmospheric Administration, Boulder, Co. Atmospheric Physics and Chemistry Lab.
R. C. Schnell.
Journal of the Atmospheric Sciences, Vol 34, No 8, p 1299-1305, August 1977. 7 fig, 20 ref.

Descriptors: *Nucleation, *Ice, *Canada, *Atmosphere, *Oceans, *Atlantic Ocean, Fog, On-site investigations, On-site data collection, Measurement, Air, Sea water, Sampling, Data processing, Cloud physics, Meteorology.
Identifiers: *Ice nuclei, *Nova Scotia, *Marine fog.

Ice nuclei were measured in seawater, fog water, and the free atmosphere from 28 July to 11 August during the 1975 Hayes Fog Cruise off the east coast of Nova Scotia, Canada. Some seawater samples were found to contain ice nuclei active at -4 to -5C, although the majority of seawater samples contained no nuclei active at temperatures warmer than -14C. Half of the fog water samples contained ice nuclei active at temperatures warmer than -10C; some nuclei were active at -2C. Atmospheric ice nucleus concentrations varied from 1.1 to 580 nuclei/cu m active at -15C. Some bacteria isolated from fog water were observed to initiate ice at -1.5C. High concentrations of active ice nuclei in seawaters and fog waters were associated with high concentrations of biological materials in the same samples. (Sims-ISWS)
W78-00094

IMPACT OF ACID PRECIPITATION ON FRESHWATER ECOSYSTEMS IN NORWAY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W78-00226

ACID PRECIPITATION IN CANADA,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W78-00227

CLIMATIC STUDY OF NEW YORK BIGHT,
National Climatic Center, Asheville, NC.
W. A. Brower Jr.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 117-218, June 1977. Chiefly data tables.

Descriptors: *Climatic data, *Baseline studies, *Environmental effects, New York, New Jersey.
Identifiers: *Outer continental shelf, *New York Bight, Marine climatology, Air-water interaction, Sea-air interaction, Environmental conditions.

The New York Bight, covers the coastal region and waters bounded by 38 degrees N latitude, 71 degrees longitude and the US coastline. It encompasses Deepwater Dumpsite 106, located at 38 degrees 45'N, 72 degrees 15'W. This study describes the environment of the dumpsite, of the adjacent waters, and of the Bight's coastal region. Tables and figures are for selected stations and marine areas within New York Bight for the general period 1949 to 1974. The baseline data should serve as a frame of reference for environmental impact studies. (Sinha - OEIS)
W78-00316

CHANGES IN TEMPERATURE AND AIR HUMIDITY DURING IRRIGATION IN THE DESERT ZONE, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 3F.
W78-00347

DESERT RODENT ABUNDANCE IN SOUTHERN ARIZONA IN RELATION TO RAINFALL,
Texas A and M Univ., Uvalde. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2I.
W78-00385

WHERE TO FIND WEATHER AND CLIMATIC DATA FOR FOREST RESEARCH STUDIES AND MANAGEMENT PLANNING,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 7C.
W78-00386

A MARKOV CHAIN MODEL OF DAILY RAINFALL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan, D. M. Allen, and J. O. Street.
Water Resources Research, Vol. 12, No. 3, p 443-449, June 1976. 10 tab, 8 ref. OWRT A-045-KY(2).

Descriptors: *Markov processes, *Rainfall, *Stochastic processes, Precipitation(Atmospheric), Water resources, Weather patterns, Statistical methods, Parametric hydrology, Streamflow, Model studies.
Identifiers: *Markov chain model, *Daily rainfall, Dry days, Historical rainfall, Wet days, Two-parameter distribution.

A stochastic model based on a first-order Markov chain was developed to simulate daily rainfall at a point, since the design on many water resources projects requires knowledge of possible long-term rainfall patterns. The model uses historical rainfall data to estimate the Markov transitional probabilities. A separate matrix is estimated for each month of the year, using 7 x 7 transitional probability matrices. The model is capable of simulating a daily rainfall record of any length, based on the estimated transitional probabilities and frequency distributions of rainfall amounts. The simulated data have statistical properties similar to those of historical data. Simulated rainfall was compared with actual rainfall in several ways. The results of these comparisons indicated generally satisfactory performance of the model. The model seemed to generate annual rainfalls that exceeded historical rainfall by about 2.5%, or 1.08 in on the average. A hydrologic model was used to generate streamflow, using both the simulated and historical rainfall. The runoff generated by using the simulated rainfall averaged about 1 in more than that generated by using the historical rainfall. (Roberts - ISWS)
W78-00437

2C. Snow, Ice, and Frost

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT - WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, MD. Office of Hydrology.
E. A. Anderson, H. J. Greenan, R. Z. Whipkey, and C. T. Machell.
June 1977. 312 p, 36 fig, 13 tab, 24 ref, 8 append.

Descriptors: *Watersheds(Basins), *Data collections, *Precipitation(Atmospheric), *Runoff, *Vermont, Snow, Snowfall, Snowmelt, Rainfall, Air temperature, Evaporation, Land use, Climatology, Weather, Weather data, Soils, Soil moisture, Geology, Topography, Vegetation, Forests, Streamflow, Rain gages, Stream gages, Data processing.

Data were provided for the 3.25 sq mi W-3 watershed which is part of the Sleepers River Research Watershed operated by the Agricultural Research Service near Danville, Vermont. The publication contained streamflow, air temperature, snow course, pan evaporation, and soil moisture data, as well as point measurements and mean areal estimates of precipitation. Also included were data from the NOAA-ARS Snow Research Station which is located adjacent to the W-3 watershed. Detailed measurements of the snow cover and the hydro-meteorological variables affecting snow cover energy exchange have been made since December 1968 at the station as part of a cooperative project to study the physical processes involved in snow metamorphosis and snowmelt. Tabulations of some of the watershed and snow cover variables were included. The remaining variables were summarized. Most of the actual data were contained on an associated magnetic tape. In addition to the data, information was provided as to the quality of the data and the hydro-climatology of the watershed. This is a high quality set of data suitable for use in developing and testing physically based hydrologic models. The watershed is hydrologically representative of most of the glaciated upland regions of the Northeastern United States. The mean annual precipitation during the 15-year period is approximately 43 in, with about 25 in per year of runoff. The maximum water-equivalent of the snow cover is generally about 9 to 12 in. (Sims-ISWS)
W78-00068

EQUILIBRIUM THICKNESS OF ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J-C. Tatinclaux.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13179, p 959-974, September 1977. 8 fig, 1 tab, 7 ref, 2 append. CRREL DAAK 03-75-C-0030, NSF ENG72-04118-A02.

Descriptors: *Ice jams, *Ice cover, *Model studies, Mathematical models, Hydraulic models, Laboratory tests, Ice, Streamflow, Rivers, Hydraulics, Flumes, Energy, Data processing.
Identifiers: *Equilibrium methods, *Ice jam thickness, Submergence, Ice formation, Ice floes.

By equating the kinetic energy of ice floes carried by a stream to the potential energy they acquire when submerged, a relationship was derived between the mean velocity of the approach flow and the average thickness of the stable ice jam formed only by accumulation and transport of floes. The relationship was verified by experiments conducted in a refrigerated laboratory flume using real ice and plastic floes. The experiments also confirmed the theoretical prediction that there exists a maximum velocity of the approach flow beyond which no stable jam can exist. For deep channels, the corresponding maximum jam thickness was found to be approximately 36% of the upstream flow depth. (Sims-ISWS)
W78-00074

ICE NUCLEI IN SEAWATER, FOG WATER AND MARINE AIR OFF THE COAST OF NOVA SCOTIA: SUMMER 1975,
National Oceanic and Atmospheric Administration, Boulder, Co. Atmospheric Physics and Chemistry Lab.
For primary bibliographic entry see Field 2B.
W78-00094

PHOTOSYNTHESIS IN THE SNOW: THE ALGA CHLAMYDOMONAS NIVALIS (CHLOROPHYCEAE),
Wisconsin Univ.-Madison. Dept. of Bacteriology.
J. L. Mosser, A. G. Mosser, and T. D. Brock.
Journal of Phycology, Vol. 13, No. 1, March 1977, p. 22-27. 3 fig, 2 tab, 22 ref. ERDA C00-2161-25 and -26.

Descriptors: *Chlamydomonas, *Snow, *Photosynthesis, Soil algae, Soil microorganism, Light intensity, Freezing, Temperature, Montana, Wyoming.
Identifiers: Beartooth Mountains(Mont and Wyo).

Field studies designed to examine the effects of temperature, light and water potential on snow algae in the Beartooth Mountains of Montana and Wyoming suggest that these alga included different temperature straits and that their development can occur only during the summer months. Red blooms of snow algae consisting almost exclusively of large spherical red cells of Chlamydomonas nivalis (Bauer) Wille were examined using photosynthetic 14C-HC03 or 14C02 incorporation as a measure of activity. Photosynthesis occurred optimally at 5.4 x 10 to the 4th power lx but were not inhibited by increased light intensity up to 8.6 x 10 to the 4th power lx, the maximum observed. It is thought unlikely that the significant algal activity occurs at the low temperatures of winter, because low water potentials develop in snow at temperatures below 0-C and photosynthesis was found sensitive to a reduction in water potential. Photosynthesis was much lower following melting of the snow, probably because of decreased diffusion of C02. In general, the results show that the snow algae have high light tolerance, require high water potential and that different populations exhibit a surprising variation in adaptation to low temperature. (Harris-Wisconsin)
W78-00223

RESPONSE OF EURASIAN WATERMILFOIL TO SUBFREEZING TEMPERATURES,
Tennessee Valley Authority, Muscle Shoals, AL. Environmental Biology Branch.
For primary bibliographic entry see Field 5G.
W78-00249

IMPLICATION OF RESOURCE DEVELOPMENT ON THE NORTH SLOPE OF ALASKA WITH REGARD TO WATER QUALITY ON THE SAGAVANIRKTOK RIVER,
Corvallis Environmental Research Lab., College, AK. Arctic Environmental Research Station.
For primary bibliographic entry see Field 5B.
W78-00420

2D. Evaporation and Transpiration

CALCULATION OF EVAPOTRANSPIRATION USING COLOR-INFRARED PHOTOGRAPHY,
Geological Survey, Reston, VA. Water Resources Div.
J. E. Jones.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $2.50.

Descriptors: *Evapotranspiration, *Aerial photography, *Remote sensing, *Terrain analysis, *Arizona, Riparian water loss, Riparian plants, Phreatophytes, Transpiration, Tamarisk, Mesquite, Sorghum, Consumptive use, Hydrology.
Identifiers: *Color IR photography, Film standardization, Spectral radiometry, Relative radiometer, *Gila River(Ariz).

Color-infrared photography was used as a relative radiometer to obtain data from 38 photographic missions flown between 1967-71 over the Gila River Phreatophyte Project in southeastern Arizona. Remote-sensing measurements of evapotranspiration from 13 photographic missions flown during 1968 were related to water-budget measurements for a 1,700-acre cleared of vegetation and a 2,200-acre phreatophyte-covered area of the Gila River flood plain. The coefficients of correlation between the water-budget measurements and the remote-sensing measurements were 0.88 for the cleared area and 0.86 for the phreatophyte covered area. Photographic data also were correlated with depth to ground-water level, soil moisture, foliar cover, and volume of canopy.

Computer mapping and digital modeling of the photographic data were useful for spatial and temporal evaluation of the flood plain. The technique used for standardizing the photographic data are explained and examples are shown. It was determined that a color-infrared photographic mission and a computer analysis of the photographic data for the Gila River Phreatophyte Project area cost about a tenth of the amount of conventional species classification and canopy-measurement techniques. An appendix discussing the derived spectral equations and a table of 24 statistical parameters describing the spectral and hydrologic variables is included. (Woodard-USGS)
W78-00212

TRANSPIRATION RATE AND SUCTION FORCE OF PLANTS OF PINE FORESTS UNDER DIFFERENT ECOLOGICAL CONDITIONS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralny Botanichy Sad.
I. M. Haranovich.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk 2, p 43-47. 1975.

Descriptors: *Transpiration, Plant physiology, *Pine trees, Forest management, Soil moisture, Soil temperature, Air temperature, Grasses.
Identifiers: *Suction force(Plants).

The transpiration rate and suction force of plants of pine forests characterize a number of interrelations in phytocenoses and depend on a whole series of factors. There is a dependence of the suction force and transpiration rate on layering, orientation of the forest margins, development of the grass cover, etc. The suction force and transpiration rate increase with an increase of the air and soil temperature. The transpiration rate increases with an increase of soil moisture; the suction force decreases.—Copyright 1976, Biological Abstracts, Inc.
W78-00334

WATER- AND PHOTOSYNTHESIS-RELATIONS OF DESERT PLANTS IN THE SOUTH ALGERIAN SAHARA: III. ANNUAL COURSE AND CONSTITUTIONAL TYPES, (IN GERMAN),
For primary bibliographic entry see Field 2I.
W78-00358

2E. Streamflow and Runoff

CALCULATORS IN TIMER-COUNTERS FOR CURRENT METERS,
Papuea New Guinea Univ. of Tech., Lae (New Guinea). Dept. of Electrical and Communications Engineering.
For primary bibliographic entry see Field 7B.
W78-00077

UNIFIED VIEW OF WASH LOAD AND BED MATERIAL LOAD,
Thessaloniki Univ., Salonika (Greece).; and Florida Univ., Gainesville. Dept. of Engineering Sciences.
For primary bibliographic entry see Field 2J.
W78-00078

BASIC PRINCIPLES OF RIVER HYDRAULICS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
G. Parker, and A. G. Anderson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY9, Proceedings Paper 13233, p 1077-1087, September 1977. 3 fig, 2 tab, 16 ref, 2 append.

Descriptors: *River flow, *Hydraulics, *Model studies, Mathematical models, Alluvial channels, Bed load, Suspended load, Suspended solids, Sediments, Beds, Graphical analysis, Beds under water, Streamflow, Sediment transport, Flow, Rivers.
Identifiers: *River hydraulics.

Derivations of the general form of fluvial resistance and sediment load relations were presented. The relations are sufficiently general to encompass the various specific dimensionally homogeneous relations that appear in the literature. An outline of the number and type of constraints necessary to specify solution sets for problems in equilibrium flow was presented. It was shown that any pair of resistance and load relations uniquely specifies depth-discharge and sediment transport rating curves at given slopes and bed particle Reynolds numbers. Such a format allowed for direct graphical calculation of such parameters as slope, discharge, load, etc., from appropriate input information. Several examples of load and resistance relations presented in the generalized format were analyzed. (Sims-ISWS)
W78-00080

WORLD-WIDE VARIATIONS IN HYDRAULIC GEOMETRY EXPONENTS OF STREAM CHANNELS: AN ANALYSIS AND SOME OBSERVATIONS,
Saint David's Univ. Coll., Dyfed (Wales). Dept. of Geography.
C. C. Park.
Journal of Hydrology, Vol. 33, No. 1/2, p 133-146, March 1977. 3 fig, 2 tab, 34 ref.

Descriptors: *Streamflow, *Channel morphology, *Velocity, *Equilibrium, *Data collections, Climatic zones, Histograms, Drainage area, Distribution patterns, Continuity equation.
Identifiers: *Hydraulic geometry, Triaxial diagrams.

A number of hydraulic geometry studies have been reported since the classic work of Leopold and Maddock. Misconceptions have arisen regarding the nature and magnitude of variations in the hydraulic geometry exponents between areas. Exponent data for 139 at-a-station sites and for 72 downstream cases were collected from the literature, and variations in the data were analyzed. To facilitate simultaneous comparison between the three exponents, the data were plotted on triaxial diagrams, with one axis per exponent. Variations within and between major climatic areas were examined, and similarities between theoretically derived and empirically observed data were appreciated. Some confusion in the literature was attributed to five basic observations: (1) downstream relationships have been related to different flow levels in different studies; (2) differences might be expected between gaging station and field data; (3) several different methods of fitting lines to relationships have been applied; (4) simple power functions may not be the best way of empirically describing the hydraulic geometry relationships in some cases; and (5) the debate on whether or not velocity decreases downstream at a constant flow frequency has been perpetuated and remains largely unresolved. (Singh-ISWS)
W78-00081

LOW-FLOW CHARACTERISTICS AT GAGING STATIONS ON THE WISCONSIN, FOX, AND WOLF RIVERS, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00204

LATERAL MIGRATION OF THE MIDDLE SACRAMENTO RIVER, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-00208

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00209

THE STRUCTURE OF A TURBULENT FLOW IN A CHANNEL OF COMPLEX SHAPE,
Geological Survey, Atlanta, GA. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-00211

COOPERATIVE INSTREAM FLOW SERVICE GROUP: THE FIRST YEAR.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
For primary bibliographic entry see Field 4A.
W78-00497

2F. Groundwater

WATER TABLE RESPONSE TO A SEQUENCE OF RECHARGES,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Water Resources Research, Vol 13, No 4, p 738-742, August 1977. 3 fig, 3 tab, 11 ref.

Descriptors: *Water table, *Subsurface drainage, *Model studies, Mathematical models, Tile drainage, Soil water, Groundwater, *Recharge, *Groundwater recharge, Drainage, Fluctuations, Hydraulic conductivity, Agriculture.

Water table behavior under subsurface drainage conditions was analyzed by considering water table fluctuations in response to a sequence of recharge events. The derived solution is applicable to a nonhomogeneous soil profile. An iteration procedure was introduced to illustrate the application of the theoretical results. Agreement between theoretical analysis and field data was shown to be adequate. (Sims-ISWS)
W78-00072

DEVELOPMENT AND RESORPTION OF A THERMAL DISTURBANCE IN A PHREATIC AQUIFER WITH NATURAL CONVECTION,
Neuchatel Univ. (Switzerland). Centre de Hydrogeologie.
For primary bibliographic entry see Field 5B.
W78-00083

HEAT DISPERSION EFFECT ON THERMAL CONVECTION IN ANISOTROPIC POROUS MEDIA,
Oslo Univ. (Norway). Dept. of Mechanics.
P. A. Tyvand.
Journal of Hydrology, Vol. 34, No. 3/4, p 335-342, August 1977. 11 ref.

Descriptors: *Thermal water, *Porous media, *Groundwater movement, Convection, Groundwater, Flow, Model studies, Mathematical models, Mathematical studies, Numerical analysis, Darcys law, Hydrology.
Identifiers: *Heat dispersion, Peclet numbers, Rayleigh number.

The effect of hydrodynamic dispersion on the onset of thermal convection in flows through anisotropic porous media was studied theoretically. The porous layer was homogeneous and bounded by 2 infinite perfectly heat-conducting impermeable horizontal planes kept at constant temperatures. Horizontal isotropy with respect to impermeability and thermal diffusivity was assumed. A pressure-driven basic flow was con-

sidered in the limits of small and large Peclet numbers. The analysis showed that the onset of convection in both cases is independent of longitudinal dispersion, while dispersion in lateral directions has stabilizing effects. The preferred mode of disturbance consists of stationary rolls with axes aligned in the direction of the basic flow. (Sims-ISWS)
W78-00084

SERIES EXPRESSION FOR THE WELL FUNCTION FOR LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol. 34, No. 3/4, p 389-394, August 1977. 5 ref.

Descriptors: *Aquifers, *Model studies, *Mathematical models, Wells, Observation wells, Equations, Mathematics, Pumping, Leakage, Groundwater, Groundwater movement, Water table.
Identifiers: *Well function, Series expressions.

Two series expansions of the well function for leaky strip aquifers were given which provide for rapid calculation over the domain of practical applications. (Sims-ISWS)
W78-00085

GROUND WATER IN THE FRESNO AREA, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00190

GROUND-WATER LEVELS IN THE UNITED STATES, 1972-74. NORTH-CENTRAL STATES.
Geological SSurvey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00191

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. SOUTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00192

SUMMARY GROUND-WATER RESOURCES OF LUZERNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00193

GROUNDWATER IN THE SOUTHERN PART OF THE CESKOTREBOVSKA VRCHOVINA (HIGHLAND),
Ceskoslovenska Akaedmie Ved, Brno. Geograficky Ustav.
H. Kriz.
Prirodoved Pr Ustavu Cesk Akad Ved Brne. 7(11), p 1-43, 1973.

Descriptors: *Groundwater, *Hydrogeology, *Statistical processes, *Water levels, Water wells, *Springs, *Discharges(Water).
Identifiers: *Czechoslovakia(Ceskotrebovska Vrchovina).

Processing of results obtained from longterm hydrological observations and special methods developed and used in Czechoslovakia are discussed. Statistics are applied to the processing of results. The 1st part of the work contains concise geological and hydrogeological characteristics. The 2nd part evaluates the regime of groundwater on the basis of a statistical processing of data obtained from observations of groundwater levels in numerous wells and of discharges of some important springs. The methods used are similar to those of the processing of discharges of a stream but are adapted to the needs of groundwater hydrology. Greater attention is paid to the analysis of the course of long-term deviations of groundwater levels and discharges of springs. Regionalization of groundwater from the geographical viewpoint is discussed.--Copyright 1975, Biological Abstracts, Inc.
W78-00374

DISSOLUTION KINETICS OF CARBONATE ROCKS 1. EFFECTS OF LITHOLOGY ON DISSOLUTION RATE,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2K.
W78-00435

CHARACTERIZATION OF COARSE POROUS MEDIA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 8D.
W78-00436

A HIERARCHY OF RESPONSE FUNCTIONS FOR GROUNDWATER MANAGEMENT,
Mekoroth Water Co., Tel-Aviv (Israel). Systems Engineering Dept.
For primary bibliographic entry see Field 4B.
W78-00444

SHAPES OF STEADY STATE PERCHED GROUNDWATER MOUNDS,
Iowa State Univ., Ames. Dept. of Agronomy.
M. Y. Khan, D. Kirkham, and R. L. Handy.
Water Resources Research, Vol. 12, No. 3, p 429-436, June 1976. 6 fig, 2 tab, 21 ref. OWRT B-019-IA(7).

Descriptors: *Groundwater, Groundwater barriers, Groundwater resources, *Aquifers, Groundwater recharge, Flow nets, *Water table.
Identifiers: *Perched groundwater mounds.

A potential theory flow solution for the potential function, stream function, and shape of the water table is given for a class of steady state two- and three-dimensional perched groundwater mounds formed under a long rectangular recharge basin or under a circular recharge basin. The solutions are done by a Gram-Schmidt method and a simple iteration scheme. The mounds are formed in a stratum of conductivity k1 overlying a perching stratum of much lower conductivity k2. Capillary fringe effects are neglected. The recharge rate is R. Potential theory mound heights are compared with those given by the Dupuit-Forchheimer (DF) theory. For the cases computed, the DF theory gives apex heights of mounds correct to better than 7% for two-dimensional mounds. For three-dimensional mounds the DF theory gives in one case a mound height that is 69% too low and in another case a mound height that is 28% too low. Profiles of the computed mounds are graphed, and examples of use of the graphs in applications are given. Sample flow nets are presented. (Skogerboe-Colorado State)
W78-00446

2G. Water In Soils

WATER AND TEMPERATURE REGIME OF THE MAIN TYPES OF SOILS OF THE APSHERON PENINSULA, (IN AZERBAIJANIAN),
R. Manedov.
Izv Akad Nauk Az SSR Ser Biol Nauk 3, p 51-58, 1975.

Descriptors: *Soil water, Soil types, *Soil temperature, Crops, Vegetables, Climates, Irrigation, Seasonal.
Identifiers: USSR, *Azerbaijan SRR(Apsheron peninsula).

The water and temperature regimes of the main types of soils under various crop plants depend on the relief and season. In the territory of the Apsheron peninsula (Azerbaijan SSR, USSR) 2 types of water regime are observed: a nonleaching water regime on virgin soils and an irrigation regime on irrigated soils. The water regime of the investigated soils in not considered normal; it can be regulated only by irrigation. The soil and climatic conditions of the peninsula favor vegetable growing during the entire year. --Copyright 1976, Biological Abstracts, Inc.
W78-00002

WATER TABLE RESPONSE TO A SEQUENCE OF RECHARGES,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-00072

NONLINEAR ADSORPTION IN LAYERED POROUS MEDIA FLOW,
Polytechnic Inst. of New York, brooklyn. Dept. of Chemical Engineering.
S. H. Lin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13192, p 951-958, September 1977. 3 fig, 11 ref, 2 append.

Descriptors: *Adsorption, *Dispersion, *Porous media, *Model studies, Mathematical models, Seepage, Seepage control, Equations, Soil water, Soil water movement, Solutes, Groundwater.
Identifiers: Nonlinear adsorption.

Dispersion and adsorption of solute in multilayer saturated porous media with constant specific discharge were examined. Differential equations were formulated for describing the solute concentration in two-layer porous media. A general nonlinear equilibrium adsorption isotherm of the Freundlich type was considered. The nonlinear coupled differential equations were solved by the orthogonal collocation method to give the solute concentration distributions in the media when subject to a step-change or an exponential input. It was found that under many circumstances, the general dispersion model can be reduced to a simpler plug-flow model by neglecting the dispersion component in the governing differential equations. A criterion for this simplification also was suggested. (Sims-ISWS)
W78-00073

PHOSPHATE REMOVAL BY SANDS AND SOILS,
New York State Dept. of Environmental Conservation, Albany. Research Unit.
For primary bibliographic entry see Field 5D.
W78-00092

A NUMERICAL METHOD FOR THE SIMULATION OF UNSTEADY GROUND-WATER FLOW IN BOTH SATURATED AND UNSATURATED SOILS,
Universitaet Muenster, Muenster (West Germany), Inst. fuer Numerische und Instrumentelle Mathematik.
U. Hornung.
Soil Science, Vol 124, No 3, p 140-144, September 1977. 6 fig, 7 ref.

Descriptors: *Soil water movement, *Porous media, *Model studies, *Mathematical models, Saturated flow, Unsaturated flow, Soil water, Groundwater, Groundwater movement, Hydraulic

conductivity, Moisture content, Pressure head, Infiltration, Soil physics, Soil science.

A numerical method for the simulation of unsteady groundwater flow was presented. In order to treat soils that are both saturated and unsaturated, stiffly stable, multiple-value methods with automatic control of order and step size were used. Numerical results from some model calculations were given. (Sims-ISWS)
W78-00093

ON THE QUANTIFICATION OF THE TRANSFORMATION AND ACCUMULATION CAPACITY OF SOIL, (IN GERMAN),
Humboldt-Univ. zu Berlin (East Germany) Sektion Pflanzenproduktion.
E. Ehwald.
Wiss Z Humboldt-Univ Berl Math Naturwiss Reihe 23(6), p 697-704, 1974.

Descriptors: *Soil types, *Nitrogen, *Phosphorus, *Potassium, Soil water movement.

An example of the water-, K-, P-d and N- relations is used in regard to better agrochemical and agrophysical characterization of soils. --Copyright 1976, Biological Abstracts, Inc.
W78-00104

SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD,
Agricultural Research Service, Lincoln, NE.
For primary bibliographic entry see Field 5B.
W78-00121

SOIL PROCESSES AND PRODUCTIVITY IN RELATION TO CLIMATIC CYCLES IN KAZAKHSTAN, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. Pochvovedeniya.
V. M. Borovsky.
Geoderma 15(1), p 41-49, 1976.

Descriptors: *Precipitation(Atmospheric), *Soils, *Climates, Drought, Floods, *Soil moisture, Groundwater, Nitrogen, Nitrates, Ammonia.
Identifiers: *USSR(Kazakstan).

The amount of precipitation in a number of boreal zone regions changes greatly from year to year. The precipitation fluctuation curves are in conformity with those of the solar activity having 11-yr or secular (80-90 yr)periodicity. Observations carried out in the lower reaches of the Syr-Darya River (USSR) showed that the river discharge fluctuations are subject to the same relationships. In wet years severe floods occur, with soils being swamped in depressions and the salinization process intensified on the highlands. In dry years the swamped soils dry up and turn into meadow-boggy soils, and the salinization process ceases due to the lowering of the ground water. In the alluvial-meadow soils of the Syr-Darya levees the soils become salinized in dry years, whereas in wet years the accumulated salts are washed away by floods. The hydrologic regime affects the irrigated paddies as well; in spring prior to flooding in wet years the groundwater table is higher than it is in dry years. In drought years the moisture storage in the soils of the North Kazakhstan experimental stations is negligible and not enough for a good grass yield, whereas in wet years the yield is satisfactory. The natural addition of plant residues to the soil is also of a rhythmical nature, depending upon the moistening rhythm. In dry years biochemical processes in the soil are much less intensive than they are in wet years, and the composition of the resultant products is different. For example, N compounds in chestnut soils of the Tien Shan foothills in wet years are mainly represented by ammonia forms and in dry years by nitrate forms. Knowing these relationships would be of great scientific and practical value in forecasting agricultural production and taking preventive measures in due time against drought and other hazards.
W78-00174

FACTORS AFFECTING DIMETHYLNITROSAMINE FORMATION IN SAMPLES OF SOIL AND WATER,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00215

ATMOSPHERIC NITROGEN FIXATION BY FREE-LIVING MICROORGANISMS: PART 2. THE EFFECT OF TEMPERATURE AND MOISTURE ON THE DEVELOPMENT OF NITROGEN-FIXING MICROORGANISMS AND THE PROCESS OF BIOLOGICAL NITROGEN FIXATION,
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
For primary bibliographic entry see Field 5B.
W78-00220

PHOTOSYNTHESIS IN THE SNOW: THE ALGA CHLAMYDOMONAS NIVALIS (CHLOROPHYCEAE),
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 2C.
W78-00223

METHOD AND APPARATUS FOR CONSERVING SOIL WATER,
For primary bibliographic entry see Field 3B.
W78-00276

THE EFFECT OF FLOODING ON THE AVAILABILITY OF ZINC AND MANGANESE TO RICE,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 3F.
W78-00337

FIELD EXPERIMENTS ON THE USE OF CHLOROCHOLINE CHLORIDE (CCC) WITH WINTER RYE, (IN GERMAN),
Landwirtschaftliche Forschungsanstalt, Buentehof (West Germany).
P. W. Kuerten, W. Schuster, and H. Kuehn.
Z Acker-Pflanzenbau. 135(1), p 29-42, 1972.

Descriptors: *Chlorides, *Rye, *Soil moisture, Loams, Sands, *Soil treatment, Colloids, Root systems.
Identifiers: *Chlorocholine chloride.

Field experiments were carried out in 2 locations in Germany with different soils and differing humidity relations, an alluvial loam soil rich in colloids (Giessen) and a light sandy soil (Dulmen), in 2 yr (1967 and 1968) with 3 rye cultivars, to test their reaction to CCC at different doses and applied at different times. A slight reduction in the mean straw length and a slight improvement in standing capacity as a result CCC treatment was accompanied by a significant increase in grain yield, particularly in 'Petkuser Normalstroh' rye and in the drier locality (Giessen). In Carsten's winter rye and in a breeding strain of 'Carsten' there was, in spite of a more marked reduction in straw length and improved standing capacity, usually no significant improvement in grain yield. Reductions in yield were also observed. The yield of 'Carsten's' winter rye was usually very high even without CCC treatment. Since the yield increases observed, even in the 2 'Carsten' cultivars occurred mainly in a dry year and on the soil with high colloid content and poor water supply, it is assumed that CCC enhances development of a stronger root system with more prolonged activity, which in turn resulted in improved water supply at the time of anthesis and grain development. Neither number of fertile ears per unit area nor 1000-grain weight displayed a definite relation to yield, so the yield increases observed are ascribed to an increase in number of grains per year. The time of application of CCC had only a small influence: the higher dose showed advantages in certain cases.--Copyright 1974, Biological Abstracts, Inc.
W78-00341

CHARACTERIZATION OF COARSE POROUS MEDIA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 8D.
W78-00436

WATER CONTENT AND BULK DENSITY DURING WETTING OF A BENTONITE-SILT COLUMN,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
D. L. Nofziger, and D. Swartzendruber.
Soil Science Society of America Journal, Vol. 40, No. 3, p 345-348, May-June 1976. 6 fig, 14 ref. OWRT B-014-IND(9).

Descriptors: *Soil moisture, Soil water, *Bulk density, *Soil water movement, Soils, Soil properties, Clays, Seepage, Saturated flow, Unsaturated flow, Methodology.
Identifiers: *Gamma ray attenuation, Soil columns.

An improved method of dual-energy gamma-ray attenuation was used to measure water content and bulk density rapidly and accurately, during one-dimensional, unsaturated water movement into a column of an equal-part mixture of initially air-dry, highly swelling bentonite and silt. The bulk density near the inlet end of the column decreased rapidly as water entered. Since the ends of the column were confined, the expansion of the wetted bentonite-silt produced a compensating compression in the remaining air-dry portion of the column. Several water-content variables were plotted against the so-called reduced material coordinate m/t(1/2) (Boltzmann variable expressed in terms of the material coordinate m and time t). Neither the volumetric water content nor the volumetric water ratio would coalesce the data when plotted against m/t(1/2). In contrast, a plot of water saturation vs. m/t(1/2) did coalesce the data into a single curve, except for very early times at positions nearer than 1 cm to the water inlet. (Skogerboe-Colorado State)
W78-00445

STUDY OF THE STATISTICAL STRUCTURE OF MOISTURE FIELDS FOR AUTOMATIZING THE WATERING OF SOIL IN HOTHOUSES, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatel
I. I. Zdanevich.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 9, p 45-46, 1974.

Descriptors: *Soil moisture, Greenhouses, *Moisture content, Automation, Statistical processes, Regulation, Plant growth.

The 3-dimensional statistical structure of the moisture field of soil in hothouses was investigated. The moisture field can be considered homogeneous and isotropic with respect to a spatial normalized correlation function, knowledge of which permits approaching the solution of a number of practical problems in regulating the moisture content of the soil.--Copyright 1975, Biological Abstracts, Inc.
W78-00476

2H. Lakes

FINITE ELEMENT APPROACH TO WAVES DUE TO LANDSLIDES,
Thessaloniki Univ., Salonika (Greece). Faculty of Technology.
For primary bibliographic entry see Field 8B.
W78-00076

PASSIVE REMOTE SENSING OF PHYTOPLANKTON VIA CHLOROPHYLL ALPHA FLORESCENCE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 7B.
W78-00090

FEEDLOTS AND RECREATION LAKES: AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS,
Agricultural Research Service, Lincoln, NE.
For primary bibliographic entry see Field 5G.
W78-00123

DECOMPOSITION OF AQUATIC BIOTA AND SEDIMENT FORMATION: ORGANIC COMPOUNDS IN DETRITUS RESULTING FROM MICROBIAL ATTACK ON THE ALGA CERATIUM HIRUNDINELLA,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W78-00218

THE INFLUENCE OF EXTREMELY HIGH CONCENTRATIONS OF INORGANIC P AT VARYING PH ON THE GROWTH AND PHOTOSYNTHESIS OF UNICELLULAR ALGAE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5C.
W78-00222

DEVELOPMENT OF THE MUD HABITAT DURING THE FILLING OF TOO NEW LAKES,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W78-00228

OBSERVATIONS ON SOME INTERESTING FRESHWATER ALGAE FROM THE NETHERLANDS,
Vrije Univ., Amsterdam (Netherlands). Afdeling Plantensystematiek.
For primary bibliographic entry see Field 5C.
W78-00230

A COMPARATIVE SURVEY OF PETROLEUM HYDROCARBONS IN LAKE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00233

A CARBON FLOW MODEL OF EPIPELIC ALGAL PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00235

ENVIRONMENTAL CONTROL OF PRIMARY PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00237

RELATIONSHIPS BETWEEN THE PHYTOPLANKTON AND THE ZOOPLANKTON IN THE RESERVOIRS OF THE KARST REGION IN CROATIA, (IN SERBO-CROATIAN),
For primary bibliographic entry see Field 5C.
W78-00238

PRODUCTIVITY OF EPIPELIC ALGAE IN TUNDRA PONDS AND A LAKE NEAR BARROW, ALASKA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00239

SOME CHARACTERISTICS OF HYDRILLA TUBERS TAKEN FROM LAKE OCKLAWAHA DURING DRAWDOWN,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-00248

RESPONSE OF EURASIAN WATERMILFOIL TO SUBFREEZING TEMPERATURES,
Tennessee Valley Authority, Muscle Shoals, AL. Environmental Biology Branch.
For primary bibliographic entry see Field 5G.
W78-00249

AN ECOLOGICAL STUDY OF THE SWANPOOL, FALMOUTH: II. HYDROGRAPHY AND ITS RELATION TO ANIMAL DISTRIBUTIONS,
Bristol Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-00258

ZOOPLANKTON OF BACINSKA LAKES: A CONTRIBUTION TO THE KARSTIC LIMNOLOGY, (IN SERBO-CROATIAN),
Bioloski Inst., Belgrade (Yugoslavia).
A. Zivkovic.
Arh Biol Nauka. 24(3/4), p 141-164, 1972.

Descriptors: *Zooplankton, Karst, Limnology, Lakes, Seasonal, *Thermal stratification, *Chemical stratification, *Oxygen, Crustaceans, Copepods, Daphnia.
Identifiers: Bosmina-longirostris, Copidodiaptomus-steurei, Daphnia-longispina, Diaphanosoma-brachyurum, Filinia-major, Mesocyclops-leuckarti, Pedalia-Mira, Pedalia-oxiurius, *Yugoslavia(Bacinska lakes).

Investigation of zooplankton of the Bacinska Lakes Crnisevo and Ocusa was carried out at season intervals from 1962-1965. Thermal and chemical stratification is obvious in the deepest Bacinska lakes, Crnisevo and Ocusa, whose basins are below sea level, thus representing a cryptodepression. According to the thermal regime, both lakes are subtropical lakes with long summer stagnation, a brief circulation in the winter, intensive variations in annual temperature and a high thermal gradient. Both lakes belong to the calcium hydrocarbonate type, with a low content of electrolytes. The O2 content of the lake water from the surface to the bottom is usually sufficient. Occasionally in autumn a low O2 coefficient occurs as a consequence of long summer stagnation. In the zooplankton, 37 spp. of Rotatoria were observed. Besides the species of wide distribution, 3 freshwater-brackish species were also found: Pedalia oxiurius, P. mira and Filinia major, which are characteristic for Crnisevo Lake. Among 6 typical limnetic species of Cladocera, the most frequent are: Daphnia longispina, Bosmina longirostris and Diaphanosoma brachyurum, while among Copepoda the most frequent are Mesocyclops leuckarti and Copidodiaptomus steueri. Very pronounced vertical distribution of zooplankton is caused by thermal and chemical stratification. Most frequently the zooplankton is concentrated in the metalimnion (i.e. from 5-15 m). The production of zooplankton expressed as average numerical values varies in the Crnisevo Lake from 31-164 individuals/l. Maximum production occurs either in spring or in autumn; the minimum occurs in winter. In Ocusa Lake the maximum development of zooplankton occurs in a hot and dry period (from 92-372 individuals/l) while the minimum is in the rainy period (from 0-5 individuals/l). The lakes can be characterized as oligotrophic. However, this oligotrophic type has specific, regional properties which are characteristic for the semiarid, mediterranean area of the Dinaric karst.--Copyright 1975, Biological Abstracts, Inc.
W78-00340

ON THE RELATION BETWEEN FISH FAUNA AND ZOOPLANKTON COMPOSITION IN NORTH SWEDISH LAKES,
Institute of Freshwater Research, Drottningholm (Sweden).
N.-A. Nilsson, and B. Pejler.
Inst Freshwater Res Drottningholm Rep. 53, p 51-77, 1973.

Descriptors: *Zooplankton, Lakes, *Predation, *Crustaceans, Daphnia, Fish, Trout, Perches, Pikes, Fish food organisms.
Identifiers: Bosmina longirostris, Ceriodaphnia quadrangula, Daphnia cristata, Daphnia galeata, Daphnia longispina, Heterocope appendiculata, Heterocope saliens, *White fish, *Sweden, Char lakes.

Fish predation appears to be the ultimate factor governing the presence or absence of certain crustaceans species. Daphnia longispina and Heterocope saliens dominate barren lakes or lakes with char or white fish and is replaced by the smaller more transparent D. galeata. Likewise, H. saliens is replaced by the smaller, less conspicuously colored H. appendiculata. In whitefish lakes, the smallest species, D. cristata, Ceriodaphnia quadrangula and Bosmina longirostris are predominant. The zonation of fish species from arctic highlands to the Baltic coast follow the sequence: barren lakes--allopatric trout or char lakes--sympatric trout and char lakes--whitefish lakes with pike, perch and 'coarse fish'. The competitive replacement of arctic char by whitefish occurs at an early stage when all species are planktivorous. The most recently introduced species appears to select the largest and most readily available prey. However, the introduction of planktivorous fish does not inevitably lead to complete extinction of the crustacean fauna; the species simply becomes sufficiently rare as to escape sampling. The rapid exchange of large-sized for small-sized species suggests that the latter were already present in small numbers or 'in refugia', before invasion.--Copyright 1975, Biological Abstracts, Inc.
W78-00372

ASPECTS OF THE LIMNOLOGY OF LAKE TALI KARNG, VICTORIA,
Avondale Coll., Cooranbong (Australia). Dept. of Science.
B. V. Timms.
Aust J Mar Freshwater Res. 25(2), p 273-279, 1974.

Descriptors: *Australia, Lakes, *Limnology, *Salts, *Acidic water, Dissolved solids, *Detritus, *Bottom sediments, *Zooplankton, Muds, Benthos.
Identifiers: Calamoecia-ampulla, Ceriodaphnia-quadrangula, Chara-sp, Chironomus-oppositus, Colubotelson-sp, Litoria-phyllochroa, Micronec-

ta-robusta, Tasmania, Victoria, *Lake Tali Karng(Australia).

Lake Tali Karng, the only deep highland lake in Victoria (Australia), was formed by a landslide. It is 51 m deep and 16.2 ha in area. Lake water is low in total dissolved salts and is slightly acidic. Bottom deposits consist of allochthonous woody detritus in the littoral and sublittoral and of mud of high organic content in the profundal. There are 6 spp. of zooplankton present, including Calamoecia ampulla and Ceriodaphnia quadrangula. Twelve spcies inhabit the littoral zone, which is either rocky or supports weedbeds of Chara sp. Micronecta robusta and tadpoles of Littoria phyllochroa are most abundant. The benthos is dominated by the phraetoicid, Colubotelson sp., and 2 spp. of chironomid in the sublittoral and by Chironomus oppositus in the profundal. Mean benthic biomass is 4.45 g/m2. There is evidence of a biogeographical relationship to highland lakes in Tasmania.--Copyright 1975, Biological Abstracts, Inc.
W78-00387

HYDROCARBON BUDGETS FOR LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00394

SHAGAWA LAKE RECOVERY CHARACTERISTICS AS DEPICTED BY PREDICTIVE MODELING,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-00417

A MATHEMATICAL MODEL OF POLLUTANT CAUSE AND EFFECT IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
For primary bibliographic entry see Field 5B.
W78-00418

MATHEMATICAL MODEL OF PHYTOPLANKTON GROWTH AND CLASS SUCCESSION IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
For primary bibliographic entry see Field 5C.
W78-00419

LAKE EUTOPHICATION: RESULTS FROM THE NATIONAL EUTROPHICATION SURVEY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-00421

METALS IN PLANTS AND WATERS IN THE OKEFENOKEE SWAMP AND THEIR RELATIONSHIP TO CONSTITUENTS FOUND IN COAL,
Governors State Univ., Park Forest South, IL. Coll. of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5B.
W78-00429

POTENTIAL CONTRIBUTION OF ATMOSPHERIC FALLOUT TO THE PHOSPHORUS BUDGET OF COLUMBIA LAKE, CONNECTICUT,
Connecticut Univ., Storrs. Biological Sciences Group.
For primary bibliographic entry see Field 5B.
W78-00438

2I. Water In Plants

THE IMPORTANCE OF ROOT SYSTEMS OF CULTIVATED PLANTS: I. THE INFLUENCE OF THE SOIL WATER CONTENT AND NITROGEN MANURING ON PLANT GROWTH, ROOT MORPHOLOGY, TRANSPIRATION AND NITROGEN ABSORPTION, (IN GERMAN),
Kiel Univ. (West Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung.
For primary bibliographic entry see Field 3F.
W78-00125

QUANTITATIVE ASSESSMENT OF COMPARATIVE SELECTION OF FOOD ORGANISMS BY FISH, (IN RUSSIAN),
Belorussian State Univ., Minsk (USSR).
E. S. Yurochko.
Vopr Ikhtiol 16(5), p 899-907, 1976.

Descriptors: *Mathematical models, *Fish diets, Ecosystems, Simulation analysis, *Carps, *Fish food organisms.
Identifiers: *Coregonus-peled.

A mathematical model in the form of series makes it possible to achieve comparative assessment under changing dietary conditions for different fish species and size groups. The quantitative indices are also necessary to simulate water ecosystems which is of importance to rational utilization of resources and water reservoirs. The model was tested on pelyads Coregonus peled and carps Cyprinus carpio. --Copyright 1977, Biological Abstracts, Inc.
W78-00176

PHOTOSYNTHESIS IN THE SNOW: THE ALGA CHLAMYDOMONAS NIVALIS (CHLOROPHYCEAE),
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 2C.
W78-00223

TRANSPIRATION RATE AND SUCTION FORCE OF PLANTS OF PINE FORESTS UNDER DIFFERENT ECOLOGICAL CONDITIONS, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralny Botanichy Sàd.
For primary bibliographic entry see Field 2D.
W78-00334

WATER MITES (HYDRACHNELLAE ACARI) OF THE EIDER RIVER. FAUNISTIC AND BIOECOLOGICAL DATA, (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Inst.
K. Boettger, and F. Ulrich.
Faunoekol Mitt 4(12-14), p 419-435, 1974.

Descriptors: *Mites, Invertebrates, Rivers, Aquatic insects, Ecological distribution, Seasonal, Growth stages, Sampling.
Identifiers: Eylais-extendens, Hydrachna-globosa, Hydrachnellae, Hygrobates-nigromaculatus, Levertia-inaequalis, Lebertia-porosa, Limnochares-aquatica, Piona-coccinea, Piona-variabilis, *Eider River(West Germany).

From 1967-1970 samples of Hydrachnellae were taken along 3 sections of the Eider, a stream in Schleswig-Holstein (West Germany). These samples yielded 40 spp. belonging to 13 families. Nearly of all them are typical inhabitants of stagnant or slowly flowing waters. Only Lebertia inaequalis, L. porosa and Hygrobates nigromaculatus are also known from faster flowing waters. New data concerning abundance, seasonal occurrence and sex ratios of the different species are given. High variability of systematic characters was found for Hydrachna globosa, Piona coccinea and P. variabilis. Observations concerning oviposition and different developmental stages of several species. Molting stages of Limnochares aquatica and Eylais extendens were found in associations.--Copyright 1976, Biological Abstracts, Inc.
W78-00350

STUDIES ON THE AQUATIC INSECTS IN THE STREAM HOSHIOKI NEAR SAPPORO,
Hokkaido Univ., Sapporo (Japan). Zoological Inst.
T. Okazawa.
J Fac Sci Hokkaido Univ SER Vi Zool 19(2), p 474-488, 1974.

Descriptors: *Aquatic insects, Streams, *Distribution, *Life cycles, Sampling, Diptera.
Identifiers: Baetiella-sp, Baetis-sp, Epeorus-latifolium, Epiophlebia-superstes, Hydropsyche-ulmeri, Mistrophora-inopus, Sapporo, Simulium-japonicum, *Stream Hoshioki(Japan).

The faunal makeup, distribution and life cycles of an insect assemblage in the Stream Hoshioki (Japan) were studied from July 1971-June 1972 by monthly sampling at 3 stations. A total of 82 belonging to 7 orders were collected; Ephemeroptera, Plecoptera, Trichoptera and Diptera comprise in combination, more than 95% of the total number. The distribution and life cycles of 42 spp. are summarized. Most species seem univoltine but Baetis sp., Eperus latifolium, Mistrophora inopus, Simulium japonicum, Baetiella sp. and Hydropsyche ulmeri are bivoltine and Epiophlebia superstes requires more than 1 yr. to complete the life cycle.--Copyright 1976, Biological Abstracts, Inc.
W78-00351

DURATION OF PHOTOSYNTHESIS AS A DIAGNOSTIC INDEX OF THE DEGREE OF DROUGHT-RESISTANCE IN PLANTS,
Patrice Lumumba People's Friendship Univ., Moscow (USSR).
V. M. Malofeev.
S-Kh Biol 11(3), p 373-377, 1976.

Descriptors: *Photosynthesis, *Plant growth, Beans, Cotton, Corn(Field), *Drought resistance, Dehydration.

The reaction of the photosynthetic function in plants (bean, corn, cotton) with experimentally obtained symptoms of xeromorphism and control plants to a sudden dehydration was studied. Dynamics of the intensity of photosynthesis is exposed to 2-stage changes during water loss. There was differential sensitivity in the reaction of the photosynthetic function in xerophyll and control plants under conditions of growing water deficit. The level of the activation of the photosynthetic function (an amplitude and a peak) and the duration of the activated condition can serve as a quantitative criterium of sensitivity.--Copyright 1977, Biological Abstracts, Inc.
W78-00356

STUDY OF WATER CONDITIONS AND DROUGHT RESISTANCE OF PLANTS AS A PROBLEM OF PARTICULAR PHYSIOLOGY, (IN RUSSIAN),
Akademiya 'Nauk URSR, Kiev. Inst. Fiziologii Rastenii i Agrokhimii.
I. G. Shmat'ko.
Fiziol Biokhim Kul't Rast 8(3), p 252-256, 1976.

Descriptors: *Drought resistance, *Plant physiology, Wheat, Fruits, Cytological studies.
Identifiers: Millet.

Directions in the study of water conditions and drought resistance of plants (wheat, millet, fruits) on the organism, cellular and subcellular levels are discussed. Effects of unfavorable factors depending on their severity at different periods of ontogenesis are very important. The significance of development of the problem taking into account the biological pecularities of the culture and

variety is emphasized.--Copyright 1977, Biological Abstracts, Inc.
W78-00357

WATER- AND PHOTOSYNTHESIS-RELATIONS OF DESERT PLANTS IN THE SOUTH ALGERIAN SAHARA: III. ANNUAL COURSE AND CONSTITUTIONAL TYPES, (IN GERMAN),
O. Stocker.
Flora (Jena). 163(6), p 480-529, 1974.

Descriptors: *Photosynthesis, *Desert plants, *Transpiration, Evaporation, Respiration, Arid climates, Drought resistance.
Identifiers: Anabasis-aretioides, Limoniastrum-feei, *Sahara desert(Algeria).

In the winter rains climate of the Northern Sahara the photosynthetic production of the investigated perennials has the maximum in the beginning dry season. Later the deterioration of the water potential causes net photosynthesis to sink to negative rates. The restriction of transpiration is limited by the demand of evaporative cooling to stabilize organ temperatures; the daily curves become 'flag like'. Also the respiration is influenced by water stress. Switch-shoot shrubs are well adapted to desert conditions, while malacophyllous ones suffer from the short vegetation period; their leaves have a tendency to persist over the winter. The cusion habit of Anabasis aretioides is of no advantage; the salt secernent succulent Limoniastrum feei is the most resistant species. There is a general tendency to lower the surface development, but to increase the sclerophyllous character and the degree of succulence. The sudano-palaeotropic vegetation of the South-Sahara is more drought resistant with a more stable water balance and greater photosynthetic activity than the mediterranean- and irano-turanian holarctic vegetation of the North-Sahara; the C4-syndrome may be important. (See also W73-13801; W73-13633 and W72-00726)--Copyright 1975, Biological Abstracts, Inc.
W78-00358

SURVIVAL OF THREE GRASS SPECIES AFTER INUNDATION,
Rocky Mountain Forest and Range Experiment Station, Alburquerque, NM.
E. F. Aldon.
USDA Forest Service Research Note RM-344, Fort Collins, Colorado, June, 1977. 2 p, 1 tab, 1 ref.

Descriptors: *Grasses, *Flooding, *Revegetation, *Southwest U.S., Water injury.
Identifiers: *Desert saltgrass(Distichlis stricta), Alkali sacaton(Sporobolus airoides), Western wheatgrass(Agropyron smithii).

Three grass species characteristically found in Southwestern areas that are periodically flooded were studied to determine how long they could remain under water and still survive. Desert saltgrass (Distichlis stricta), alkali sacaton (Sporobolus airoides), and western wheatgrass (Agropyron smithii) were either totally or partially submerged for periods of zero, 3, 6, 12, and 24 days. All three species survived at least 24 days of complete or partial inundation. (Witt-IPC)
W78-00384

DESERT RODENT ABUNDANCE IN SOUTHERN ARIZONA IN RELATION TO RAINFALL,
Texas A and M Univ., Uvalde. Agricultural Research and Extension Center.
F. J. Turkowski, and J. R. Vahle.
USDA Forest Service Research Note RM-346, Fort Collins, Colorado, June, 1977. 4 p, 2 tab, 6 ref.

Descriptors: *Deserts, *Arizona, *Rodents, *Rainfall, *Population, Small animals(Mammals), Mammals, Xerophilic animals, Precipitation(Atmospheric).

Desert rodent populations in southern Arizona fluctuated in rodent numbers and rodent species composition over a 30-year period. Data indicate that the direction of these annual fluctuations can be predicted from the amount of rainfall received during the previous year. (Witt-IPC)
W78-00385

STUDIES ON THE INTESTINAL MICROFLORA OF SALMONIDS: II. EFFECTS OF ARTIFICIAL TRANSPLANTING FROM FRESH WATER INTO SEA WATER ON THE INTESTINAL MICROFLORA OF FEEDING AND NON-FEEDING FISH, (IN JAPANESE),
Hokkaido Univ., Hakodate (Japan). Lab. of Microbiology.
M. Yoshimizu, T. Kimura, and M. Sakai.
Bull Jpn Soc Sci Fish 42(8), p 863-873, 1976.

Descriptors: *Salmonids, *Fish diseases, Microbiology, Sea water, *Fish reproduction, Pseudomonas, Fresh water.
Identifiers: Aeromonas, Oncorhynchus-masou, Vibrio.

Masu salmon (92) (Oncorhynchus masou) which developed silvering were divided into 4 groups; 3 were transplanted from fresh water into sea water. The feeding conditions varied with the group. Viable counts were determined in the intestinal contents or slime of these salmon, in their ambient waters and in their diets. Over 1500 strains were isolated from the above samples. Microbial viable counts in the intestinal contents or slime of the fish transplanted under normal feeding conditions were nearly constant while those which were transplanted without being fed decreased rapidly. This decreasing tendency was found in fresh and sea water reared non-feeding fish. The predominant genus in the intestinal microflora of the fresh water fish was Aeromonas, while in sea water fish it was Vibrio. Upon transplanting the fish from freshwater into sea water, Aeromonas of the terrestrial type was gradually replaced by Pseudomonas as the proportion of sea water in the rearing water increased. This was followed by further replacement by halophilic Vibrio which became predominant in the intestinal microflora.--Copyright 1977, Biological Abstracts, Inc.
W78-00439

MICROFLORA OF THE 'SABALO' (PROCHILODUS PLATENSIS, HOLMBERG): II. COMPOSITION AND ACTIVITY OF THE MICROFLORA IN THE SEDIMENTS AND ITS RELATION TO THE NUTRITION OF THE 'SABALO,' (IN SPANISH),
Instituto Nacional de Limnologia, Santo Tome (Argentina).
F. Emiliani, and R. Brandi.
Rev Latinoam Microbiol. 13(4), p 245-248, 1971.

Descriptors: *Bacteria, *Muds, *Microorganisms, Nitrogen cycle, Microbiology, *Fish diseases, Nutrients, Biochemistry, Fish food organisms, *Bottom sediments, Reservoirs.
Identifiers: *Argentina, *Prochilodus-Platensis.

A bacteriological study of the mud in the dam of the Belgrano park (Santa Fe, Argentina) and of the gut content of P. plantensis was made. Culture media based on aqueous extracts obtained from the samples were adequate for the estimation and isolation of the bacterial population. The total number of microorganisms in the mud was rather low; only certain physiological groups in the N cycle were represented; proteolytics and ammonifiers predominated. The denitrification activity was low. The majority of the bacteria occured in the 0-2 cm layer. Comparison of microbiological and chemical analyses suggest that the feeding of the 'sabalo' is selective. Bacteria are not important as food: to obtain 1 g of bacteria the fish must ingest about 100 kg of mud. Their importance in the biochemical activity of the bacteria developing in the intestine after drastic selection has taken place in the anterior part of the gut.--Copyright 1975, Biological Abstracts, Inc.
W78-00452

2J. Erosion and Sedimentation

BED LOAD TRANSPORT BY NATURAL RIVERS,
Rickwoods and Mark Beech, Edenbridge (England).
R. A. Bagnold.
Water Resources Research, Vol 13, No 2, p 303-312, April 1977. 8 fig, 4 tab, 8 ref.

Descriptors: *Sediment transport, *Bed load, *Wyoming, Saltation, On-site data collctions, Rivers, Laboratory tests, Movement, Analytical techniques, Analysis, Evaluation, Scour, Erosion, Traction.
Identifiers: *East Fork River(Wyo), Stream power.

Since stream power, omega, and sediment transport rate, i, are different values of the same physical quantity, namely, the time rate of energy supply and dissipation, it is rational to relate one to the other. The experimental relation has been difficult to interpret because of the spurious curvature of log-log plots in which a constant threshold stream power of zero is involved. The substitution of an excess power (omega - omega sub o) removes this curvature, and existing data on laboratory bed load transport rate measurements i sub b suggest a general empirical relation: i sub b varies with (omega - omega sub o) ((omega - omega sub o)/omega sub o) to the 1/2 power. Existing laboratory data have also shown clearly that at any given value of omega - omega sub o the bedload transport rate decreases as an inverse function of the ratio flow depth to grain size Y/D. The East Fork River (Wyoming) project recently has enabled bed load sampling devices to be calibrated, so reasonably reliable measurements can be made in natural rivers. The uncertainties in the measurement of the corresponding river power were discussed, and a simple data reliability test was suggested. Data covering three seasons collected from both Snake and Clearwater rivers appear to be reliable. Though there is much scatter due to day variations in the river conditions, the data, together with data on an intermediate scale from East Fork River and on a small laboratory scale conform with startling consistency to the following general empirical relation: i sub b/(omega - omega sub o) is approximately equal to ((omega - omega sub o)/omega sub o) to the 1/2 power times (Y/D) to the minus 2/3 power over a 2 million-fold range of stream discharge. (Humphreys-ISWS)
W78-00071

UNIFIED VIEW OF WASH LOAD AND BED MATERIAL LOAD,
Thessaloniki Univ., Salonika (Greece).; and Florida Univ., Gainesville. Dept. of Engineering Sciences.
E. Partheniades.
Journal of the Hydraulis Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13215, p 1037-1057, September 1977. 6 fig, 13 ref, 2 append. NSF GK-31259.

Descriptors: *Bed load, *Suspended load, *Sediment transport, *Model studies, Mathematical models, Suspended solids, Sediments, Streams, Alluvial channels, Particle size, Sands, Silts, Flow, Streamflow, Sedimentology.

Presented in this paper was a new generalized model of flow-sediment interaction. The behavior of the wash load and of the suspended bed-material load can then result as special cases of the new model. The latter follows the lines of Einstein's

original probabilistic model except that interparticle forces of mechanical and physicochemical nature have been introduced and that the flow-induced forces on the individual grains or flocs were assumed to have an upper and lower bound. It was shown that the actual wash load may consist of 2 distinct types of sediment which may coexist: (1) Bed load function for a limited range of flow conditions; whereas above that range it behaves as a wash load; and (2) the other never has a bed load function. It was shown that the latter consists predominantly of silt and clay, i.e., of sediment finer than 0.06 mm, a fact consistently observed in alluvial channels. (Sims-ISWS)
W78-00078

BASIC PRINCIPLES OF RIVER HYDRAULICS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-00080

SEDIMENTS AS SOURCES OF DDT AND PCB,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00140

CHANGES IN THE GRAIN SIZE OF SEDIMENTS ON THE PALOS VERDES SHELF,
Southern California Coastal Water Research Project, El Segundo.
C. S. Greene.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 91-93, 1977. 1 fig, 1 ref.

Descriptors: *Sediments, *Particle size, *Baseline studies, *Outfall sewers, California, Continental shelf, Resources development, Environmental effects, Water pollution sources.
Identifiers: *Outer continental shelf, Environmental factors, Southern California, Palos Verdes shelf.

In the summer of 1973, the sediments from the Palos Verdes shelf were analyzed for grain-size composition and compared with the findings of Uchupi and Gaal from the period of 1954 to 1959. The greatest increase in clay-sized particles occurred around and downcurrent (to the northwest) of the outfalls and was attributed to an interaction between the organic material originating from the outfalls and fine sediments entering the shelf. A large increase in clay-sized particles on this shelf has been relatively recent and may reflect the addition of new and larger submarine outfalls and a substantial increase in the volume of sewage discharged since the late 1950's. The sediments were resampled and analyzed in the summer of 1975. Results show a dramatic decrease in the clay fraction between 1973 and 1975. These observations suggest that the sediments had been acted on by hydrological forces of sufficient energy to stir the sediments to a depth of several centimeters, allowing a large portion of the clay fraction and a smaller portion of the finer silt fraction to be resuspended and transported away from this area. (See also W78-00134) (Sinha - OEIS)
W78-00146

ESTIMATING BIOAVAILABILITY OF SEDIMENT-BOUND TRACE METALS WITH CHEMICAL EXTRACTANTS,
Geological Surve, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-00196

SEDIMENT-TRAP EFFICIENCY OF TORTUGAS ARROYO NEAR LAS CRUCES, NEW MEXICO, WATER YEARS 1963-1974,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-00199

FLUVIAL SEDIMENT DATA FOR IOWA: SUSPENDED-SEDIMENT CONCENTRATIONS, LOADS AND SIZES: BED-MATERIAL SIZES: AND RESERVOIR SILTATION,
Geological Survey, Cheyenne, WY. Water Resources Div.; and Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 7C.
W78-00201

LATERAL MIGRATION OF THE MIDDLE SACRAMENTO RIVER, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. Brice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 662, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-43, July 1977. 51 p, 18 fig, 5 tab, 36 ref.

Descriptors: *Sediment transport, *Channel morphology, *Channel erosion, *Alluvial channels, *Bank erosion, *Vegetation effects, Reviews, Paleohydrology, Baseline studies, Streams, Meanders, *California.
Identifiers: *Middle Sacramento River(Calif), *Vegetation removal effects, *Bank-erosion rate, Stream channel changes.

Rates and processes of lateral erosion were studied for the middle Sacramento River between Chico Landing and Colusa, Calif., a river distance of about 50 miles which is bordered by valuable agricultural land. The study is based on comparison of maps made during 1867-1949 and on aerial photographs made during 1924-74. Meander loops migrate by downstream translation in a direction nearly perpendicular to the loop axis. Loops are cut off by straight or diagonal chutes across the meander neck. The sinuosity of the river has gradually decreased from a value of 1.56 in 1896 to 1.35 in 1974. The morphology and curvature of meander loops cut off before white settlers came to the area indicate that the river was more stable, as well as more sinuous, then than now; subsequent morphologic changes are attributed mainly to the clearing of riparian vegetation and the effects of levees in reducing the area of overflow. The bank-erosion is 1.82 acres per year per stream mile or about 15 feet per year per stream foot for the period 1896-1974. (Woodard-USGS)
W78-00208

DECOMPOSITION OF AQUATIC BIOTA AND SEDIMENT FORMATION: ORGANIC COMPOUNDS IN DETRITUS RESULTING FROM MICROBIAL ATTACK ON THE ALGA CERATIUM HIRUNDINELLA,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W78-00218

DISTRIBUTION OF HEAVY METALS IN THE SEDIMENT OF AN UNPOLLUTED ESTUARINE ENVIRONMENT,
Imperial Chemical Industries, Ltd. Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 5B.
W78-00224

DEVELOPMENT OF THE MUD HABITAT DURING THE FILLING OF TOO NEW LAKES,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
A. J. McLachlan, and S. M. McLachlan.
Freshwater Biology, Vol. 6, No. 1, February 1976, p. 59-67. 3 fig, 4 tab, 32 ref.

Descriptors: *Mud-water interfaces, *Sediments, *Sedimentation rates, *Paleolimnology, Water chemistry, Insect behavior, Lake stages, Africa, *Lake sediments.
Identifiers: *Lake Chilwa(Malawi), *Lady Burn Laugh Lake(England).

A study was made to illustrate some of the principles of early development of muds in two contrasting lake basins which had no vegetation before they were filled. Lake Chilwa, Malawi (central Africa), a natural lake several thousands of years old, recently refilled after a dry phase; Lady Burn Laugh Lake in northeastern England, an artificially-created lake in temperate latitudes, with less than one ten-thousandth the area of Lake Chilwa. Field and laboratory observations suggest that the appearance of a sediment layer during the filling of the lakes was crucial to the development of communities of mud dwelling animals. The sediment layer formed from the re-arrangement of materials found in the newly flooded lake bottom rather than from introduction of the extraneous matter. Material less than 105 millimicrons in diameter was generated by deposition of silt and clay following mechanical distruption of the newly flooded lake. Material greater than 250 millicicrons diameter was generated by aggregation of fine surface material due to feeding and tube building behavior of the mud-dwelling animals. The major source of ions in both lakes was the lake bottom itself. Release of ions was accelerated by the mechanical disturbance of the mud. The increased concentrations of ions in solution accelerated precipitation of the clays. (Harris-Wisconsin)
W78-00228

A COMPARATIVE SURVEY OF PETROLEUM HYDROCARBONS IN LAKE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00233

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR III.
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, CA.
For primary bibliographic entry see Field 5G.
W78-00260

EROSION AND SEDIMENT CONTROL TECHNOLOGY,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W78-00263

REVEGETATION AND EROSION CONTROL AT HEAVENLY VALLEY,
For primary bibliographic entry see Field 5G.
W78-00264

FAUNAL DISTRIBUTIONS IN SOFT SEDIMENTS OF THE SEVERN ESTUARY,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group; and Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 5B.
W78-00272

PREVENTION OF SAND BAR FORMATION AT OUTLETS INTO THE SEA OR OTHER BODIES OF WATER,
Wijesiriwardena (Don Bernard), Arcadia, CA. (Assignee).
For primary bibliographic entry see Field 8D.
W78-00290

ECOLOGY OF BENTHOS IN A TROPICAL ESTUARY,
Naval Physical and Oceanographic Lab., Cochin (India).
For primary bibliographic entry see Field 2L.
W78-00296

2K. Chemical Processes

VARIATION OF NITRATE VS. PHOSPHATE RATIO IN THE PACIFIC WATER,
Meteorological Coll., Kashiwa (Japan).
For primary bibliographic entry see Field 5B.
W78-00070

GROUND WATER IN THE FRESNO AREA, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00190

COMPARATIVE EVALUATION OF WATER QUALITY ON THE ST. JOSEPH RIVER (MICHIGAN AND INDIANA, U.S.A.) BY THREE METHODS OF ALGAL ANALYSIS,
California Academy of Sciences, San Francisco. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-00236

THE EFFECT OF FLOODING ON THE AVAILABILITY OF ZINC AND MANGANESE TO RICE,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
For primary bibliographic entry see Field 3F.
W78-00337

DISSOLUTION KINETICS OF CARBONATE ROCKS 1. EFFECTS OF LITHOLOGY ON DISSOLUTION RATE,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
H. W. Rauch, and W. B. White.
Water Resource Research, Vol. 13, No. 2, p 381-394, April 1977. 15 fig, 4 tab, 36 ref. OWRT B-046-PA(3).

Descriptors: *Carbonate rocks, *Solubility, *Laboratory tests, *Pennsylvania, Dolomite, Calcite, Limestones, Karst, Sedimentary rocks, Caves, Geomorphology, Rock properties, Rocks, Carbon dioxide, Water, Chemistry, Hydrogen ion concentration, Karst hydrology, Groundwater, Petrology.
Identifiers: *Dissolution rates.

Laboratory dissolution of Middle Ordovician rock samples from central Pennsylvania was studied at 23C and 1 atm carbon dioxide pressure. Carbonate dissolution rates were compared at 22% bicarbonate saturation with respect to both calcite and dolomite. The results showed that carbonate lithology exerts a strong influence on the dissolution rate and hence, on the degree of cavity development in karst aquifers. The dissolution rate is affected most significantly by dolomite and impurity content. The rate decreases as percentages of dolomite and disseminated insolubles increase. Maximum dissolution rates occur for carbonate rocks with 1.0-2.5% MgO content and with abundant silty streaks. The sparite content is related inversely to cave development but is independent of dissolution rates measured under the laboratory conditions adopted in this study. (Sims-ISWS)
W78-00435

2L. Estuaries

VARIATION OF NITRATE VS. PHOSPHATE RATIO IN THE PACIFIC WATER,
Meteorological Coll., Kashiwa (Japan).
For primary bibliographic entry see Field 5B.
W78-00070

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY: THE CHARACTER OF PARTICLE DISPERSION AND WATER MOVEMENT IN MASSACHUSETTS BAY AND ADJACENT WATERS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological.
For primary bibliographic entry see Field 5B.
W78-00086

THE EFFECT OF THE SPRING-NEAP TIDAL CYCLE ON THE VERTICAL SALINITY STRUCTURE OF THE JAMES, YORK AND RAPPAHANNOCK RIVERS, VIRGINIA, U.S.A.,
Virginia Inst. of Marine Science, Gloucester Point.
L. W. Haas.
Estuarine and Coastal Marine Science, Vol. 5, No. 4, p 485-496, July 1977. 7 fig, 1 tab, 17 ref. NASA-NGL 47-022-005, RANN GI-38973.

Descriptors: *Estuaries, *Chesapeake Bay, *Virginia, *Salinity, *Tidal effects, Bays, Saline water, Hydrography, Mixing, Stratification, Water circulation, Cycles, Tidal waters, Tides, Water levels, On-site data collections, Analysis, Tidal streams.
Identifiers: *James River(Va), *York River(Va), *Rappahannock River(Va), Spring-neap tidal cycle.

Analysis of salinity data from the lower York and Rappahannock Rivers (Virginia) for 1974 revealed that both of the estuaries oscillated between conditions of considerable vertical salinity stratification and homogeneity on a cycle that was correlated closely with the spring-neap tidal cycle, i.e., homogeneity was developed most highly about 4 days after sufficiently high spring tides, while stratification was developed most highly during the intervening period. The stratification-mixing cycle generally was correlated more closely with the height of high tide than with the magnitude of the tidal range. As a result of the annual cycle in the magnitude of spring high tides, periods of homogeneity were both more numerous and more intense in the late summer than in the winter. Variation in river flow appeared to be of secondary importance in regulating the hydrography of the estuary. Analysis of salinity data collected during the period following Tropical Storm Agnes (July-August 1972) revealed that cycles of stratification and mixing occurred simultaneously throughout the entire salt-influenced lengths of the James, York and Rappahannock Rivers. The cycles were similar to those described above and appeared to be a manifestation of the normal oscillatory nature of the estuaries and not a result of storm related flood waters. (Humphreys-ISWS)
W78-00087

METEOROLOGICAL AND TIDAL EXCHANGES BETWEEN CORPUS CHRISTI BAY, TEXAS, AND THE NORTHWESTERN GULF OF MEXICO,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
N. P. Smith.
Estuarine and Coastal Marine Science, Vol. 5, No. 4, p 511-520, July 1977. 4 fig, 1 tab, 19 ref.

Descriptors: *Bays, *Gulf of Mexico, *Texas, *Water level fluctuations, Coasts, Tides, Tidal waters, Intertidal areas, Water circulation, Winds, Stress, Analysis, On-site investigations, Meteorology.
Identifiers: *Corpus Christi Bay(Tex), Ekman layers, Spectral analysis, Pressure gradient.

Previous studies conducted along Atlantic and Pacific coastlines suggested that there should be meteorological as well as tidal water level variations in the Gulf of Mexico, and thus long-period exchanges between the inner shelf and the coastal bays. Water level data from Corpus Christi Bay, Texas, collected during a 53-day period in early 1972 were used to obtain a time series of computed Bay volumes. Spectral analysis indicated exchanges occurring primarily at tidal periods and over time intervals longer than about 50 h. Atmospheric pressure data from three locations in south Texas were used to compute regional pressure gradients. Coherence-squared spectra computed from time series of Bay volumes and surface pressure gradient components suggested that meteorologically forced exchanges between the Gulf of Mexico and Corpus Christi Bay are due primarily to Ekman transport across the continental shelf, maintained by quasi-steady winds paralleling the coast, and onshore-offshore winds at periods of 60-100 h. (Humphreys-ISWS)
W78-00088

TRANSPORT OF LOW-SALINITY WATER AT THE SLOPE WATER-GULF STREAM BOUNDARY,
Delaware Univ., Newark. Coll. of Marine Studies.
S. L. Kupferman, and N. Garfield.
Journal of Geophysical Research, Vol. 82, No. 24, p 3481-3486, August 20, 1977. 6 fig, 2 tab, 14 ref. NSF GA-28752, DES74-23680, OCE75-23434.

Descriptors: *Salinity, *Ocean currents, *Atlantic Ocean, Temperature, Water temperature, Thermocline, Conductivity, On-site investigations, On-site data collections, Measurement, Profiles, Buoys, Continental shelf, Circulation, Water circulation, Ocean circulation, Oceans, Oceanography.
Identifiers: *Gulf Stream, *Cape Hatteras, *Low-salinity bands, Water transport, Drogues, Shelf water.

Hydrographic and drogue measurements were used to estimate the transport of shelf water by the freshened water bands at the slope water-Gulf Stream boundary, north of Cape Hatteras. Surface and subsurface bands were observed. Total transport was found to be 40,000 cu m/s. The source of the water for the surface and subsurface bands is the water above and below the shelf thermocline north of Cape Hatteras. The bands carry a significant, perhaps major, fraction of the shelf water passing through the Middle Atlantic Bight. (Sims-ISWS)
W78-00089

PASSIVE REMOTE SENSING OF PHYTOPLANKTON VIA CHLOROPHYLL ALPHA FLORESCENCE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 7B.
W78-00090

ICE NUCLEI IN SEAWATER, FOG WATER AND MARINE AIR OFF THE COAST OF NOVA SCOTIA: SUMMER 1975,
National Oceanic and Atmospheric Administration, Boulder, Co. Atmospheric Physics and Chemistry Lab.
For primary bibliographic entry see Field 2B.
W78-00094

ON THE DYNAMIC BALANCE OF THE CHESAPEAKE BAY WATERS,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
A. F. Blumberg.

Chesapeake Science, Vol. 18, No. 3, p 319-323, September 1977. 6 fig, 5 ref. NOAA 04-3-022-33.

Descriptors: *Chesapeake Bay, *Water circulation, *Tides, *Water balance, *Model studies, Mathematical models, Circulation, Tidal waters, Tidal effects, Equations, Computer models, Bays, Estuaries, Bodies of water.
Identifiers: Dynamic balance.

An investigation into the dynamic balance of Chesapeake Bay waters was carried out by means of a two-dimensional, plan view numerical model. The results of the investigation showed that neither the Coriolis force nor the advective terms in the governing vertically integrated equations can be neglected without changing the tidal dynamics and circulation patterns of this Bay. Also, a bottom friction coefficient of 0.0025 produces the most realistic simulations of observed tidal data. (Sims-ISWS)
W78-00095

CALIFORNIA COASTAL PROCESSES STUDY - SKYLAB FINAL REPORT - EPN 492,
Army Engineer District, San Francisco, CA.
D. M. Pirie, and D. D. Steller.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-11528, Price codes: A04 in paper copy, A01 in microfiche. Report EPN-492, June 1975. 74 p, 38 fig, 1 tab, 22 ref. A-85918-A.

Descriptors: *California, *Coastal engineering, *Computer programs, *Sediment transport, *Estuarine environment, *Currents(Water), Ecology, Dredging, Sediment distribution, Remote sensing, Surveys, Photography, Bays.
Identifiers: *Skylab imagery, *San Francisco Bay, Color composites, Interactive image analysis, LANDSAT data.

The Skylab imagery from S-190A, S-190B, and S-192 experiments was analyzed for coastal and estuarine processes for the San Francisco Bay and the Northern California coast. In northern San Francisco Bay, the sediment transport was traced to areas of known deposition. Information from the Skylab imagery interpretation was found to correlate closely with plots of sediment distribution obtained during the same period by boat surveys. Color composite enhancements of S-192 imagery, bands 4, 6 and 7, provided detailed current and sediment transport patterns. Off the Northern California coast, the surface current patterns from the California and Davidson Currents were mapped. The S-190B color photographs provided the most useful information for this study. Close correlation between the Skylab S-190A film/filter combinations and LANDSAT 1 and 2 imagery provided detailed resolution of the study area not possible with LANDSAT alone. (Singh-ISWS)
W78-00096

COASTAL WATER RESEARCH PROJECT ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1976.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00134

MEASUREMENTS OF SUBTHERMOCLINE CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00142

CURRENT VELOCITIES REQUIRED TO MOVE SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00143

MERCURY IN SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00145

INITIAL ASSESSMENT OF THE GROUNDWATER RESOURCES IN THE MONTEREY BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00188

ESTIMATING BIOAVAILABILITY OF SEDIMENT-BOUND TRACE METALS WITH CHEMICAL EXTRACTANTS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-00196

DISTRIBUTION OF HEAVY METALS IN THE SEDIMENT OF AN UNPOLLUTED ESTUARINE ENVIRONMENT,
Imperial Chemical Industries, Ltd. Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 5B.
W78-00224

FAUNAL DISTRIBUTIONS IN SOFT SEDIMENTS OF THE SEVERN ESTUARY,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group; and Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 5B.
W78-00272

SOME FACTORS AFFECTING THE DISTRIBUTION OF ESTUARINE ISOPODS (CRUSTACEA),
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-00275

ADJUSTABLY SUBMERSIBLE BREAKWATER,
For primary bibliographic entry see Field 8B.
W78-00277

PREVENTION OF SAND BAR FORMATION AT OUTLETS INTO THE SEA OR OTHER BODIES OF WATER,
Wijesiriwardena (Don Bernard), Arcadia, CA. (Assignee).
For primary bibliographic entry see Field 8D.
W78-00290

FLOATING BREAKWATER,
For primary bibliographic entry see Field 8B.
W78-00291

ECOLOGY OF BENTHOS IN A TROPICAL ESTUARY,
Naval Physical and Oceanographic Lab., Cochin (India).
C. V. Kurian.
Proc Indian Natl Sci Acad Part B Biol Sci. 38(3/4), p 156-163, 1972.

Descriptors: Ecology, *Benthos, *Estuaries, *Salinity, Tropical regions, *Biomass, *Sediments, Seasonal.
Identifiers: *India, *Polychaetes.

Studies on the benthos of the Cocin (India) backwaters--a typical, tropical, positive estuary--are based on seasonal collections from 30 stations in 10 profiles during 1966-1968. Hydrographical features play an important part in the sedimentation and distribution of fauna at the different stations. Salinity and grade composition of the sediment have the maximum influence on the distribution and abundance of fauna; fine sand with silt harbors the maximum number of macrofauna. The polychaete are present in large numbers at all the stations during all the seasons in spite of the wide changes in salinity. The meiofauna are more numerous in the finer sediments and their abundance is not affected by the tidal changes.--Copyright 1975, Biological Abstracts, Inc.
W78-00296

DEEPWATER DUMPSITE 106 BATHYMETRY AND BOTTOM MORPHOLOGY,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
J. J. Bisagni.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 1-8, June 1977. 5 fig, 3 ref.

Descriptors: *Baseline studies, *Waste disposal, *Bathymetry, *Environmental effects, Oceanography.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Submarine topography, Oceanographic data, Environmental conditions.

During the MAy 1974 characterization cruise to Deepwater Dumpsite 106, a series of 11 camera stations were conducted which covered a portion of the continental slope and upper continental rise. This work was undertaken to better understand the seafloor environment and to provide background information for later manned submersible dives. The boundary between the continental slope and the upper rise, defined here to be at the 2,500 meter bathymetric contour, trends southwest and northeast. The slope of the continental slope area within the dumpsite is approximately 4%, while the slope of the upper continental rise is considerably less, about 1%. In the dumpsite area, the continental slope is dissected by four small canyon systems. This baseline data should serve as a frame of reference for environmental studies. (Sinha-OEIS)
W78-00311

SIX DIVES TO THE LOWER CONTINENTAL SLOPE AND UPPER CONTINENTAL RISE SOUTHWEST OF HUDSON CANYON GEOLOGICAL ASPECTS,
Lamont-Doherty Geological Observatory, Palisades, NY.
B. C. Heezen.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 9-27, June 1977. 16 fig, 1 tab. NOAA-04-5-158-62.

Descriptors: *Continental shelf, *Continental slope, *Baseline studies, *Environmental effects, *Waste disposal, Geology, Currents, Oceanography.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Submarine topography, Continental rise, Environmental conditions.

Three dives were made with D.S.V. ALVIN to the upper continental rise and three dives were made to the lower continental slope during July and August 1975. This report limits consideration to the effects of current on the sea floor and the occurrence of rock exposures. A seismic reflection profile which crossed drill site 108 indicates a several mile wide band where Miocene is close to or at the present sea floor. This suggests that a narrow belt at the base of the continental slope may

have a transitory blanket of hemipelagic ooze which, depending on the strength of the bottom currents, is either deposited or swept away. At the present time the currents seem insufficient to create a major erosional or nondepositional episode. The baseline data should serve as a frame of reference for environmental impact studies. (Sinha-OEIS)
W78-00312

THE GENERAL PHYSICAL OCEANOGRAPHY OF DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
M. C. Ingham, J. J. Bisagni, and D. Mizenko.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 29-54, June 1977. 11 fig, 3 tab, 15 ref.

Descriptors: *Baseline studies, *Gulf Stream, *Circulation, *Currents, *Environmental effects, Mixing, Waste disposal, *Oceanography.
Identifiers: *Outer Continental Shelf, *Oceanographic data, Slope water, Environmental conditions, Ocean dumping.

The Slope Water has been known to be a region of mixing between Shelf Water and waters of the Gulf Stream. The results obtained by these baseline studies further support this conclusion, by depecting a great amount of variability in the Slope Water also, especially within the upper 400 meters of the water column. Large scale, non-seasonal spatial and temporal variability of temperature and salinity occurring in this region during these baseline studies may be attributed to certain principal processes: anticyclonic Gulf Stream eddies and meanders; mixing across the Shelf/Slope front; and mixing of anticyclonic Gulf Stream eddies and meanders with the Slope water. As concluded from the baseline data, Deepwater Dumpsite 106 should be considered as being within one of the most variable and complex oceanographic regions of the entire western North Atlantic. (Sinha-OEIS)
W78-00313

PHYSICAL OCEANOGRAPHY OF DEEP-WATER DUMPSITE 106, UPDATE: JULY 1975,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
J. R. Goulet, Jr., and K. A. Hausknecht.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol I, Physical Characteristics, p 55-86, June 1977. 19 fig, 2 tab, 7 ref.

Descriptors: *Baseline studies, *Environmental effects, Waste disposal, *Oceanography.
Identifiers: *Outer Continental Shelf, Environmental conditions, *Oceanographic data, Physical oceanography, Ocean dumping.

The physical oceanographic conditions encountered in the dumpsite area in July, 1975 are described. Cruise AMC-SP-6-AL-75, 22 July - 4 August 1975, of the ALBATROSS IV was planned as part of the second of three baseline studies of the dumpsite area. Supporting physical oceanographic sampling consisted of XBT drops during the trawling operations and STD lowerings, with sampling bottles, conducted opportunistically. Salinity and dissolved oxygen were determined from all the sampling bottles and four bottles on each lowering were equipped with reversing thermometers. Temperature, salinity, and dissolved oxygen data were thus obtained as a calibration check on the corresponding sensors of the STD. The horizontal distribution of XBT drops and STD lowerings, though not uniform, was adequate to obtain a good characterization of physical oceanographic conditions. (Sinha-OEIS)
W78-00314

CLIMATIC STUDY OF NEW YORK BIGHT,
National Climatic Center, Asheville, NC.
For primary bibliographic entry see Field 2B.
W78-00316

APPENDIX, (NOAA DUMPSITE EVALUATION REPORT),
National Marine Fisheries Service, Washington, DC. National Systematics Lab.
For primary bibliographic entry see Field 5E.
W78-00331

DISTRIBUTION OF LARVAL TABANIDAE (DIPTERA) IN A SPARTINA ALITERNIFLORA SALT MARSH,
North Carolina State Univ. at Raleigh. Dept. of Entomology.
J. C. Dukes, T. D. Edwards, and R. C. Axtell.
J Med Entomol. 11(1), p 79-83, 1974.

Descriptors: *Diptera, *Salt marshes, *Distribution, Larvae, Soils, Vegetation.
Identifiers: Chrysops-Fuliginosus, *Spartina-Alterniflora, *Tabanidae, Tabanus-Nigrovittatus.

Larvae of Chrysops fuliginsus Wiedemann and Tabanus nigrovittatus Macquart were recovered from the soil of a regularly flooded salt marsh having S. alterniflora Loisel (smooth cordgrass) as the dominant vegetation. The larvae were found throughout the sampling area with no consistently greater abundance adjacent to a natural drainage ditch. The larvae were found about as frequently in areas of 'tall' as in 'short' S. alterniflora.—Copyright 1974, Biological Absrtracts, Inc.
W78-00339

DISSOLVED AND PARTICULATE TRACE METALS IN THE RHINE ESTUARY AND THE SOUTHERN BIGHT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5B.
W78-00344

SOME PHYSICAL, CHEMICAL, AND MICROBIOLOGICAL CHARACTERISTICS OF TWO BEACHES OF ANGLESEY,
University Coll. of North Wales, Bangor. Dept. of Marine Biology.
For primary bibliographic entry see Field 5B.
W78-00375

MAN'S IMPACT ON ESTUARINE SEDIMENTATION,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-00392

HEAVY METALS IN THE DERWENT ESTUARY,
Tasmania Univ., Hobart. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-00393

BIOLOGICAL TRANSPORT OF ZINC-65 INTO THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00395

DISTRIBUTION AND TEMPERATURE ADAPTATION IN THE TELEOST FISH GENUS GIBBONSIA,
San Francisco State Univ., CA. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-00399

STRUCTURAL ANALYSIS OF STRESSED MARINE COMMUNITIES,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-00409

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-00410

PERSISTENCE IN MARINE SYSTEMS,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-00411

MONITORING THE ENVIRONMENT FOR ECOLOGICAL CHANGE,
Washington Univ., Seattle. Dept. of Biostatistics.
For primary bibliographic entry see Field 5B.
W78-00422

THE DYNAMICS OF BIOLOGICALLY AVAILABLE MERCURY IN A SMALL ESTUARY,
Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-00430

INVESTIGATIONS ON THE PHYTOPLANKTON OF THE NORTHERN CENTRAL ATLANTIC: II THE PHYTOPLANKTON IN THE SEA AREA OFF NORTH WEST AFRICA TO THE NORTH OF CAP BLANCO, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
E. Kuehner, and H. Kurth.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1165-1168, 1973.

Descriptors: *Phytoplankton, *Diatoms, *Atlantic Ocean, Cytological studies, Oxygen, *Nutrients, Nitrates, Phosphates, Africa, Coasts.
Identifiers: *Northwest Africa(Cap Blanco).

Investigations of the phytoplankton to the north of Cap Blanco show that nutrient-rich water has risen in the area covered by 3 southern stations and that this upwelling process is still continuing. Due to the new water, the number of phytoplanktonic organisms did not exceed 170,000 cells/l. The phytoplankton developed strongly (up to 875,000 cells/l) in the areas covered by the central and northern stations. The O2 content rose noticeably and the NO3 and PO4 values dropped. The phytoplankton consisted mainly of diatoms.—Copyright 1976, Biological Abstracts, Inc.
W78-00472

POSSIBILITIES OF INTERPRETING AERIAL PHOTOGRAPHS WHEN MAPPING THE SHORE ZONE AND SUBMERSAL PLANT SOCIETIES IN WATERS WITH A LOW DEPTH OF VISIBILITY, (IN GERMAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Eberswalde (East Germany). Inst. fuer Forstwissenschaften.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1135-1140, 1973.

Descriptors: *Aerial photography, *Mapping, *Vegetation, Submerged aquatic plants, Plant grouping, Aquatic plants.
Identifiers: Darss southern area(E Germany).

The possibility of using aerial photography for rationalizing and increasing the precision of work regarding the vegetation of the chain of shallow inlets to the S of Darss (East Germany) was investigated. Optimum photographic conditions were determined for these waters with an extreme-

ly low depth of visibility during an experimental photographic flight, the best information being provided by aerial photographs using Orwochrom emulsion type UT 18 with a scale of 1:2300. The available photographs permit sure interpretation of the principle community in the submersal area and the shore zone, differences in degree of coverage and increased precision when mapping the borders and determining area.--Copyright 1976, Biological Abstracts, Inc.
W78-00482

LIST OF ENERGY EQUIVALENTS FOR AQUATIC ORGANISMS WITH SPECIAL REGARD TO THE BALTIC SEA, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
M. Kreuzberg, and J. A. Von Oertzen.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1153-1158, 1973.

Descriptors: Aquatic animals, *Energy, *Trophic level, *Brackish water, Sea water, Marine animals.
Identifiers: *Baltic Sea.

Energy equivalents obtained by different methods and found in the literature for marine and limnic species and some data from the authors relating especially to brackish water forms are ordered according to the main trophic stages in a list which is to be continued later.--Copyright 1976, Biological Abstracts, Inc.
W78-00485

PRIMARY PHYTOPLANKTON PRODUCTION IN THE WATERS OF THE SHALLOW INLETS TO THE SOUTH OF THE DARSS ZINGST PENINSULA DURING 1972 TAKING THE RESULTS OF A SYNOPTIC INVESTIGATION INTO SPECIAL CONSIDERATION, (IN GERMAN),
H. Huebel.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1101-1104, 1973.

Descriptors: *Phytoplankton, *Primary productivity, Inlets(Waterways), *Salinity, Peninsulas, Trophic level, *Radiation, Synoptic analysis.
Identifiers: *Darss Zingst peninsula(E Germany).

Daily fluctuations in primary production and its dependence on external factors (available radiation, salinity) were investigated at 3 stations during the synoptic investigation in 1972. The primary production maximum was located in the surface layer in the shallow inlets (East Germany) during the investigations. The trophogenic layer was restricted to not more than 110 cm. The results are compared with those obtained at 6 stations spread over the whole chain of shallow inlets (May-Dec., 1972).--Copyright 1976, Biological Abstracts, Inc.
W78-00486

SHORT TERM FLUCTUATION IN THE PHYTOPLANKTON VOLUME AT THE END OF MAY/BEGINNING OF JUNE, 1972, IN THE WATERS OF THE SHALLOW INLETS TO THE SOUTH OF DARSS (SOUTH BALTIC), (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Marine and Fishery Biology.
V. Kell.
Wiss Z Univ Rostock Mathnaturwiss Reihe 22(10), p 1105-1110, 1973.

Descriptors: *Phytoplankton, *Hydrography, Correlation analysis, Coasts, Inlets(Waterways).
Identifiers: *Baltic Sea, *Darss coastal area(East Germany).

Short term fluctuations in the volume of phytoplankton are related to the hydrographical situation. Although the correlation between the phytoplankton and the hydrography is always visible at Station 1 (entrance to the shallow inlet), short term hydrographic changes are no longer reflected by the phytoplankton at the stations located further within the shallow inlets (East Germany).--Copyright 1976, Biological Abstracts, Inc.
W78-00487

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

COMPARATIVE ECONOMICS OF FREEZING PROCESSES AS BRINE CONCENTRATORS,
Fluor Engineers and Constructors, Inc., Irvine, Calif.
P. J. Schroeder, A. R. Khan, and S. F. Mulford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 318, Price codes: A05 in paper copy, A01 in microfiche.
Final Report, June 1977. 79 p, 21 fig, 19 tab, 7 ref.
OWRT/SW-77-5, OWRT 14-30-7507.

Descriptors: *Freezing, *Economics, Evaluation, *Design, *Design criteria, *Design standards, *Brines, *Cost estimates, *Evaporators, Costs.
Identifiers: *Brine concentrators.

Recent general awareness of the environment and imposition of Federal Pollution Control Laws have created a need for low cost waste water concentrators. Probably the best commercially available brine concentrator is marketed by the Resources Conservation Company (RCC). This brine concentrator is a vertical tube vapor compression evaporator using the calcium sulfate seeding technique to prevent scale formation. Freezing processes as brine concentrators have the potential of concentrating waste brine to solid salt at a much lower overall cost than RCC Brine Concentrator. Conceptual designs and cost estimates were prepared for 225,000 gallon per day freezing process concentrators for four brines. Estimated, capital, concentration, and salt removal costs are compared. The freezing process appears to be technically feasible, and economically viable, but requires development and demonstration. (OWRT)
W78-00001

STATE-OF-THE-ART SURVEY AND ECONOMIC COMPARISON OF FREEZING PROCESSES.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 298, Price codes: A04 in paper copy, A01 in microfiche.
Final Report, December 1976. 65 p, 7 fig, 7 tab, 45 ref. OWRT T-0004(No. 6703)(1), 14-34-0001-6703.

Descriptors: *Reviews, *Desalination processes, Freezing, Flash freezing, Crystallization, Supercooling, Refrigeration, Tertiary treatment, Water treatment.
Identifiers: *Technology transfer, *Freezing processes.

Freezing processes are potentially the least costly and most reliable of desalting processes. Though development has continued for nearly 25 years, no commercial plant exists. The causes for this status as well as feasible processes are discussed. The advantages of freezing are enumerated along with a discussion of the problems associated with its development and are defined in relation to freezing as a general process. Specific problems of individual processes are also enumerated. The arguments for the low cost economic potential are presented. Areas requiring further research and development are defined and a time phased program is suggested.
W78-00003

NEED FOR NEW AND BETTER MEMBRANES,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
K. C. Channabasappa.
(1976). 41 p. 11 fig, 9 tab, 13 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Waste treatment, *Technology, By products, Membranes, Industrial wastes, Organic wastes, Chemical wastes, Pulp wastes, Sulfite liquors, Water reuse, Desalination processes, Desalination, Brackish water, Food processing industry, Iron, Steel, Costs, Reviews, Municipal wastes, Water supply.
Identifiers: Food processing.

Preparation of wastes and polluted waters for reuse requires treatment for removal of inorganic and organic contaminants released to the water in its prior use. Conventional water and waste treatment techniques are inadequate and uneconomical for preparing poor quality waters for reuse as municipal, industrial, and agricultural water supplies. Since water purification basically involves solute-solvent separation, reverse osmosis membrane technology offers considerable promise as a water and waste treatment technique. The present technology membranes, primarily developed for desalination of brackish waters and sea waters, have restricted chemical and thermal stability and are highly susceptible to fouling with colloidal inorganic and organic contaminants normally present in water supplies. New and improved membranes that do not have the above limitations are very much needed to improve the economics of reverse osmosis technology for water reuse application. (Humphreys-ISWS)
W78-00069

BUFFERING AGENTS,
Aerojet-General Corp., El Monte, CA. (Assignee).
A. Katzakian, Jr., and D. O. DePree.
U.S. Patent No. 4,028,234, 10 p, 2 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 300-301, June 7, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Demineralization, *Desalination, Waste water treatment, Brackish water, Separation techniques, Ion exchange, Resins.
Identifiers: *Buffering agents.

This invention allows the efficient use of weak acid cation and weak base anion exchange resins in a separated, fixed-bed or moving bed, both current and countercurrent configurations for the purpose of removing salts from brackish and waste water streams. The process minimizes expenditures for chemical by recycling all reagents required in the process and otherwise limited reagent losses. The process comprises the steps of passing the feed stock through a weak cation resin buffered with at least one member of a particular class of hydroxyl-substituted organic amines and exchanging the cations of the feed for the buffer and releasing buffered salts. The released buffered salts are then passed through a bed of weak anion exchange resin to remove the anions releasing the buffer. The released amine buffer is then deposited on a further bed of weak cation exchange resin which when loaded is used as the first bed of the next demineralization cycle while the first bed is regenerated. (Sinha-OEIS)
W78-00281

DRIED SEMIPERMEABLE MEMBRANE AND MANUFACTURE THEREOF,
Mitsubishi Rayon Co. Ltd., Tokyo (Japan). (Assignee).
K. Kamada, and S. Minami.
U.S. Patent No. 4,025,439, 6 p, 5 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 958, no 4, p 1662, May 24, 1977.

Descriptors: *Patents, *Water treatment, *Desalination, *Reverse osmosis, *Membranes,

*Semi-permeable membranes, Permeability, Equipment, Membrane processes.
Identifiers: Manufacturing process.

The use of semipermeable membranes for the desalination of sea water, the desalination of brackish water, the treatment of industrial food industry wastes and the like by reverse osmosis or ultrafiltration is well documented. The selective permeability of the semi-permeable membranes is a very important property in the technology for the separation of solution components by membranes. Especially desired are semi-permeable membranes which inhibit the permeation of a solute but readily permit the permeation of the liquid medium (e.g. water) in the separation process. The object of this invention is to provide a method of manufacturing a polyacrylonitrile semipermeable membrane which is reversible in water by dissolving the polyacrylonitrile or the copolymer in a solvent to prepare a concentrated solution and casting the solution to form a membrane under the conditions of 60-85% relative humidity, immersing the membrane in a non-solvent to remove the solvent and heat-treating the membrane under moist conditions at 50-1/4 - 90-1/4% C and then drying the membrane at a temperature less than the temperature of the heat treatment under conditions such that the coefficient of contraction is less than 1%. (Sinha-OEIS)
W78-00309

3B. Water Yield Improvement

CALCULATION OF EVAPOTRANSPIRATION USING COLOR-INFRARED PHOTOGRAPHY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2D.
W78-00212

METHOD AND APPARATUS FOR CONSERVING SOIL WATER,
D. I. Hillel.
U.S. Patent No 4,027,428, 18 p, 14 fig, 1 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 38, June 7, 1977.

Descriptors: *Patents, *Water conservation, *Soil moisture, *Evaporation control, Soil treatment, Soil physical properties, Soil surfaces, Equipment, *Soil water.
Identifiers: Hydrophobic agents, Soil-water relationship.

Natural soil is formed into clods ranging in size from a minimum dimension of about 5 mm to a maximum dimension of about 10 cm, and a hydrophobic agent is applied to the surface of the clods to increase the contact angle of water on the exposed grain surfaces of the clods to an angle greater than 90 degrees, which makes the clods water repellent. The clods thus treated are employed to form the top layer of soil. The treated clods conserve soil water by allowing maximal intake of water and by constituting a barrier which reduces water evaporation. Such soil water conservation together with other advantages enable farming on land in regions which could never before be successfully farmed. An apparatus for forming the treating the clods has a lifting device for lifting the top layer of soil of a field to a screening device for breaking up the soil to have a maximum dimension of about 10 cm and to drop the broken up soil back to the field. A chamber having an open bottom surrounds the screening device, and nozzles direct a spray of liquid hydrophobic agent into the chamber to coat the clods. Alternatively, a blower may direct a powdered hydrophobic agent into the chamber. The screening device may be an apertured continuous belt, continuously moving and vibrating between a pair of horizontal axes, the soil being directed by the lifting device to the upper course of the belt. (Sinha-OEIS)
W78-00276

UNIFORMITY AMONG WEATHER MODIFICATION LAWS,
Arizona Univ., Tucson.
R. J. Davis.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. IR3, Proceedings paper No. 12379, p 285-294, September 1976. 1 tab, 11 ref. OWRT A-064-ARIZ(3).

Descriptors: *Water rights, *Weather modification, Irrigation, Regulation.
Identifiers: *Uniformity, *State laws, *Federal laws, Diversity.

Although there have been efforts to secure uniformity, wide diversity remains among state laws regulating weather modification. Differences stem from ignorance of other states' laws, legal experimentation, different perceptions of weather modification efficacy, and desire to be consistent with local jurisprudence. Uniformity can be achieved through Federal legislation, interstate compacts, and uniform or model state laws. Funding arrangements and administrative structures should vary among the states. Some diversity, mixed with some uniformity, is appropriate for issuing operational permits, allocating weather modification runoff water rights, and determining legal liability. Professional licensing, record keeping, and reporting should be uniformly regulated. Weather modification advocates should support state laws that preserve the strengths of diversity and secure needed uniformity and Federal legislation allowing diversity where it is advantageous. (Bell-Cornell)
W78-00440

3D. Conservation In Domestic and Municipal Use

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-00194

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00209

3E. Conservation In Industry

PHYSICAL AND CHEMICAL METHODS,
Research-Cottrell, Bound Brook, N.J.
For primary bibliographic entry see Field 5D.
W78-00006

ON-SITE CARBON REGENERATION SYSTEM SOLVES EFFLUENT PROBLEM.
For primary bibliographic entry see Field 5D.
W78-00009

RO WATER TREATMENT SYSTEM.
For primary bibliographic entry see Field 5D.
W78-00010

HIGH PURITY PROTEIN RECOVERY,
Viscose Group Ltd., Swansea (Wales).
For primary bibliographic entry see Field 5D.
W78-00023

FRUIT-, VEGETABLE-, AND GRAIN-PROCESSING WASTES, (LITERATURE REVIEW),
Environmental Associates, Inc., Corvallis, OR.
For primary bibliographic entry see Field 5D.
W78-00025

MEAT-, FISH-, AND POULTRY-PROCESSING WASTES, (LITERATURE REVIEW),
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5D.
W78-00028

FERMENTATION INDUSTRY, (LITERATURE REVIEWS),
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5D.
W78-00029

METAL RECOVERY MAKES GOOD SENSE,
Corning Glass Works, NY.
For primary bibliographic entry see Field 5D.
W78-00032

NEW TECHNOLOGY FOR BOILER FEED AT MOBIL,
For primary bibliographic entry see Field 5D.
W78-00039

CHEMICAL RECOVERY SYSTEM CHECKS POLLUTION.
For primary bibliographic entry see Field 5D.
W78-00042

SLUDGE DEWATERING IN TEXTILE PLANTS,
Kendall Co., Griswoldville, MA.
For primary bibliographic entry see Field 5D.
W78-00049

PROSPECTS FOR WATER RE-USE,
Shirley Inst., Manchester (England). Finishing Div.
For primary bibliographic entry see Field 5D.
W78-00050

WASTE WATER TREATMENT AND WATER RECYCLING.
For primary bibliographic entry see Field 5D.
W78-00051

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) and Associates, Media, PA.
For primary bibliographic entry see Field 5D.
W78-00052

WATER RECYCLING-NO WASTE WATER TO SEWAGE TREATMENT PLANTS (RECYCLING FUER WASSER - KEIN ABWASSER AN KLAERANLAGEN).
For primary bibliographic entry see Field 5D.
W78-00054

ZINC RECOVERY FROM RAYON PLANT SLUDGE,
Avtex Fibers, Inc., Front Royal, VA.
For primary bibliographic entry see Field 5D.
W78-00055

NEW PLANT FILTERS 400 GAL/MIN. OF MINE WATER.
For primary bibliographic entry see Field 5D.
W78-00056

UNIQUE AUTOMATIC WATER-TREATMENT PLANT AT SILVERDALE COLLIERY.
For primary bibliographic entry see Field 5D.

W78-00057

NCB WATER TREATMENT PLANT NEEDS NO LAGOONS.
For primary bibliographic entry see Field 5D.
W78-00058

GUIDE TO WASTEWATER TREATMENT: BIOLOGICAL-SYSTEM DEVELOPMENTS,
Engineering-Science, Inc., Austin, TX.
For primary bibliographic entry see Field 5D.
W78-00062

SCREW PRESS DEWATERING SOLVES COSTLY WASTE DISPOSAL PROBLEM,
Cross Bros. Meat Packers, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5D.
W78-00105

CHEMICAL TREATMENT OF MEATPACKING PLANT WASTEWATER FROM UNIT OPERATIONS,
Texas Univ. at El Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-00167

AMI DESCRIBES HOW MEAT PLANTS HAVE SAVED ENERGY.
American Meat Inst., Washington, DC. Energy Task Force.
Energy Conservation, Case Studies 1-11, 1976, 26 p.

Descriptors: *Cost analysis, *Cost comparisons, *Energy, Analysis, Conservation, Food processing industry.
Identifiers: *Meat packing industry.

The American Meat Institute's energy task force has prepared a series of case studies on energy conservation which describe experiences in existing meat packing plants that may have application to other plants. Each case study is presented in the same six-section format: (1) description, (2) applicability, (3) operations prior to the project, (4) revisions made and operations after installation, (6) comparison of energy and other savings to capital and extra operating costs. (Prodehl - EPA, Corvallis)
W78-00171

ALTERNATIVES TO END-OF-PIPE TREATMENT,
CH2M/Hill, Corvallis, OR.
For primary bibliographic entry see Field 5D.
W78-00172

POULTRY PROCESSOR MEETS CHALLENGE OF INCREASED WASTE LOAD,
Gold Kist, Inc., Atlanta, GA.
For primary bibliographic entry see Field 5A.
W78-00180

STERLING POULTRY PIONEERS PLANT WATER RECLAMATION,
Sterling Poultry Processing Corp., Oakland, MD.
For primary bibliographic entry see Field 5D.
W78-00183

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-00194

INTRODUCTION TO WASTEWATER TREATMENT PROCESSES,
Laval Univ., Quebec.
For primary bibliographic entry see Field 5D.
W78-00360

TREATMENT AND USE OF WASTE EFFLUENT STREAMS,
Lummus Co., New York.
For primary bibliographic entry see Field 5D.
W78-00364

PRODUCTION OF FOOD YEAST FROM SPENT SULFITE LIQUOR,
Boise Cascade Paper Group, Salem, OR.
For primary bibliographic entry see Field 5D.
W78-00365

BIOLOGICAL TREATMENT OF SPENT LIQUOR FROM HIGH-YIELD BISULFITE PULPING OPERATION. PART I,
Consolidated-Bathurst, Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W78-00366

BIOLOGICAL TREATMENT OF SPENT LIQUOR FROM HIGH-YIELD BISULFITE PULPING OPERATION. PART II,
Consolidated-Bathurst Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W78-00367

QUALITY OF EFFLUENTS FROM VARIOUS MECHANICAL PULPING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5B.
W78-00368

A PROMISING NEW PROCESS FOR REMOVING HEAVY METALS FROM WASTEWATER,
For primary bibliographic entry see Field 5D.
W78-00370

OPTIMIZATION OF WATER MANAGEMENT IN THE PRODUCTION OF WOOD FIBERBOARD USING THE WET PROCESS (K RACIONALIZACII VODNEHO HOSPODARSTVA VO VYROBE DREVOVLAKNITYCH DOSAK MOKRYM SPOSOBOM),
Research and Development Inst. of Wood and Timber, Bratislava (Czechoslovakia).
F. Mytny.
Drevo, Vol 32, No 1, p 8-11, January, 1977. 3 fig, 20 ref.

Descriptors: *Water conservation, *Water management(Applied), *Pulp and paper industry, Water pollution control, Water reuse, Water pollution sources, Dissolved solids, Waste water treatment.
Identifiers: *Fiberboard mills, Closed systems, Board mills.

The first fiberboard-producing plants were designed to use about 10 cu m of water per ton of product. This was gradually reduced to 25-40 cu m/ton on the average, and there are some plants with a fully closed water circuit. The closing of water circuits resulted in substantially higher concentration of dissolved solids in the circuit, reaching 90-100 g/liter compared to 5-6 g/liter in the effluent of an open-circulation plant. The fiberboard plant effluent can be treated using mechanical and biological process stages. (Trubacek-IPC)
W78-00371

REVERSE OSMOSIS AND ULTRAFILTRATION APPLIED TO THE PULP INDUSTRY (OSMOSE INVERSE ET ULTRAFILTRATION APPLIQUEES A L'INDUSTRIE DES PATES),
For primary bibliographic entry see Field 5D.
W78-00377

UDDEHOLM-KAMYR BLEACH PLANT WITH CLOSED WATER SYSTEM (BIELARNIA TYPU UDDEHOLM-KAMYR O ZAMKNIETYM OBIEGU),
Uddeholm A.B., Skoghall (Sweden).
For primary bibliographic entry see Field 5D.
W78-00380

CONTINENTAL (GROUP INC.)'S APPROACH FOR REDUCED PAPER MILL WATER CONSUMPTION AND ITS EFFECT ON ENERGY USE,
Continental Group, Inc., Hodge, LA.
A. L. Boska.
Southern Pulp and Paper Manufacturer, Vol. 40, No. 2, p 17-18, 20, February, 1977. 1 fig, 4 tab.

Descriptors: *Pulp and paper industry, *Water conservation, *Water reuse, Water pollution control, Industrial water, Water pollution sources, Energy, Louisiana.
Identifiers: Paper mills, White water(Paper machine).

After analyzing critical water needs at the Hodge, Louisiana, paper mill, it was concluded that the turpentine condenser water, packing seal water, and cooling water are the critical flows and would not be altered. Most of the plan for water use reduction rested with the paper machine room which consumed 71% of the mill's total water requirements. Water consumption was reduced by 1855 gallons/minute by using incoming cold water for cooling and condensing needs and using heated water from condensers in showers and as makeup water, separating high- and low-pressure condensate return to the power house from machine dryer drainage systems, using white water in the paper machine showers, and utilizing NSSC white water on the pulp showers. (Swichtenberg-IPC)
W78-00381

NEW MILL DESIGN -- A PRESENT DAY APPROACH TO REDUCED WATER USAGE,
Wheelabrator-Frye Inc., Birmingham, AL.
L. E. Doughty.
Southern Pulp and Paper Manufacturer, Vol. 40, No. 2, p 49-52, February, 1977. 8 fig.

Descriptors: *Pulp and paper industry, *Water reuse, Water conservation, Industrial water, Water treatment, Water pollution sources, Water pollution control, *Treatment facilities.
Identifiers: Woodyard, Pulp mill, Paper machine room, Chemical recovery.

Current methods for in-plant water treatment and reuse which would be included in the engineering of a modern pulp and paper mill are reviewed. Opportunities for waste water reuse in the woodyard, pulp mill, machine room, recovery-evaporation area, and causticizer (lime kiln) are described. Problems and problem areas associated with water reuse are identified. (Swichtenberg-IPC)
W78-00382

WHITE WATER INVENTORYING,
For primary bibliographic entry see Field 5D.
W78-00383

PROCESS FOR CLARIFYING (PAPER-)COATING PLANT EFFLUENTS--A CONTRIBUTION TO THE IMPROVEMENT OF ENVIRONMENTAL PROTECTION (VERFAHREN ZUR KLAERUNG VON STREICHEREIABWAESSERN -- BEITRAG ZUR VERBESSERUNG DES UMWELTSCHUTZES),
Feinpapierfabrik Koenigstein VEB (East Germany).
For primary bibliographic entry see Field 5D.
W78-00391

USE OF CHITOSAN FOR THE REDUCTION AND RECOVERY OF SOLIDS IN POULTRY PROCESSING WASTE EFFLUENTS,
Georgia Univ., Experiment. Dept. of Food Science; and Georgia Experiment Station, Experiment.
For primary bibliographic entry see Field 5D.
W78-00457

INDUSTRIAL WASTE PROCESS DESIGN,
Manhattan Coll., Bronx, NY. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-00459

CONSERVATION OF WATER IN FOOD PROCESSING BY USE OF LOW VOLUME HIGH PRESSURE SPRAYS,
North Carolina State Univ. at Raleigh. Dept. of Food Science.
A. Hamza, C. Smallwood, Jr., and V. Jones.
Proceedings of the Third National Conference on Complete Water Reuse, June 27 - 30, 1976, p. 546-551, 5 fig, 4 tab, 10 ref.

Descriptors: *Cleaning, *Poultry, *Water conservation, *Hydraulic equipment, *Water utilization, Food processing industry, Water rates, Bacteria, Water quality.
Identifiers: *Poultry processing wastes.

An investigation was undertaken to evaluate the effect of a number of spray parameters on water and energy conservation as measured by bacteria removal during washing. The spray parameters for the studies were studies were water quantity and temperature, nozzle pressure, impingement velocity, nozzle type, and rotation of carcass. Measurement of bacteria washed from the poultry was done via radioactive tagged E. coli. Three commercial nozzles that produced droplets of 50 to 1,000 microns diameter of flat, cone, and swuare spray patterns were selected for study. Nozzle pressures selected were 2.7 atm., 5.4 atm., 10.9 atm., and 17 atm. Water temperatures were 20 degrees, 45 degrees, and 70 degrees. Distances of nozzle from bird were 15, 20, and 25 cm. General formulas are given for the proposed models. Conclusions include: (1) the amount of wash water is the most significant factor in bacteria removal (2) the effect of nozzle pressure improves removal by about 2.5% for each atm., only in the first increment of wash, (3) bacteria removal of 1%/C degrees temperature rise occurs only in the first increment of wash, and (4) high pressures may force bacteria into skin. (Prodehl - EPA, Corvallis)
W78-00460

FULL-SCALE MODIFIED DIGESTION OF MEAT PACKING WASTES,
Wilson and Co., Inc., Chicago, IL. Research and Technical Dept.
For primary bibliographic entry see Field 5D.
W78-00461

AN INVESTIGATION INTO THE DISPOSAL OF BLOOD BY ANAEROBIC DIGESTION,
Kent Sewage Treatment Plant, OH.
For primary bibliographic entry see Field 5D.
W78-00462

POLLUTION ABATEMENT OF POULTRY PROCESSING AND BY-PRODUCTS WASTES,
Rockingham Poultry Marketing Cooperative Inc., Broadway, VA.
For primary bibliographic entry see Field 5D.
W78-00466

PACKINGHOUSE WASTE PROCESSING, APPLIED IMPROVEMENT OF CONVENTIONAL METHODS,
Rath Packing Co., Waterloo, IA.
For primary bibliographic entry see Field 5D.
W78-00469

POLYELECTROLYTES IN INDUSTRIAL WASTE TREATMENT,
Dow Chemical U.S.A., Midland, MI.
For primary bibliographic entry see Field 5D.
W78-00475

THE ECONOMICS OF POOR HOUSEKEEPING IN THE MEAT-PACKING INDUSTRY,
Hormel (George A.), and Co., Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-00481

EQUALIZATION OF LIQUID WASTES,
New Jersey Inst. of Tech., Newark. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-00484

LAND TREATMENT OF FOOD PROCESSING WASTEWATER,
Campbell Soup Co., Camden, NJ.
For primary bibliographic entry see Field 5D.
W78-00494

ENERGY, PUBLIC CHOICES AND ENVIRONMENTAL DATA NEEDS,
Institute of Public Administration, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-00499

3F. Conservation In Agriculture

WATER AND TEMPERATURE REGIME OF THE MAIN TYPES OF SOILS OF THE APSHERON PENINSULA, (IN AZERBAIJANIAN),
For primary bibliographic entry see Field 2G.
W78-00002

AGRONOMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES,
Institut National de la Recherche Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5E.
W78-00102

WASTEWATER RESEARCH EXPANDS,
For primary bibliographic entry see Field 5E.
W78-00122

THE EFFECT OF FERTILIZERS ON THE WATER CONSUMPTION AND WATER SUPPLY OF SOME FIELD CROPS, (IN HUNGARIAN),
University of Agriculture, Debrecen (Hungary).
L. Ruzsanyi.
Novenytermeles 23(3), p 249-258, 1974.

Descriptors: *Water consumption, *Water supply, *Fertilizers, Crops, Sugarbeets, Leaves, Wheat, Corn(Field), *Crop production.
Identifiers: Lucerne.

Water consumption of winter wheat, maize, sugar beet and lucerne stands were studied over 4 yr, with 3 treatments. Water and fertilizer utilization was the subject of another field experiment, with and without irrigation. The effect of leaf nutrition of plants varied according to species. Leaf area of sugar beet increased in parallel with the growing rates of applications; the leaf area of maize showed almost no reaction. When water consumption and yields were related-water consumption taken as independent variable-an exponential function was obtained. The effect of fertilizer, in water consumption and yield alike was closely linked with leaf surface area. The influence of fertilizers on water utilization (plant product per water used in millimeter) was reflected in the following ranking of crops: sugar beet, winter wheat, lucerne, maize. When the index of water utilization is assessed as based on crop species only, ranking was reversed: maize, lucerne, sugar beet, winter wheat.—Copyright 1976, Biological Abstracts, Inc.
W78-00124

THE IMPORTANCE OF ROOT SYSTEMS OF CULTIVATED PLANTS: I. THE INFLUENCE OF THE SOIL WATER CONTENT AND NITROGEN MANURING ON PLANT GROWTH, ROOT MORPHOLOGY, TRANSPIRATION AND NITROGEN ABSORPTION, (IN GERMAN),
Kiel Univ. (West Germany). Inst. fuer Pflanzenbau und Pflanzenzuechtung.
G. Geisler, and D. Maarufi.
Z Acker Pflanzenbau 141(3), p 211-230, 1975.

Descriptors: *Root systems, *Plant growth, Soil water, *Moisture content, *Nitrogen, Absorption, Transpiration, *Cultivation, Barley, Corn(Field), Soil moisture.

Model experiments with maize and barley with 2 soil water content concentrations within the range between the permanent wilting point and field capacity were considered. The effect of different levels of N fertilization on the effects of water content and correlations between the effects are reported.
W78-00125

ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W78-00133

SOIL PROCESSES AND PRODUCTIVITY IN RELATION TO CLIMATIC CYCLES IN KAZAKHSTAN, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W78-00174

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-00194

FEASIBILITY STUDY FOR IRRIGATING THE TRIBAL FARM ON THE CROW CREEK RESERVATION, FORT THOMPSON, SOUTH DAKOTA,
Roubal (Dana Larson) and Associates, Pierre, SD.
T. C. Werblow, and J. J. Olmsted.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 444, Price codes: A04 in paper copy, A01 in microfiche. Engineering Report, 1976. 49 p, 6 fig. OTA 05-06-01566, and DLRA 202475.

Descriptors: *Irrigation, *Feasibility studies, Sprinkler irrigation, Crops, Agriculture, Missouri River, Lakes, Cost analysis, Runoff, Surface runoff, *South Dakota, Federal reservations, *Indian reservations, Groundwater, Water wells.
Identifiers: *Crow Creek Sioux Reservation(Ft. Thompson, SD), Center pivot sprinkler irrigation system, Lake Sharpe(SD).

It is concluded that irrigation is feasible on the 1,400-acre Tribal Farm of the Crow Creek Sioux Reservation located near Fort Thompson, S.D. The proposed irrigated fields are within 2.5 miles of Lake Sharpe on the Missouri River, the recommended source of irrigation water. Dissolved solids in well water and mineral content of ground water limit the usefulness of these sources. Power for the 6,600-gallon/minute pumping station would come through the Missouri River Basin Power System. The topography is gently rolling (1,420 to 1,500 feet elevations), and drainage occurs to the south and east into Lake Sharpe. The semi arid climate produces hot summers and cold winters (0-100 F). Rainfall averages 17 inches per year, with an average growing season of 135 days. Currently dryland farming and grazing are practiced; the principal cash crops are winter wheat and alfalfa. Most of the soils are Lowry, Promise, or Dorna silt loams, which should yield good to excellent crop results with irrigation. The center pivot sprinkler irrigation system is recommended. It has the lowest annual per-acre labor cost ($32), and is most commonly used in the area. Total per-acre construction costs are lower than the side-move tow sprinkler system, and only hydraulic power is needed to move it. Other systems considered required fueled engines. The total estimated project cost is $960, 650, with an annual irrigation cost of $157,200. Four crops are recommended: wheat, alfalfa, grain sorghum, and corn. (Lynch-Wisconsin)
W78-00216

RESPONSE BY PEARL MILLET TO SOIL INCORPORATION OF WATERHYACINTHS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-00259

IRRIGATION CONTROL APPARATUS,
C. J. M. Ayme de la Chevreliere.
U.S. Patent No. 4,026,467, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 2014, May 31, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Water control, *Irrigation efficiency, Irrigation practices, Application equipment, Electrodes, Soil-water-plant relationship, Humidity.
Identifiers: Drop by drop irrigation.

An improved irrigation control apparatus comprises an assembly electrically controlling the starting and stopping of an irrigation installation through the agency of two electrodes measuring the electrical resistance of the soil. The two electrodes are simulataneously spaced from one another laterally and vertically. The improvement comprises an upper electrode placed at a point which is laterally offset with respect to the axis of symmetry of the bulb formed by drop by drop irrigation, at a distance equal to at least half of the maximum radius of the bulb and situated at the upper limit of the bulb; and a lower electrode placed in a diametrically opposite position, at a point laterally offset in the inverse sense by at least half of the maximum radius of the bulb and situated at the lower limit of the bulb. (Sinha - OEIS)
W78-00268

SPRINKLER SYSTEMS,
Toro Co., San Marcos, CA. (Assignee).
E. J. Hunter.
U.S. Patent No. 4,026,471, 8 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 2015, May 31, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Flow, Irrigation operation and maintenance, Application equipment.

A sprinkler system has a sprinkler head with a pop-up nozzle actuated by fluid pressure. An impeller is actuated by the fluid flow to rotate the nozzle and thus rotate the spray of fluid. A transmission between the impeller and the nozzle transmits rotation of the impeller to the nozzle. Means are provided for regulating the rate of rotation of the impeller, and then the nozzle, under varying volume flow of fluid being sprayed. This may be accomplished by a substantially constant velocity of incoming fluid impinging on impeller blades. This velocity may be maintained constant velocity of jets of fluid on the impeller blades to rotate them which in turn rotates the nozzle at a substantially constant rate of rotation. (Sinha - OEIS)
W78-00269

HYDRAULIC COEFFICIENTS FOR PE PIPE OF LARGE DIAMETER: STUDIES ON THE PIPE DISTRIBUTION IN SYSTEMS FOR SPRINKLER IRRIGATION: V, (IN JAPANESE),
Okayama Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 8B.
W78-00297

IRRIGATION TUBING COUPLING FASTENER,
Du Pont de Namours (E. I.) and Co., Wilmington, DE. (Assignee).
R. B. Duggins, P. G. Mackauf, and D. L. Withington.
U.S. Patent No. 4,024,716, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1421, May 24, 1977.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation operation and maintenance, Application equipment, Tubing.
Identifiers: Drip irrigation.

A method for irrigating by means of burying expansible porous tubes is known as drip irrigation. Each expansible tube is constructed of two parallel lengths of porous material bound together along the edges. During use expansible tubes may be joined together or to a water pipe via a connecting tube, by inserting the end of the connecting tube into the end of the expansible tube. However in attempting to seal the expansible tube to the connecting tube, there are seams which cause discontinuities on the inner surface of the expansible tube which causes leakage. This invention provides a fastener for joining a connecting tube and an expansible tube telescoped on the end of the connecting tube. The fastener is composed of a compressible ring on the end of the connecting tube and a tubular sheath telescoped on the connecting tube, the expansible tube and the ring. The sheath has an inner surface tapered to a circumference less than the normal circumference of the ring. (Sinha - OEIS)
W78-00299

FOLDING ALUMINUM RICE AND IRRIGATION BOX,
W. D. Hudson, and B. M. Hudson.
U.S. Patent No. 4,024,717, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1422, May 24, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Surface irrigation, Water delivery, Flow control, Irrigation efficiency, Flooding, Application equipment.

The cultivation of rice and other crops requires the occasional flooding or irrigation of the fields. Rice boxes and similarly constructed irrigation devices are used to provide and regulate water flow throughout numerous fields and between individual fields and checks, levees or ditches. After the rice is harvested, many growers burn the remaining rice stubble to help maintain a good quality rice crop the next planting season. Wooden, steel, and fiberglass rice boxes have deficiencies which impair efficient irrigation. This invention describes a folding box providing lightweight and long life expectancy. The hinged construction enables the box to be folded up or laid out flat for convenience in handling, transportation, storage and repairs. It also allows for damaged part replacement. (Sinha - OEIS)
W78-00300

THE EFFECT OF FLOODING ON THE AVAILABILITY OF ZINC AND MANGANESE TO RICE,
Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.
K. G. Tiller, and P. Wassermann.
Z Pflanzenernaehr Bodenkd. 136(1), p 57-67, 1973.

Descriptors: *Flooding, *Zinc, *Manganese, *Rice, Soils, Nutrients, Isotope studies.

The effect of flooding of soils on the availability of Zn and Mn to rice was studied in pot experiments by measuring the isotopic dilution of nutrients absorbed from doubly labelled soils. The results of this procedure were not appreciably affected by incubation for up to 6 wk before planting the rice but were affected by the inclusion of carrier, especially for Zn. Flooding approximately doubled the total amount of available Mn. It only marginally increased available Zn for all soils, yet the plant concentrations of Zn and Mn were sometimes markedly less under flooded conditions. The isotopic dilution procedure confirmed that for non-flooded soils. The mildly reducing procedure of Jones and Leeper (1951) was most appropriate for characterizing total available Mn and showed that a hydroquinone reagent containing EDTA (after Beckwith 1955) promises a more reliable estimate of the total amount of Mn to be released under flooded conditions. The hypothesis is offered that only the exposed monolayer of the manganese oxide surface contributes to the equilibria controlling uptake by plants under non-flooded conditions, and that this fraction is largely reorganized under water-logged conditions such that the underlying manganese oxide surface can also contribute to plant uptake.--Copyright 1974, Biological Abstracts, Inc.
W78-00337

CHANGES IN TEMPERATURE AND AIR HUMIDITY DURING IRRIGATION IN THE DESERT ZONE, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
I. G. Gorbunova, N. S. Orlovskii, and Z. M. Utina.
Probl Osvoeniya Pustyn 6, p 9-14, 1974.

Descriptors: *Air temperature, *Humidity, Deserts, Cotton, *Irrigation, Arid lands, Arid climates.
Identifiers: *USSR, Karakum, Kizylkum, Kazahkstan.

Irrigation of new lands had a decreasing effect on temperature and air humidity rate of the surface layer. During the growth period the average decrease of air temperature in irrigated cotton fields was 1-2 degrees, with the height at 2, and the air humidity increase at 2-4 millibars (mb). Under the plant cover the values were 2.5 degrees and 5-10 mb, respectively. Maximum changes of the meterological factors in the course of irrigation took place in the territory of Central Karakum and Southwestern Kizylkum and minimum in Southern Kazahkstan (USSR).--Copyright 1976, Biological Abstracts, Inc.
W78-00347

DURATION OF PHOTOSYNTHESIS AS A DIAGNOSTIC INDEX OF THE DEGREE OF DROUGHT-RESISTANCE IN PLANTS,
Patrice Lumumba People's Friendship Univ., Moscow (USSR).
For primary bibliographic entry see Field 2I.
W78-00356

STUDY OF WATER CONDITIONS AND DROUGHT RESISTANCE OF PLANTS AS A PROBLEM OF PARTICULAR PHYSIOLOGY, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Fiziologii Rastenii i Agrokhimii.
For primary bibliographic entry see Field 2I.
W78-00357

LINE SOURCE SPRINKLER FOR CONTINUOUS VARIABLE IRRIGATION-CROP PRODUCTION STUDIES,
Utah State Univ., Logan. Dept. of Soil Science.
R. J. Hanks, J. Keller, V. P. Rasmussen, and G. D. Wilson.
Soil Science Society of American Journal, Vol. 40, No. 3, p 426-429, May-June 1976. 3 fig, 2 tab, 4 ref. OWRT C-5189(No 4233)(2).

Descriptors: *Sprinkler irrigation, Irrigation, *Irrigation systems, Irrigation effects, *Crop production, Crop response, Fertilization.
Identifiers: *Irrigation frequency, Continuous variable.

The design details and a sample set of field test results for a line source sprinkler plot irrigation system are presented. The system produces a water application pattern which is uniform along the length of the plot and continuously, but uniformly variable across the plot. By applying a fertility variable along a plot (at right angles to the water variable) planted in some test crop, the system offers a convenient means for developing crop production function data. The system test area and water supply are both small. However, the application of the system may be limited by wind and all water application levels within a plot must be supplied at the same irrigation frequency. (Skogerboe-Colorado State)
W78-00447

LAND TREATMENT OF FOOD PROCESSING WASTEWATER,
Campbell Soup Co., Camden, NJ.
For primary bibliographic entry see Field 5D.
W78-00494

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CALCULATORS IN TIMER-COUNTERS FOR CURRENT METERS,
Papuea New Guinea Univ. of Tech., Lae (New Guinea). Dept. of Electrical and Communications Engineering.
For primary bibliographic entry see Field 7B.
W78-00077

A REGIONAL RESERVOIR STORAGE ANALYSIS FOR EASTERN MASSACHUSETTS AND RHODE ISLAND,
Geological Survey, Reston, VA. Water Resources Div.
G. D. Tasker.
In: Journal of the Boston Society of Civil Engineers Section, American Society of Civil Engineers, Vol 64, No 1, p 13-26, April 1977. 6 fig, 4 tab, 16 ref.

Descriptors: *Reservoir storage, *Reservoir yield, *Reservoir releases, *Reservoir design, *Regional analysis, *Massachusetts, *Rhode Island, Flow control, Low-flow augmentation, Water supply, Hydrologic data.

Regionalized relationships between reservoir storage and uniform reservoir outflow resulting from redistribution of natural flow by storage are presented for streams in eastern Massachusetts and Rhode Island. The relationships are given in terms of percent chance that the reservoir would become empty and are based on long-term streamflow records. They take into account seasonal and year to year variations in streamflow by use of hydrologic indices which can be estimated for ungaged sites. The indices are the 7-day, 2-year low flow and the coefficient of variation of annual discharge. (Woodard-USGS)
W78-00195

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1976.
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00200

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00202

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1976.
Geological Survey, Lincoln, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00203

LOW-FLOW CHARACTERISTICS AT GAGING STATIONS ON THE WISCONSIN, FOX, AND WOLF RIVERS, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00204

HYDROLOGY OF THE CREEPING SWAMP WATERSHED, NORTH CAROLINA, WITH REFERENCE TO POTENTIAL EFFECTS OF STREAM CHANNELIZATION,
Geological Survey, Raleigh, NC. Water Resources Div.
M. D. Winner Jr., and C. E. Simmons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 926, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-26, April 1977. 54 p, 20 fig, 11 tab, 15 ref.

Descriptors: *Channeling, *Channel improvement, *Hydrologic budget, *Coastal Plains, *North Carolina, Water quality, Trace elements, Sediment yield, Small watersheds, Base flow, Confined water, Potentiometric level, Hydrogeology, Aquifers, Streamflow, Swamps.
Identifiers: *Creeping Swamp watershed(N C).

Hydrologic data were collected for four years at six sites in the Creeping Swamp watershed in eastern North Carolina in a preliminary effort to study the effects of stream channelization on the hydrology of a small watershed. A water-budget evaluation for pre-channelized conditions showed that runoff accounts for about 17 percent of the total rainfall, base runoff about 20 percent, ground-water outflow about 2 percent, and evapotranspiration about 61 percent. Channelization would have caused the greatest decline in ground-water levels nearest the stream, with the decline diminishing with increased distance from the stream. Channelization would also have resulted in a decrease in overland runoff and an increase in the amount of water reaching Creeping Swamp through the ground-water system, although the total volume of runoff would not change significantly. The water-quality characteristics of Creeping Swamp indicate that the stream is relatively free of pollution, although it is likely that channelization would increase (1) suspended-sediment loads, (2) stream temperatures, and (3) concentrations of dissolved solids, especially during low flows. (Woodard-USGS)
W78-00207

LATERAL MIGRATION OF THE MIDDLE SACRAMENTO RIVER, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-00208

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00210

THE STRUCTURE OF A TURBULENT FLOW IN A CHANNEL OF COMPLEX SHAPE,
Geological Survey, Atlanta, GA. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-00211

OPTIMAL AERATION POLICIES FOR THE ABATEMENT OF POLLUTION IN RIVER BASINS,
Columbia Univ., New York. Dept. of Mechanical Engineering.; and Columbia Univ., New York. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5G.
W78-00213

RESPONSE OF POTAMOGETON PECTINATUS L. TO NORFLURAZON,
Massachusetts Univ., East Wareham. Lab. of Experimental Biology.
For primary bibliographic entry see Field 5G.
W78-00221

THE AQUATIC PLANT REGULATION PROGRAM IN FLORIDA,
Florida Dept. of Natural Resources, Tallahassee. Bureau of Aquatic Plant Research and Control.
For primary bibliographic entry see Field 5G.
W78-00242

POTENTIAL GROWTH OF AQUATIC PLANTS IN THE REPUBLIC OF THE PHILIPPINES AND PROJECTED METHODS OF CONTROL,
Office of the Chief of Engineers (Army), DC. Aquatic Plant Control Program.
For primary bibliographic entry see Field 5G.
W78-00243

SEASONAL PRODUCTION AND GERMINATION OF HYDRILLA VEGETATIVE PROPAGULES,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-00247

DISSIPATION OF RESIDUES OF 2,4-D IN WATER, HYDROSOIL, AND FISH,
Fish and Wildlife, Warm Springs, GA. Fish Pesticide Research Lab.
For primary bibliographic entry see Field 5G.
W78-00251

BIOLOGICAL CONTROL OPERATIONS ON ALLIGATORWEED,
Office of the Chief of Engineers (Army), Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00253

ECOLOGICAL STUDIES OF NEOCHETINA BRUCHI AND N. EICHHORNIAE ON WATERHYACINTH IN ARGENTINA,
Agricultural Research Service, H Hurlingham (Argentina). Biological Control of Weeds Research Lab.
For primary bibliographic entry see Field 5G.
W78-00254

HOST SPECIFICITY OF NEOCHETINA BRUCHI HUSTACHE (COLEOPTERA CURCULIONIDAE), A BIOLOGICAL CONTROL AGENT FOR WATERHYACINTH,
Agricultural Research Service, Fort Lauderdale, FL. Aquatic Plant Management Lab.
For primary bibliographic entry see Field 5G.
W78-00255

A REVIEW OF METHODS FOR OBTAINING MONOSEX FISH AND PROGRESS REPORT ON PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
For primary bibliographic entry see Field 5G.
W78-00257

LEGAL REVIEW OF LAND USE CONTROLS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-00262

WATER FLOW METER,
For primary bibliographic entry see Field 7B.
W78-00266

MEASURING DEVICE FOR WATER FLOW IN A BURIED PIPE,
For primary bibliographic entry see Field 7B.
W78-00267

METHOD FOR ADJUSTING AN AUTOMATIC SLUICE WITH A VIEW TO ENSURING A DETERMINED LEVEL,
Societe Generale de Constructions Electriques et Mecaniques (Alsthom), Paris Cedix (France). (Assignee).
For primary bibliographic entry see Field 8C.
W78-00278

PRESSURIZED WATER WHEEL,
W. S. Kerby.
U.S. Patent No. 4,023,915, 7 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 1147, May 17, 1977.

Descriptors: *Patents, *Waterwheels, Engineering structures, *Water control, Flow, Flow control, Runoff, Watershed management.

A waterwheel assembly has entry and outlet flow directing channel portions and a flow directing member below the waterwheel. The waterwheel has radially placed paddles mounted on arotatable shaft and arranged with spaces between the paddles in open fluid communication in the center portion of the waterwheel. The upper portion of the waterwheel is enclosed in a pressurized air cavity so water is kept in the lower portion of the waterwheel. A method of controlling the water flow in a watershed includes directing water flow through small channels which connect with larger channels with flow controlling waterwheels in the channels at selected location so that releasing water through the waterwheels control water flow and thus regulates runoff in the watershed area. (Sinha - OEIS)
W78-00293

EVALUATION OF THE EFFECTIVENESS OF USING DRAINED STATE FOREST HOLDINGS, (IN RUSSIAN),
M. E. Maiorov.
Vyestsi Akad Navuk Bssr Syer Biyal Navuk 3, p 118-119, 1975.

Descriptors: Soils, *Soil types, *Drainage, *Swamps, Forests, *Forest management, Ecology, Climates.
Identifiers: Belorussian-SSR, USSR.

An analysis was made of the Lyuban Forest in the Minsk district (Belorussian SSR, USSR) which is based on the use of an edaphic-climatic grid. The disposition of soil varieties according to forest vegetation types and the effects of an ecological shift in growing conditions as a result of the draining of swampy areas of the forest are shown.--Copyright 1976, Biological Abstracts, Inc.
W78-00345

WHERE TO FIND WEATHER AND CLIMATIC DATA FOR FOREST RESEARCH STUDIES AND MANAGEMENT PLANNING,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 7C.
W78-00386

ALTERNATIVE MODELS FOR ESTIMATING THE TIME SERIES COMPONENTS OF WATER CONSUMPTION DATA,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W78-00443

GUIDE TO LAND COVER AND USE CLASSIFICATION SYSTEMS EMPLOYED BY WESTERN GOVERNMENTAL AGENCIES,
Ecology Consultants, Inc., Fort Collins, CO.
S. L. Ellis, C. Fallat, N. Reece, and C. Riordan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 173, Price codes: A09 in paper copy, A01 in microfiche. Publication No. FWS/OBS-77/05, March 1977. 184 p. WELUT No. 004.1-76, FWS 14-16-0008-2123.

Descriptors: *Ecosystems, *Land classification, *Data collections, *Data processing, *Habitats, *Vegetation, Wildlife habitat, Mapping, Habitat types, Canada, Alaska, Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, *Classification.

The guide surveys and lists the classification systems in use by State and Federal agencies in 18 Western States and the Provinces of Alberta and Manitoba in Canada. The guide--limited primarily to wildlife, land use, and terrestrial vegetation--provides summary descriptions of classification systems, and the data base and the techniques required to implement these systems. System descriptions are divided into three sections: local systems, regional and multi-regional systems, plus some Canadian systems. Each system summary includes the title of the system, contact person, objectives, background, description, products and related systems. Author and keywork indexes and a glossary of terms are included. (Fish and wildlife Service)
W78-00496

COOPERATIVE INSTREAM FLOW SERVICE GROUP: THE FIRST YEAR.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
Publication No. FWS/OBS-77/36, August 1977. 8 p.

Descriptors: Flows, Hydrology, Water quality, *Streamflow, Research and development.
Identifiers: *Instream flow.

The activities and accomplishments of the Cooperative Instream Flow Service Group during its first year of existence are described. The group, established in July 1976 as a satellite group of the Western Energy and Land Use Team, is a multiagency multi-discipline organization. Its goal was to establish an entity which could utilize the contributions of different agencies and persons from different disciplines to advance the state-of-the-art and become the center of activity related to instream flow assessments. The group's areas of research include: (1) development of improved methods for assessing and predicting instream flow requirements for fish, wildlife, other aquatic organisms, recreation, and aesthetics; (2) development and improvement of guidelines for implementing instream flow recommendations; (3) establishment of an effective communication network for disseminating instream flow information. (Fish and Wildlife Service)
W78-00497

A DECOMPOSITION APPROACH TO THE CAPACITY EXPANSION PROBLEM,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
J. A. Craig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 674, Price codes: A06 in paper copy, A01 in microfiche. MS thesis, June 1976. 118 p. 8 fig, 18 tab, 18 ref, append. OWRT B-050-OHIO(2).

Descriptors: *Systems analysis, *Optimum development plans, *Water supply, *Multiple-purpose projects, Dynamic programming, Simulation analysis, Water resources development, Water allocation(Policy), Planning, Future planning(Projected), Long-term planning, Computer programs, Computer models.

A quantitative model is described for the optimal sequencing of water supply projects constructed to meet a projected demand function, in which there is a need to solve capacity demand computational problems associated with uncertainties in the data. The decomposition approach involves a computer-based program described in the text and utilizes incremental cost considerations to permit effective analysis of systems previously considered dimensionally infeasible. The method results in a substantial reduction of computational time requirements, while maintaining a high degree of accuracy in achieving the optimal solution. With the problem of dimensionality eliminated, the procedure may be applied to a variety of real water resource problems. Examples illustrated in the report include the optimal expansion for a large regional system, and consideration of demand functions for multiple water qualities. It is thought that the most significant application of the approach is for simulation and the generation of alternative solutions and policies, in which an incremental use of the model might generate a set of cost-competitive alternative solutions. (Harris-Wisconsin)
W78-00500

4B. Groundwater Management

WATER TABLE RESPONSE TO A SEQUENCE OF RECHARGES,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-00072

DEVELOPMENT AND RESORPTION OF A THERMAL DISTURBANCE IN A PHREATIC AQUIFER WITH NATURAL CONVECTION,
Neuchatel Univ. (Switzerland). Centre de Hydrogeologie.
For primary bibliographic entry see Field 5B.
W78-00083

HEAT DISPERSION EFFECT ON THERMAL CONVECTION IN ANISOTROPIC POROUS MEDIA,
Oslo Univ. (Norway). Dept. of Mechanics.
For primary bibliographic entry see Field 2F.
W78-00084

SERIES EXPRESSION FOR THE WELL FUNCTION FOR LEAKY STRIP AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W78-00085

SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD,
Agricultural Research Service, Lincoln, NE.
For primary bibliographic entry see Field 5B.
W78-00121

INITIAL ASSESSMENT OF THE GROUNDWATER RESOURCES IN THE MONTEREY BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00188

EXPERIMENTAL STUDY OF ARTIFICIAL RECHARGE ALTERNATIVES IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. C. Sinclair.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 953, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-13, 1977. 52 p, 16 fig, 3 tab, 8 ref.

Descriptors: *Groundwater recharge, *Aquifer characteristics, *Florida, *Artificial recharge, Methodology, Water spreading, Tile drains, Drainage wells, Groundwater movement, Natural recharge, Evaluation.
Identifiers: Northwest Hillsborough County(Fla), *Floridan aquifer, *Connector wells, Groundwater management.

Extensive water withdrawal from the Floridan aquifer in the urban Tampa Bay area has induced leakage from the overlying surficial aquifer adversely effecting the water table and lake levels. Artificial recharge could reduce the impact of these effects. Four experiments were conducted to investigate possible recharge alternatives; sinkhole recharge, water-spreading, connector wells, and subsurface-tile drainage to a deep well. Experiments indicate that all four methods can be effective. However, the sink-hole recharge experiment moved the greatest volume of water into the Floridan aquifer. The drain-tile experiment indicated greatest potential for draining the surficial aquifer. Combinations of the four methods could be used where potential exists for downward movement of water and sufficient unsaturated aquifer for water storage. (Woodard-USGS)
W78-00189

GROUND WATER IN THE FRESNO AREA, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
K. S. Muir.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 964, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-59, June 1977. 22 p, 6 fig, 2 tab, 21 ref.

Descriptors: *Groundwater availability, *Aquifer characteristics, *Water utilization, *Water quality, *California, Withdrawal, Water yield, Groundwater recharge, Water level fluctuations, Hydrogeology, Petrology, Municipal water, Domestic water, Irrigation water.
Identifiers: *Fresno area(Calif).

The Fresno area of California uses about 140,000 acre-feet of ground water a year for municipal and domestic purposes. An average of 2,000,000 acre-feet of water a year is pumped for irrigation. Major sources of recharge are deep penetration of irrigation water (80 percent) and seepage from canals, rivers, and streams (15 percent). Ground water occurs under unconfined and confined conditions; most water is pumped from the unconfined, alluvial aquifer. Ground-water quality is generally suitable for domestic and irrigation uses, although hardness and concentrations of nitrates and dissolved solids are of local concern. Water levels in the unconfined aquifer declined about 25 feet in the period 1947-1976. Levels in the confined aquifer declined about 100 feet in the period 1954-1976. Increased reliance on ground water for irrigation during the drought period will accelerate water-level declines. (Woodard-USGS)
W78-00190

GROUND-WATER LEVELS IN THE UNITED STATES, 1972-74. NORTH-CENTRAL STATES.
Geological SSurvey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00191

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. SOUTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00192

SUMMARY GROUND-WATER RESOURCES OF LUZERNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
T. G. Newport.
Pennsylvania Geological Survey, Harrisburg, Fourth Series, Water Resources Report 40, 1977. 63 p, 10 fig, 1 plate, 5 tab, 21 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Well data, *Water quality, Water yield, Groundwater movement, Petrology, Hydrogeology, Surface-groundwater relationships, Groundwater recharge, Water supply, Pennsylvania.
Identifiers: Luzerne County(Pa).

The geologic units in Luzerne County, Pa., include the unconsolidated Quaternary deposits; the Pennsylvania Llewellyn and Pottsville Formations; the Mississippian Mauch Chunk and Pocono Formations; and the Devonian Catskill Formation, marine beds, and Hamilton Group. Ground water occurs largely in the pore spaces, secondary openings, and solution channels in the consolidated rocks. In the alluvium deposits along the Susquehanna River, yields of over 1,000 gpm have been reported from wells. The Llewellyn Formation, marine beds, and Hamilton Group are the poorest of the bedrock aquifers. Well yields range from less than 1 to 50 gpm and water is of poor quality. In the other bedrock aquifers, well yields range from 2 to 325 gpm, and most wells produce soft water of good quality. Well-water samples collected outside of the mined areas were of acceptable quality. Ground water in the vicinity of the coal mines is generaly high in iron and sulfate. There is no known overdraft of ground water anywhere in the county, except in the vicinity of active mines, where the water table is being lowered to facilitate mining. The locations of sources of pollution, such as sanitary landfills and septic tanks, are a major factor in the selection of well sites. The discharge from abandoned strip and deep mines is a major source of pollution. (Woodard-USGS)
W78-00193

EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE WESTERN SNAKE PLAIN AQUIFER, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00197

MUNICIPAL WATER SUPPLIES IN LEE COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, FL. Water Resources Div.
T. H. O'Donnell.
Open-file report 77-277, May 1977. 96 p, 30 fig, 23 tab, 17 ref.

Descriptors: *Municipal water, *Water supply, *Water utilization, *Water demand, *Withdrawal, Surface waters, Groundwater, Water quality, Aquifers, Drawdown, Evaluation, Hydrologic data, *Florida.
Identifiers: Lee County(Fla).

In 1974 the total pumpage for Lee County, Fla., municipal supplies reached 5,700 Mgal (million gallons annually), an increase of 54 percent over 1970 levels. Pumpage from individual sources included: Caloosahatchee River, 1,312 Mgal; water-table aquifer, 2,171 Mgal; the water-bearing zone in the Tamiami Formation, 340 Mgal; the water-bearing zone in the upper part of the Hawthorn Formation, 1,399 Mgal; the saline water zones in the lower part of the Hawthorn Formation and the Suwannee Limestone, 483 Mgal. Among the various sources, the water-table aquifer showed the greatest increase in municipal pumpage over 1970 levels (60 percent) while the saline zones in the lower part of the Hawthorn Formation and Suwannee Limestone showed the least (40 percent). Intensive pumpage from the water bearing zone in the upper part of the Hawthorn Formation has caused a progressive decline in water levels in wells tapping that zone. The quality of fresh ground water in areas unaffected by intrusion of saline water, generally meets all the recommended limits of the Environmental Protection Agency. The chemical treatment processes utilized by water plants in the county are generally effective in producing finished water that meets EPA preliminary drinking water standards. (Woodard-USGS)
W78-00198

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1976.
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00200

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00202

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1976.
Geological Survey, Lincoln, NE. Water Resources Div.

For primary bibliographic entry see Field 7C.
W78-00203

NATURE AND EXTENT OF GROUND-WATER-QUALITY CHANGES RESULTING FROM SOLID-WASTE DISPOSAL, MARION COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00205

EVALUATION OF GROUND-WATER QUALITY IN THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00206

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00210

FEASIBILITY STUDY FOR IRRIGATING THE TRIBAL FARM ON THE CROW CREEK RESERVATION, FORT THOMPSON, SOUTH DAKOTA,
Roubal (Dana Larson) and Associates, Pierre, SD.
For primary bibliographic entry see Field 3F.
W78-00216

GROUNDWATER IN THE SOUTHERN PART OF THE CESKOTREBOVSKA VRCHOVINA (HIGHLAND),
Ceskoslovenska Akaedmie Ved, Brno. Geograficky Ustav.
For primary bibliographic entry see Field 2F.
W78-00374

ACCELERATED SALT TRANSPORT METHOD FOR MANAGING GROUND WATER QUALITY,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00442

A HIERARCHY OF RESPONSE FUNCTIONS FOR GROUNDWATER MANAGEMENT,
Mekoroth Water Co., Tel-Aviv (Israel). Systems Engineering Dept.
Y. C. Dreizin, and Y. Y. Haimes.
Water Resources Research, Vol. 13, No. 1, p 78-86, February 1977. 5 fig, 4 tab, 20 ref. OWRT B-062-OHIO(3).

Descriptors: *Groundwater, *Management, *River basins, *Aquifers, *Linear programming, Pumping, Recharge, Streams, Stress, Ohio, Input-output analysis, Simulation analysis, Methodology, Behavior, Hydraulics, Mathematical models, Equations, Systems analysis.
Identifiers: Response functions, Decomposition approach, Superposition approach, Boundary conditions.

The physical system dealt with in this paper is a river basin with multiunit aquifers and interconnected streams. The problem is how to model this complex system and then to represent it in terms of its response to stress in the form of pumpage and recharge. The system responds to pumpage in two ways: as drawdown or as flow between streams and aquifers. A hierarchy of linear mathematical models for a large-scale physical system response to stress has been developed. For the system response, an explicit mathematical expression is used to couple the physical system with the formulation of a management model. The models developed herein have been successfully tested on a case study of the Fairfield-New Baltimore area at the lower part of the Great Miami River in southwestern Ohio. (Bell-Cornell)
W78-00444

SHAPES OF STEADY STATE PERCHED GROUNDWATER MOUNDS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2F.
W78-00446

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF THE URBAN ENVIRONMENT ON HEAVY RAINFALL DISTRIBUTION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-00091

HIGHWAY ICE AND SNOW REMOVAL AND DEICING SALT PROBLEMS AT LAKE TAHOE,
California State Dept. of Transportation, Sacramento.
For primary bibliographic entry see Field 5B.
W78-00261

PHYSICAL OCEANOGRAPHY OF DEEP-WATER DUMPSITE 106 FEBRUARY-MARCH, 1976,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 1A.
W78-00315

LONG-TERM EFFECTS OF REPEATED LOGGING ON AN APPALACHIAN STREAM,
Northeastern Forest Experiment Station, Parson, WV.
J. H. Patric, and G. M. Aubertin.
Journal of Forestry, Vol 75, No 8, p 492-494, August, 1977. 1 fig, 9 ref, 3 tab.

Descriptors: *Water quality, *Forest watersheds, *West Virginia, *Lumbering, Forest management, Surface waters, Streamflow, Streams, Turbidity, Roads, Appalachian Mountain Region, Forestry.

A watershed on the Fernow Experimental Forest (West Virginia) has been logged four times since the turn of the century. While little is known of how streams were affected by logging after 1901 or during World War II, the effect of diameter-limit cutting in 1958 and 1972 are well documented. Both cuts caused small increases in streamflow but had little effect on water quality by any criterion except turbidity, which was increased by poorly located and ill-managed logging roads. The evidence suggests that if responsible road practices are followed, continued diameter-limit cutting will not harm forest streams. (Witt-IPC)
W78-00376

SURVIVAL OF THREE GRASS SPECIES AFTER INUNDATION,
Rocky Mountain Forest and Range Experiment Station, Alburquerque, NM.
For primary bibliographic entry see Field 2I.
W78-00384

MAN'S IMPACT ON ESTUARINE SEDIMENTATION,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-00392

IMPLICATION OF RESOURCE DEVELOPMENT ON THE NORTH SLOPE OF ALASKA WITH REGARD TO WATER QUALITY ON THE SAGAVANIRKTOK RIVER,
Corvallis Environmental Research Lab., College, AK. Arctic Environmental Research Station.
For primary bibliographic entry see Field 5B.
W78-00420

4D. Watershed Protection

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT - WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2C.
W78-00068

THE INFLUENCE OF HUMAN ACTIVITY ON THE EXPORT OF PHOSPHORUS AND NITRATE FROM FALL CREEK,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00131

SEDIMENT-TRAP EFFICIENCY OF TORTUGAS ARROYO NEAR LAS CRUCES, NEW MEXICO, WATER YEARS 1963-1974,
Geological Survey, Albuquerque, NM. Water Resources Div.
D. E. Funderburg, and F. E. Roybal.

Descriptors: *Sediment control, *Reservoir silting, *Trap efficiency, *New Mexico, Dry beds, Thunderstorms, Runoff, Streamflow, Flow rates, Sediment yield, Particle size, Reservoir operation.
Identifiers: *Tortugas Arroyo(N Mex), Las Cruces(N Mex).

The U.S. Geological Survey, in cooperation with the U.S. Soil Conservation Service, began an investigation of sedimentation of Tortugas Floodwater Retarding Reservoir No. 1 on Tortugas Arroyo near Las Cruces, New Mexico, in 1963. This investigation was part of a nationwide investigation of the trap efficiency of detention reservoirs. Reservoir No. 1 is normally a dry reservoir and runoff from the 20.7 sq mi drainage area generally occurs from high-intensity summer thundershowers. The total outflow recorded for the period of record (July 3, 1963 to June 30, 1974) was 1,743 acre-feet, yielding 6,055 tons of sediment. Over 99 percent of the coarse sediments and a high percentage of the silts and clays were deposited in the reservoir before reaching the outflow pipe. The determined trap efficiency of Reservoir No. 1 was 96 percent for the period of record. (Woodard-USGS)
W78-00199

FLUVIAL SEDIMENT DATA FOR IOWA: SUSPENDED-SEDIMENT CONCENTRATIONS, LOADS AND SIZES: BED-MATERIAL SIZES: AND RESERVOIR SILTATION,
Geological Survey, Cheyenne, WY. Water Resources Div.; and Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 7C.
W78-00201

HYDROLOGY OF THE CREEPING SWAMP WATERSHED, NORTH CAROLINA, WITH REFERENCE TO POTENTIAL EFFECTS OF STREAM CHANNELIZATION,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00207

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00209

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR III.
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, CA.
For primary bibliographic entry see Field 5G.
W78-00260

EROSION AND SEDIMENT CONTROL TECHNOLOGY,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W78-00263

REVEGETATION AND EROSION CONTROL AT HEAVENLY VALLEY,
For primary bibliographic entry see Field 5G.
W78-00264

AREAWIDE WASTE TREATMENT AND EROSION CONTROL PLANNING,
For primary bibliographic entry see Field 5G.
W78-00265

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PLANNING CHEMICAL MONITORING PROGRAMS FOR INDUSTRIAL FACILITIES AND ELECTRIC POWER PLANTS,
Westinghouse Electric Corp., Pittsburgh, PA. Environmental Systems Dept.
H. K. Roffman.
In: Institute of Environmental Sciences 1977 Proceedings, April 25-27, 1977, Los Angeles, California, p 32-35, 4 tab.

Descriptors: *Monitoring, *Analytical techniques, *Environmental effects, *Sampling, *On-site data collections, Bioassay, Water pollution effects, Geochemistry, Air pollution, Industrial wastes, Chemical wastes, Trace elements, Waste water disposal.
Identifiers: Chemical monitoring programs.

A checklist of facts to be considered in the design and implementation of a chemical monitoring program for industrial installation, power plants, and mining operations is provided. The selection of program parameters, specific sampling techniques, sample preservation and preparation methods, and appropriate analytical methods is suggested before a chemical monitoring program is initiated. Major functions of a chemical monitoring program are outlined, including preparation of baseline studies, detection of impact trends, detection of pollution abatement equipment malfunction, identification of periods of major impact, and the collection of data for general use. Specific objectives to be met are described for each function of a chemical monitoring program. Sampling techniques for air, water, solids, and aquatic and terrestrial flora and fauna are described. Methods of sample preservation and preparation which insure sample integrity are described. (Schulz-FIRL)
W78-00015

EFFECTIVE MEASUREMENT OF CHLORINE RESIDUAL,
J. J. Morrow, and J. B. Martin.
Effluent and Water Treatment Journal, Vol. 17, No. 5, p 238-242, May, 1977. 3 fig, 1 tab, 9 ref.

Descriptors: *Chlorination, *Disinfection, *Automatic control, *Analytical techniques, *Monitoring, Colorimetry, Equipment, Industrial wastes, Municipal wastes, Water treatment, *Waste water treatment.
Identifiers: *Chlorine residuals.

Objectives and methods of chlorination and techniques for measuring chlorine residuals are reviewed. Various terms related to chlorination are defined, including: dosage, demand, residual, free chlorine residual, combined chlorine residual, total chlorine residual, available C12, and breakpoint chlorination. Measurement techniques described for chlorine residuals include the idometric, orthotolidine (OT), orthotolidine-arsenite (OTA), amperometric, diethyl-p-phenylene (DPD), leuco crystal violet (LCV), and stabilized neutral orthotolidine (SNORT) methods. Typical dosages, residual types, and residual levels are given for a variety of municipal and industrial situations in which chlorination is indicated, including disinfection of raw water, control of organic growths, control of bacteria, and chemical removal/oxidation. The choice of chlorine gas dispensation and chlorine residual control are described. (Schulz-FIRL)
W78-00017

COOLING-WATER CALCULATIONS,
Air Products and Chemicals, Inc., Allentown, PA.
For primary bibliographic entry see Field 5B.
W78-00064

DETERMINATION OF TRACE QUANTITIES OF ORGANIC SUBSTANCES FROM INDUSTRIAL WASTES IN WASTE WATERS (OPREDELENIE SLEDOV ORGANICHESKIKH VESHCHESTV-PROMYSHLENNYKH OTKHODOV V STOCHNYKH VODAKH),
V. Kubelka, J. Mitera, J. Novak, and J. Mostecky.
Technologie Vody, Vol F, No 20, p 85-119, 1976. 14 fig, 2 tab, 57 ref.

Descriptors: *Analytical techniques, *Water analysis, *Organic wastes, *Gas chromatography, *Mass spectrometry, Chemical analysis, Path of pollutants, Organic compounds, Volatility, Chemical wastes, Industrial wastes, Waste water disposal, *Pollutant identification.

Analytical methods involving gas chromatography in combination with mass spectrometry for the identification of trace quantities of organic compounds in water are reviewed. The applicability of a particular technique is suggested as dependent on the structural and physico-chemical properties of the substance. Two basic techniques for identifying water-borne pollutants having a wide range of boiling points are described. In the first process a stream of inert gas is used to strip volatile compounds from the water. The compounds are then trapped in a freezing loop at the temperature of liquid nitrogen. The mixture is transferred from the trap to the gas chromatograph-mass spectrometer by rapid heating of the loop to 200C. The detection for this method with substances having a boiling point greater than 140C is approximately 0.1 ppb. For the second process, organic pollutants in water are sorbed on a styrene-divinylbenzene copolymer and washed with a solvent. Tests with waters containing xylene, cresol, and quinoline indicated that extended sorption periods and/or increases in the accumulated amount of sorbent produced analytical errors. Although the reliability of the method is also dependent on the mutual action of contaminants during sorption, the method is suggested as accurate for measuring concentrations in units as low as ppb for low volatile compounds. (Schulz-FIRL)
W78-00065

PASSIVE REMOTE SENSING OF PHYTOPLANKTON VIA CHLOROPHYLL ALPHA FLORESCENCE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
For primary bibliographic entry see Field 7B.
W78-00090

PESTICIDE POLLUTION STUDIES.
Public Health Service, Atlanta, GA. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5B.
W78-00098

CHARACTERISTICS OF WASTE WATERS FROM PACKINGHOUSES,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-00100

WASTEWATERS DISCHARGED FROM AN ABATTOIR,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W78-00108

WASTES FROM POULTRY DRESSING ESTABLISHMENTS,
Public Health Service, Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-00112

TWO INDUSTRIAL WASTE PROBLEMS AT NEW HAVEN, CONN.,
Hartford Sewage Treatment Plant, CT.
K. E. Foote.
Sewage and Industrial Wastes, Vol. 24, No. 10, p. 1305, Oct 1952.

Descriptors: *Clogging, *Food processing industry, *Oil pollution, *Waste identification, Industrial wastes, Sewage treatment, Treatment facilities, Waste water treatment, Sewage, Connecticut, Pollutant identification.
Identifiers: *Meat packing wastes, *Pork processing, Grease pollution, Hartford(Conn).

A pork slaughtering and processig plant located on the shore of a harbor was connected with the municipal sewers. The waste from this plant is grease, hog hairs or bristles, hog worms, and hog toenails. Grease is the main problem in the treatment plant and specific plant locations and problems involving combinations with hair wastes are discussed. The processing plant has installed a pumping station, settling and skinning tanks, fine bar screens and mesh screens on the floor drains. (Prodehl - EPA, Corvallis)
W78-00114

POULTRY DRESSING WASTE,
Indiana State Board of Health Indianapolis.
For primary bibliographic entry see Field 5D.
W78-00115

PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-00120

INPUTS OF CHLORINATED BENZENES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00137

TECHNIQUES FOR COLLECTING DDT AND PCB IN AERIAL FALLOUT,
Southern California Coastal Water Research Project, El Segundo.
T. C. Heesen, and R. A. Johnson.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 39-41, 1977. 2 tab.

Descriptors: *Water pollution sources, *DDT, *Pesticides, *Analytical techniques, *Fallout, Air pollution, California Continental shelf, Resources development, Environmental effects, Polychlorinated biphenyls.
Identifiers: *Outer Continental Shelf, Resources management, Southern California, Vapor phase.

An air sampler to measure the partitioning of chlorinated hydrocarbons between the particulate and vapor phases was developed. In recent surveys a dry-ice-cooled collector was employed. There was good agreement between the total DDT and 1254 PCB values obtained with the dry-ice sampler and those obtained with the regular sampler, the oiled plate. Thus, the measurements obtained in past fallout surveys appear to be reliable and revolatilization of these components from the glass plate collectors does not appear to be occurring to any significant degree. At all stations measured, the ratio of volatile to particulate components is higher for p,p'-DDE and p,p'-DDT. This is to be expected since p,p'-DDE is more volatile than p,p'DDT. The ratios also indicate that most of the chlorinated hydrocarbons measured are in the vapor phase as they are trapped on the foam sample. (See also W78-00134) (Sinha-OEIS)
W78-00138

AERIAL FALLOUT OF METALS DURING A BRUSHFIRE,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T-K. Jan.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 43-47, 1977. 2 fig, 2 tab, 2 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Chlorinated hydrocarbon pesticides, *Fallout, California, Continental Shelf, Resources development, Environmental effects.
Identifiers: *Outer Continental Shelf, Southern California, Resources management.

The data indicate that aerial fallout probably is a relatively minor source of most metals to the coastal waters off highly populated sections of southern California. With the exception of lead, which is used in antiknock additives in gasoline and primarily enters the atmosphere via automobile emissions, aerial inputs of the toxic metals are one to two orders of magnitude below those from municipal wastewater. The importance of the aerial fallout of these contaminants would not be much altered if major forest fires burned under desert wind conditions the year around. Thus, fires do not appear to be significant sources of trace metals or chlorinated hydrocarbons to the coastal marine ecosystem. (See also W78-00134) (Sinha-OEIS)
W78-00139

MEASUREMENTS OF SUBTHERMOCLINE CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
T. Hendricks.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 63-70, 1977. 3 fig, 1 tab.

Descriptors: *Water pollution sources, *Currents(Water), *Measurement, *Pollutant identification, Dispersion, Variability, California, Continental shelf, Resources development, Environmental effects.
Identifiers: *Outer continental shelf, *Southern California, Subthermocline currents, Alongshore flow, Resources management.

Measurements made at a number of sites over the nearshore shelf area off southern California show similarities in the currents: The mean of the speeds at all sites at a depth of 41 m in 56 m of water was 9.8 cm/sec; the mean speed for each site differed from the area-wide value by less than 20%. The predominant direction of flow is alongshore--approximately parallel to the local contours of constant depth. The similarity in statistical properties supports on of the assumptions in the dispersion model and indicates that a single calculation may be applicable to a number of areas. Some differences between sites were, however, also evident: Although the mean speed for a particular site did not greatly differ from the area-side average, there appeared to be definite differences among sites. Tidal currents varied significantly from site to site, not only in the speed and predominant direction of flow, but also in the ranking of importance of the various tidal harmonics. (See also W78-00134) (Sinha - OEIS)
W78-00142

MERCURY IN SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse Jr.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 83-89, 1977. 3 fig, 2 tab, 2 ref.

Descriptors: *Water pollution sources, *Mercury, *Sediments, *Outfall sewers, *Pollutant identification, California, Continental shelf, Resources development, Environmental effects.
Identifiers: *Outer continental shelf, Southern California, Palos Verdes shelf.

Because of high levels of heavy metals found in sediments near Los Angeles County Sanitation Districts outfall system off Whites Point in 1970, detailed survey of the Palos Verdes shelf were conducted in 1972 and 1973. The results of the 1975 survey for total mercury in surface sediments in this same area are given. Results show that levels of total mercury in the surface sediments on the Palos Verdes shelf dropped slightly between 1972 and 1975, although the exact cause of this decrease is still uncertain. Organic mercury constituting up to 2.3% of the total mercury, appears to have been concentrated in the regions where total mercury values were highest, except for two stations near the outfalls, where organic values dropped. Data on the relationship between total volatile solids and total mercury showed that mercury in the surface sediments is probably trapped in the refractory component and is largely unavailable to the benthic animals. (See also W78-00134) (Sinha - OEIS)
W78-00145

VIRUSES AND BACTERIA IN COASTAL WATERS AND SHELLFISH,
Southern California Coastal Water Research Project, El Segundo.
R. L. Morris, A. J. Mearns, and J. Kim.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 97-103, 1977. 4 tab, 3 ref.

Descriptors: *Water pollution sources, *Viruses, *Bacteria, *Shellfish, *Municipal wastes, *Pollutant identification, Outfall sewers, Coliforms, Mussels, California, Continental shelf, Environmental effects.
Identifiers: *Outer continental shelf, Southern California, Resources management.

The objectives of research this year were to (1) determine the concentrations and rates at which enteric viruses enter the sea via municipal wastewater effluents, (2) measure concentrations of viruses in the digestive glands of mussels suspended from buoys near outfalls, and (3) determine the relationship between virus and coliform concentrations in mussels and seawater. The most important finding to date is that viruses can be detected in shellfish near outfalls and do appear to survive relatively longer in mussels than do total coliforms. The relative time required for 90% of the viruses in seawater to be inactivated was estimated to be three to six times as long as that for total coliform. (See also W78-00134) (Sinha - OEIS)
W78-00147

MERCURY IN MUSSELS,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse Jr., and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 105-109, 1977. 3 fig, 2 tab, 1 ref.

Descriptors: *Mercury, *Mussels, *Bioindicators, *Water pollution, *Pollutant identification, *Heavy metals, California, Continental shelf, Environmental effects, Water pollution sources.
Identifiers: *Outer continental shelf, Southern California Bight, Mytilus californianus.

Experiments demonstrate the value of Mytilus californianus as an environmental bioindicator. Studies showed that, of the three tissues analyzed, digestive gland contained the highest levels of mercury and experiences the fastest uptake. Adductor muscle and gonadal tissues had markedly slower accumulation rates. These results tend to support the idea that the digestive gland analyses reflect environmental mercury levels, but the adductor muscle and gonadal tissues are more accurate indicators of the extent of physiological incorporation. The digestive gland mercury concentrations appear to reflect relatively short-term changes in the environment. The gradual accumulation of mercury in adductor muscle and gonadal tissues, however, appears to result primarily from a chronic exposure to mercury. (See also W78-00134) (Sinha - OEIS)
W78-00148

MERCURY IN BENTHIC ANIMALS,
Southern California Coastal Water Research Project, El Segundo.
R. P. Eganhouse Jr., and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 111-115, 1977. 3 fig, 2 tab, 1 ref.

Descriptors: *Mercury, *Benthos, *Growth, *Water pollution sources, *Sediments, Outfall sewers, California, Continental shelf, Environmental effects.
Identifiers: *Outer continental shelf, Southern California, Microstomus pacificus, Organomercurials.

The object of this study was to determine if uptake of mercury had occurred in benthic animals from the Palos Verdes region. The survey involved collection of six different species totaling 96 specimens from trawl stations. In general, the levels of total mercury appeared to be low and did not reflect the high concentrations found in Palos Verdes sediments. Good correlations were found between concentrations to total and organic mercury in various tissues of Dover sole, Microstomus pacificus. The data showed a significant, although somewhat scattered, relationship between both total and organic mercury and the common measures of growth. An analysis of the data with respect to the proximity to the outfall failed to reveal any distinct distribution patterns. This implies that the tissue mercury content of these benthic animals is not governed significantly by the levels of mercury in the sediments. The data lead one to believe that the mercury contained in the Palos Verdes sediments is largely unavailable

to benthic animals that are found there. (See also W78-00134) (Sinha - OEIS)
W78-00149

METALS IN SCALLOPS,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T-K. Jan.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 117-121, 1977. 2 tab, 4 ref.

Descriptors: *Water pollution sources, *Metals, *Shellfish, *Municipal wastes, Outfall sewers, California, Continental Shelf, Environmental effects.
Identifiers: *Outer Continental Shelf, Southern California, Hinites multirugosus.

Los Angeles County's submarine discharge of municipal wastewater off the Palos Verdes Peninsula is the single largest man-related source of trace metals to the marine ecosystem off southern California. Bottom sediments around this submarine outfall system are highly contaminated by a number of trace metals. Abnormal levels of seven metals are found in three tissues of filter-feeding rock scallops (Hinites multirugosus) that were collected in the discharge zone and thus had been exposed to suspended wastewater particulates. Although the results of this study point to a potential problem from waste materials discharged via municipal outfalls, it is not known yet the degree to which these elevated metals levels affect the rock scallop or its predators (including man). Standards for these metals in seafood have not yet been established. Toxicity information that relates abnormal tissue concentrations with adverse biological effects is needed and results from field studies, such as this one, is a necessary first step in conducting relevant toxicity tests. (See also W78-00134) (Sinha - OEIS)
W78-00150

CHEMICAL STUDIES OF OFFSHORE OIL PLATFORMS,
Southern California Coastal Water Research Project, El Segundo.
D. McDermott-Ehrlish, and G. A. Alexander.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 129-135, 1977. 1 fig, 5 tab, 2 ref.

Descriptors: *Oil pollution, Offshore platforms, *Sediments, *Metals, Vanadium, Water pollution sources, Environmental effects, Continental shelf, California, Resources development.
Identifiers: *Outer continental shelf, Southern California, Resources management, Sebastes auriculatus, Sebastes vexillaris, Cancer anthonyi.

As part of the effort to determine if drilling and oil production operations had an effect on organisms found around two oil platforms, chemical analyses of the nearby sediments and of the tissues of several marine animals found in the area were made. Levels of copper, zinc, hexane extractable materials, and volatile solids in sediments around the oil platforms were similar to average coastal background levels and were well below levels observed in sediments contaminated by municipal wastewater outfalls. The petroleum hydrocarbon content of all sediment samples collected was higher than values observed in areas with no natural seeps. The gas chromatographic fingerprints for all samples were indicative of highly weathered oil, indicating no recent contamination of the sediments. No statistically significant differences in metals were observed for yellow rock crabs collected from the oil platforms and control sites and no detectable amount of petroleum hydrocarbons were observed in any of the animals analyzed. (See also W78-00134) (Singa - OEIS)
W78-00152

COMPARISON OF FIN EROSION DISEASE: LOS ANGELES AND SEATTLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00154

RAPID ANALYSIS OF PACKINGHOUSE WASTES,
Morrell (John) and Co., Ottumwa, IA. Research Labs.
K. A. Hirlinger, and C. E. Gross.
Sewage and Industrial Wastes, Vol 25, No 8, p 958-962, August, 1953. 1 fig, 6 tab, 7 ref.

Descriptors: *Water analysis, *Oil wastes, *Food processing industry, Analysis, Industrial wastes, *Waste identification, *Pollutant identification, Oxygen demand.
Identifiers: *Meat packing wastes, Oxygen demand analysis, Grease analysis.

Data sufficiently reliable for good plant control and for estimating the probable effect of discharged wastes on the receiving stream can be obtained the same day the sample is taken. Satisfactory results can be had on a routine basis using the rapid methods described. Data from the Kjeldahl nitrogen analysis and the Smith-Sanderson grease analysis will give a reliable check on nitrogen and grease losses from the plant. The same data can be used to calculate oxygen demand. Use of these data (which can easily be confirmed by the reflux chromate oxygen consumed analysis) will give the basis for a constant estimate of the probable effect of sewage on the oxygen resources of the receiving stream. All of this information will be available rapidly enough to permit immediate corrective action whenever trouble develops. (Prodehl-EPA, Corvallis)
W78-00168

STATISTICAL EVALUATION OF PACKINGHOUSE WASTE DATA,
Environmental Health Center, Oak Ridge, TN.
C. A. Straub.
In: Proceedings of the 8th Industrial Waste Conference, Purdue University, Lafayette, Indiana, Engr. Ext. Ser. No. 83, p 222-239, May 1953. 16 fig, 22 ref.

Descriptors: *Statistics, *Food processing industry, Biochemical oxygen demand, Data collections, Industrial wastes, Oil wastes, Waste identification, Waste water treatment.
Identifiers: *Meat packing wastes, Statistical evaluation.

In an attempt to group published data from many plants on characteristics of packinghouse and slaughterhouse wastes, and to obtain a more reliable estimate of the normal range in values that might be expected in volume, biochemical oxygen demand, suspended solids, total nitrogen, grease and population equivalent of the wastes, these data are analyzed by statistical methods. By means of standard graphical and analytical statistical procedures used, mean values for many of the packing waste parameters and variation in the data are presented. In general, log probability plots of these data are normal. The analytical procedures employed bring out the fact that packinghouse and slaughterhouse data may be highly variable, resulting from the variability in plant killing and recovery practices, numbers and kinds of animals slaughtered, and waste collection or treatment facilities available, etc. (Prodehl-EPA, Corvallis)
W78-00169

POULTRY PROCESSOR MEETS CHALLENGE OF INCREASED WASTE LOAD,
Gold Kist, Inc., Atlanta, GA.
W. J. Camp.
Industrial Wastes, September 1969, p 24-26. Presented at the 18th Southern Water Resources and Pollution Control Conference, North Carolina, April 9, 1969.

Descriptors: *Food processing industry, *Waste identification, *Waste water treatment, Activated sludge, Aerobic treatment, Design data, Flow rates, Industrial wastes, Standards, *Biochemical oxygen demand.
Identifiers: *Poultry processing wastes, Extend aeration, In-plant waste control, By-product recovery.

Gold Kist Poultry presently operates six poultry plants in four states with a combined hourly capacity of 67,000 birds and processes approximately 2.5 million birds/week. Waste loading per 1000 birds in 1965 was 63.3 lb BOD, 47 lb SS, and 7570 lb BOD/day. The Florida State Board of Health set the effluent standards for one plant at BOD less than 10 mg/l, no settleable solids, no grease, MPN not to exceed 500, and residual chlorine should be not less than 0.5 mg/l after 30 minutes detention. In-plant waste control and by-product recovery such as 64% protein feed from offal and feathers, were designed extensively in the plant. The waste treatment plant consists of a large extended aeration system based on influent design data of 50,000 birds per day, 10 gal. water per bird, and 52 lb. BOD per 1000 birds. Each unit process is discussed. The plant is operating with the following results: 7.6 gal/water bird, 39 lb BOD/1000 birds, and final effluent at 99 - 100% BOD removal per day. (Prodehl - EPA, Corvallis)
W78-00180

ANAEROBIC DIGESTION OF PACKING PLANT WASTES,
Hormel (George A.) and Co., Austin, MN.
For primary bibliographic entry see Field 5D.
W78-00181

STERLING POULTRY PIONEERS PLANT WATER RECLAMATION,
Sterling Poultry Processing Corp., Oakland, MD.
For primary bibliographic entry see Field 5D.
W78-00183

ESTIMATING BIOAVAILABILITY OF SEDIMENT-BOUND TRACE METALS WITH CHEMICAL EXTRACTANTS,
Geological Surve, Menlo Park, CA. Water Resources Div.
S. N. Luoma, and E. A. Jenne.
In: Trace Substances in Environmental Health-X: Symposium held at University of Missouri, Columbia, Missouri, June 8-10, 1976, p 343-351, 1976. 3 tab, 12 ref.

Descriptors: *Heavy metals, *Sediments, Estuarine environment, *Clams, *Food chains, Laboratory tests, Cadmium, Cobalt, Zinc, *Trace elements, Pollutant identification.
Identifiers: *Macoma balthica, *Silver, *Trace metals.

Chemical extraction from laboratory prepared sediments of the biologically available fraction of Ag, Cd, Co and Zn is best accomplished by complexation and/or mild dissolution procedures. Deposit-feeding clams (Macoma balthica) were exposed in separate experiments to radio-tracers of the 4 elements bound to 6 physicochemically types of sediment (organic detritus, iron oxides, organically coated iron oxides, manganese oxides, inorganic carbonates and biogenic carbonates). At the end of each experiment, tracer concentrations in clam soft tissues were compared with the concentration of tracer chemically extracted from experimental sediments by several geochemical techniques. Because Ag was highly available from all types of sediment, uptake by the clam correlated well with most indicators of non-crystalline Ag concentrations. However, uptake of Cd, Co and Zn was strongly influenced by physicochemical form. Concentrations of Cd or Co accumulated

by the clam from the different sediments correlated significantly only with the concentration of the metal extracted by 70% ethanol or 1 N ammonium acetate. Bioaccumulation of Zn was most closely estimated by 1 N ammonium acetate extraction of 1 N NaOH plus EDTA extraction of the different sediments. Concentrations of Cd, Co and Zn extracted by weak acids (0.1 N HCl: 25% acetic acid), reducing agents (1 N hydroxylamine hydrochloride in 0.01 N HNO3; sodium dithionite plus citrate) or oxidizing agents (3% H2O2 plus citrate) correlated poorly with bioaccumulation. (Woodard-USGS)
W78-00196

MUNICIPAL WATER SUPPLIES IN LEE COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00198

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1976.
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00200

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00202

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1976.
Geological Survey, Lincoln, NE. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00203

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00210

NATIONAL WATER QUALITY INVENTORY. 1974 REPORT TO THE CONGRESS. VOLUME I.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 627, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-440/9-74-001, 1974, 305 p. EPA/440/9-74/001.

Descriptors: *Rivers, *Water quality, *Baseline studies, Water quality control, Water pollution, Watersheds(Basins), Mississippi River, Missouri River, Ohio River, Tennessee River, Columbia River, Hudson River, Delaware River, Potomac River, Rio Grande River, Colorado River, Sacramento River, Lake Michigan, Phosphorus, Oxygen demand, Nitrogen, Eutrophication, Bacteria, Nutrients, Algae, Tributaries.
Identifiers: Snake River, Willamette River, Detroit area(Mich), Susquehanna River, Alabama River, Coosa River, Arkansas River, Red River, Brazos River, Yukon River, Boston harbor(Mass), Chicago area(Ill), Los Angeles Harbor(Cal).

This first systematic inquiry of water quality in U.S. waterways was prepared by the Environmental Protection Agency pursuant to the 1972 Federal Water Pollution Control Act. It is organized into three sections: water quality status, point source inventory, and water quality goals. The first section concentrates on the largest rivers, and waters near the largest cities. Tables and figures are presented showing degree of pollution, water temperature, stream flow, turbidity, color, dissolved oxygen, biochemical oxygen demand, pH, alkalinity, filtrable and nonfiltrable residue, organic nitrogen, ammonia, nitrite plus nitrate, phosphate, hardness, and coliforms. Rivers covered statistically only are: Hudson, Delaware, Susquehanna, Potomac, Alabama-Coosa, Arkansas, Red, Brazos, Rio Grande, Colorado, Sacramento, Yudon, Boston harbor, Chicago metropolitan, Detroit metropolitan, and Los Angeles harbor. Eight rivers are covered in greater detail: Mississippi, Missouri, Ohio, Tennessee, Detroit area, Columbia, Snake, and Willamette. The second section gives summary statistical information on point sources of pollution, including permit applications, municipal discharges by state, and industrial discharges by industry. Section Three describes planning goals and gives brief, descriptive assessments of water quality problems by state. The report's general conclusion is that pollutants receiving the most widespread controls (such as oxygen-demanding loads and bacteria) are improving, but eutrophication-associated nutrients (nitrogen and phosphorus) are worsening. (Lynch-Wisconsin)
W78-00214

SUITABILITY OF SHELLFISH FOR PROCESSING: 2. SEASONAL CHANGES IN HEAVY METAL CONTENT OF BABY CLAM, (IN KOREAN)
Pusan Fisheries Coll. (Republic of Korea). Dept. of Food Science and Technology.
E.-H. Lee, B-H. Ryu, and S.-T. Yang.
Bull Korean Fish Soc 8(2), p 85-89, 1975.

Descriptors: Shellfish, Seasonal, *Heavy metals, *Clams, *Pollutant identification, Mercury, Lead, Copper, Cadmium, Water quality standards.
Identifiers: Korea, Tapes-japonica.

Heavy metal contents were determined in baby clams (Tapes japonica) from March 1973-April 1974 in Depori, Samchunpo, Korea. Monthly changes of Hg, Pb, Cu and Cd in the samples were irregular but as a whole, the content of Hg, Pb, Cu and Cd were relatively high in the summer. The content of total Hg, Pb, Cu and Cd in the samples ranged from 0.003-0.038 ppm, 0.096-0.921 ppm, 0.023-0.139 ppm and 0.009-0.038 ppm, respectively. In the consideration of heavy metal content, it was concluded that baby clams in Depori, Samchunpo, Korea are suitable for processing.--Copyright 1976, Biological Abstracts, Inc.
W78-00225

IMPACT OF ACID PRECIPITATION ON FRESHWATER ECOSYSTEMS IN NORWAY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W78-00226

A COMPARATIVE SURVEY OF PETROLEUM HYDROCARBONS IN LAKE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00233

POTAMOLOGICAL STUDIES ON THE RIVER INA OF THE RIVER SYSTEM OF YODO: II, (IN JAPANESE),
Osaka Kyoiku Univ. (Japan). Oceanography Lab.
For primary bibliographic entry see Field 5B.
W78-00234

COMPARATIVE EVALUATION OF WATER QUALITY ON THE ST. JOSEPH RIVER (MICHIGAN AND INDIANA, U.S.A.) BY THREE METHODS OF ALGAL ANALYSIS,
California Academy of Sciences, San Francisco. Dept. of Zoology.
S. L. Vanlankingham.
Hydrobiologia, Vol. 48, No. 2, p. 145-173, 1976. 12 fig, 6 tab, 28 ref.

Descriptors: *Water quality, *Analytical techniques, Evaluation, Chemical analysis, Standing crops, Seasonal, Coliforms, Algae, Nutrients, *Michigan, *Indiana, Rivers, *Pollutant identification.
Identifiers: *St. Joseph River(Mich - Indiana), *Palmer's Index, Microalgal spectral analysis.

A study was made to determine the water quality of the St. Joseph River in Michigan and Indiana and to designate particular problem sites. In addition specific information was sought on the effects of seasonal changes upon the algal flora and water quality of the river. Samples from 28 stations along the river were chemically, physically and biologically analyzed. The latter analysis employed three methods: (1) standing crop (in units per ml); (2) Palmer's index (PI); and (3) microalgal spectral analysis (MSA) which utilized saprobien and dissolved inorganic nutrients with additional physical, chemical and ecological spectra. The results showed no evidence of water quality improvement at the mouth of St. Joseph River since the 1968 Water Resources Commission report. Both nutrient and saprobien spectra of MSA showed that water quality was poorer at station 29 (near the river mouth) in December 1972 than at any other station where microalgal analysis was performed. This stands in contrast with a low Palmer's Index for this station. However when PI is considered in conjection with coliform and fecal coliform bacteria and such parameters as SOP, TP, NH3, DO, BOD, SS and NO3, degradation in water quality is much more evident. This implies that neither the standing crop nor the generic PI may be reliable measures of nutrients in colder, less productive times of the year and that MSA correlates better with the various physical and chemical parameters and therefore is a more reliable method of evaluating dissolved organic nutrients. (Harris-Wisconsin)
W78-00236

A QUANTITATIVE SAMPLING METHOD FOR HYDRILLA-INHABITING MACROINVERTEBRATES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-00245

A BIOASSAY USING COMMON DUCKWEED TO EVALUATE THE RELEASE OF AVAILABLE PHOSPHORUS FROM POND SEDIMENTS,
New Jersey Dept. of Transportation, Trenton. Bureau of Environmental Analysis.
A. Fekete, D. N. Riemer, and H. L. Motto.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 19-25. 11 fig, 4 tab, 14 ref.

Descriptors: *Chemical analysis, *Bioassay, *Phosphorus, *Sediments, Nutrients, Ponds, Growth rates, Aquatic plants, Plant growth, Eutrophication, Nutrient requirements, Essential nutrients, Aerobic conditions, Anaerobic conditions.
Identifiers: *Duckweed, Lemna minor.

Common duckweed (Lemna minor) was used to determine the availability of phosphorus in pond sediments under aerobic and anaerobic conditions. Preliminary tests showed the minimum critical value of P concentration in the plant tissue associated with maximum growth to be .15-.22%. A P concentration of 0.031 mg perliter in a test nutrient solution was the critical concentration above

which growth was most pronounced. Three bottom sediment samples from man-made impoundments at Rutgers University's research center in Adelphia, N.J. were selected to represent low, medium, and high levels of absorbed P. Nutrient solutions were added to the sediments, which were then incubated. Jars containing nutrient solution but no sediment were designated blanks. In the sediment tests under both aerobic and anaerobic conditions greatest frond number and size, root length, dry weight, and P content of the plants were directly related to higher P concentrations in the sediments. The magnitude of the results of the anaerobic tests was much greater than the aerobic, however, implying that a greater release of available P occurred under anaerobic conditions. Chemical analysis of the total P released from the sediments demonstrated that this method was not useful in predicting the amount of P available to the duckweed, and showed the superiority of the bioassay. (Lynch-Wisconsin)
W78-00246

WASTE WATER SAMPLING SYSTEM,
J. A. Perry.
U.S. Patent No. 4,024,766, 9 p, 12 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1437, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution control, *Sampling, Water sampling, Monitoring, Control systems, Measurement, Equipment, Pollutant identification.

The object of this invention is to provide an improved waste water sampling system for industrial plants which takes precise and representative samples from the effluent. In a force main sampling chamber the liquid is always maintained above a predetermined level so as to insure that a sample can always be drawn. An improved seal leg construction tends to cause the waste water flowing past it to be maintained in a state which is representative of all of the waste water flowing through the system. A flow loop has a meter so oriented that it gives an extremely accurate measurement of the amount of flow passing through the system. The waste water monitoring system has an improved control circuit which will terminate operation of the sampling cycle in the event that a sample is not taken within a predetermined time period after the sampling cycle has been initated, to thereby permit additional sampling cycles to be initiated. (Sinha - OEIS)
W78-00301

RECENT ANALYSES OF COPPER, CADMIUM AND LEAD AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. R. Kester, K. A. Hausknecht, and R. C. Hittinger.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 3, Contaminent Inputs and Chemical Characteristics - Appendix, p 543-546, June 1977. 1 tab, 1 ref. NOAA-04-6-148-44050.

Descriptors: *Waste disposal, Water pollution, *Heavy metals, *Baseline studies, *Environmental effects, Copper, Cadmium, Lead, *Pollutant identification.
Identifiers: *Outer continental shelf, *Ocean dumping.

During 1976 additional research was carried out on the concentrations of some of the transition and heavy metals at DWD-106. Analyses of copper, cadmium, and lead were obtained from a series of samples collected aboard R/V KNORR cruise 58, on 27 August - 7 September 1976 using 8 liter Niskin samplers. A table lists the concentrations of metals from three stations in the DWD-106 region which represent 'background' values. These stations were not in the immediate influence of a test dump of waste. The cadmium concentrations are an order of magnitude less than those reported in the May 1974 and February 1976 studies. The lead values are a factor of 20 less than the earlier studies and the copper concentrations approximately one-half the values reported in the earlier work. With refinements in the techniques for collecting, processing, and analyzing seawater samples for transition and heavy metals, it has been possible to show that the background concentrations at DWD-106 are similar to those observed in other oceanic regions. (Sinha - OEIS)
W78-00329

ATMOSPHERIC VANADIUM TRANSPORT TO THE OCEAN,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00336

TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W78-00369

DETERMINATION OF FREE SULFUR DIOXIDE IN SPENT SULFITE LIQUOR AND PAPER MILL EFFLUENTS USING A SELECTIVE ELECTRODE (DETERMINAZIONE DI ANIDRIDE SOLFOROSA LIBERA NEL LISCIVO SOLFITICO ESAUSTO ED IN ACQUE DI SCARICO DE CARTIERA MEDIANTE ELETTRODO SELETTIVO),
Istituto di Fisica dell'Atmosfera, Bologna (Italy).
S. Fuzzi.
Industria della Carta, Vol 15, No 3, p 69-72, March, 1977. 3 fig, 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Water analysis, *Electrodes, *Sulfite liquors, Wastes, Industrial wastes, Water pollution sources, Sulfur compounds, Effluents, Pulp and paper industry, Potentiometers, Effluents, *Pollutant identification.
Identifiers: *Sulfur dioxide, Spent sulfite liquor.

The potentiometric measurement of free sulfur dioxide in spent sulfite liquor and paper mill effluents by means of a sulfur dioxide-selective electrode was studied. The data obtained from such potentiometric measurements and from iodometric titrations (corrected for interfering substances) were compared, showing the two techniques to give results which are in good agreement within the limits of experimental error. Potentiometric measurement of free sulfur dioxide in spent sulfite liquor must be performed after dilution of the sample in order for the electrode measuring range to be appropriate. The dilution of spent sulfite liquor converts some loosely bound sulfur dioxide to free sulfur dioxide, leading to high results. (Speckhard-IPC)
W78-00373

CHARACTERIZING EFFLUENT VARIABILITY FROM PAPER INDUSTRY WASTEWATER TREATMENT PROCESSES EMPLOYING BIOLOGICAL OXIDATION,
Tufts Univ., Medford, MA.
For primary bibliographic entry see Field 5B.
W78-00378

LABORATORY DETERMINATION OF ACUTE AND SUBLETHAL TOXICITIES OF INORGANIC CHLORAMINES TO EARLY LIFE STAGES OF COHO SALMON (ONCORHYNCHUS KISUTCH),
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-00400

WATER QUALITY CRITERIA RESEARCH OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY, PROCEEDINGS OF AN EPA SPONSORED SYMPOSIUM ON MARINE, ESTUARINE AND FRESHWATER QUALITY, PRESENTED AT THE 26TH ANNUAL MEETING OF THE AIBS, AUGUST 1975.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-00408

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-00410

CRITERIA FOR MARINE MICROBIOTA,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-00412

MONITORING THE ENVIRONMENT FOR ECOLOGICAL CHANGE,
Washington Univ., Seattle. Dept. of Biostatistics.
For primary bibliographic entry see Field 5B.
W78-00422

AQUATIC INSECTS AS BIOLOGICAL MONITORS OF HEAVY METAL POLLUTION,
Iranian Dept. of the Environment, Tehran.
For primary bibliographic entry see Field 5B.
W78-00426

CONTINUOUS FLOW CULTURE OF BENTHIC DIATOMS AND ITS APPLICATION TO BIOASSAY,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. K. Lin.
Journal of Phycology, Vol. 13, p 267-271, 1977. 3 fig, 2 tab, 22 ref.

Descriptors: *Bioassay, *Diatoms, *Productivity, *Cultures, *Continuous flow, Research and development, Toxicity, Copper, Filters, Growth stages, Algae, Plankton, Benthic flora, Design, Methodology, Membranes, Pollutant identification.
Identifiers: Artificial substrate, Colonization, Agar substrate, Diatom, Ecology.

Diatom colonization showed large variation and low reproducibility on Millipore membranes of different materials and pore sizes. Solidified agar substrate supported stable and reproducible colonization and was nutritionally neutral, translucent, homogeneous and easy to sample. The diatom colonization process on agar substrate involved four growth phases: (1) pioneer, (2) exponential, (3) steady state, and (4) vanishing. The culture system was also used in bioassay, testing the toxic effect of copper on the growth of benthic diatoms. The proposed method provided a useful means for studying autecology of benthic diatoms as well as for bioassay work. (Klein)
W78-00427

WARNING TEST TO DETECT THE PRESENCE OF HIGHLY TOXIC CONCENTRATIONS OF POISONS IN WATER,
Landestelle fuer Gewaesserkunde und Wasserwirtschaftliche Planung, Baden-Wuerttemberg (West Germany).
W. K. Besch, H. G. Loseries, K. Meyer-Waarden, and W. Schmitz.
November 1975, 20 p. Translation from Archiv fur Hydrobiologie, Vol. 71, No. 4, p 551-565, 1974. 3 fig, 10 ref.

Descriptors: *Toxicity, Design, Research and development, *Warning systems, Hazard, Regula-

tion, Water pollution, Water quality, Fish behavior, Effluents, Methodology, Public health, *Monitoring, *Pollutant identification, Bioassay, Bioindicators.
Identifiers: *Rheomenotaxis, Toxicant, Rheotaxis.

A warning test system was designed to detect the immediate presence of highly toxic concentrations of poisonous substances in drinking water supplies, waste treatment plant effluents and bank filtrate. Rheomenotaxis was used as test criterion. The alarm threshold was defined as a certain arbitrary reduction in the fish's ability to swim against the current. Test apparatus, operation of the warming system, design, care of test fish, and testing results were presented. (Klein)
W78-00428

METALS IN PLANTS AND WATERS IN THE OKEFENOKEE SWAMP AND THEIR RELATIONSHIP TO CONSTITUENTS FOUND IN COAL,
Governors State Univ., Park Forest South, IL. Coll. of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5B.
W78-00429

POTENTIAL CONTRIBUTION OF ATMOSPHERIC FALLOUT TO THE PHOSPHORUS BUDGET OF COLUMBIA LAKE, CONNECTICUT,
Connecticut Univ., Storrs. Biological Sciences Group.
For primary bibliographic entry see Field 5B.
W78-00438

A STUDY OF THE WASTE WASH WATER FROM EGG WASHING MACHINES,
Richard B. Russell Agricultural Research Center, Athens, GA.
D. Hamm, G. K. Searcy, and A. J. Mercuri.
Poultry Science, Vol 53, p. 191 - 197, 1974. 3 fig, 2 tab, 4 ref.

Descriptors: *Chemical oxygen demand, *Flow rates, *Waste identification, *Water analysis, *Water sampling, Food processing industry, Poultry, Suspended solids, Pollutant identification.
Identifiers: *Poultry processing wastes, Egg washing, Total solids, Volatile solids.

The egg washer waste waters from 11 grading and breaking plants in the Southeast were sampled and characterized for the common pollution parameters. Egg grading plants studies were found to use an average of 4.6 liters of water per case for washing. Measured median waste concentrations for the wash waters were: for the grading plants - Chemical Oxygen Demand (COD) 7,300 mg/l, total solids 9,300 mg/l, volatile solids 4,600 mg/l; for the breaking plant washers COD 22,500, total solids 27,000, and volatile solids 16,600 mg/l. (EPA, Corvallis)
W78-00458

PACKINGHOUSE WASTE TRICKLING FILTER EFFICIENCY FOLLOWING AIR FLOTATION,
Morrell (John) and Co., Ottumwa, IA. Chemical and Research Labs.
For primary bibliographic entry see Field 5D.
W78-00463

5B. Sources Of Pollution

AMINO ACID COMPOSITION OF DRIED CITRUS SLUDGE AND ITS POTENTIAL AS A POULTRY FEEDSTUFF,
Agricultural Research Service, Winter Haven, FL. Citrus and Subtropical Products Lab.
R. L. Coleman, and P. E. Shaw.
Journal of Agricultural and Food Chemistry, Vol. 25, No. 4, p 971-973, 1977. 1 tab, 11 ref.

Descriptors: *Poultry, *Citrus fruits, *Industrial wastes, *Feeds, *Ultimate disposal, Sludge disposal, Anaerobic digestion, Food processing industry, *Amino acids, Aerobic treatment, Sludge treatment, Waste water treatment.

The protein contents and amino acid profiles for three types of citrus sludges were measured and compared with the amino acid profiles and nutritional requirements for poultry feed. Samples of aerobic, anaerobic, and sun-dried sludge were collected from waste treatment facilities of commerical citrus processors. Amino acid and protein composition of dried citrus sludges are compared in tabular form with amino acid requirements of broiler pullets. Variations in composition were found in sludges obtained from different sources. Amino acid contents were similar in amount for the aerobic and anaerobic digested sludges. The lower amino acid content in sun-dried sludges was attributed to the lack of protein production during digestion. Comparisons between pullet requirements and sludge composition indicated that the use of citrus sludge for poultry feed requires the addition of arginine, histidine, and methionine to maintain desired growth rates. (Schulz-FIRL)
W78-00018

COOLING-WATER CALCULATIONS,
Air Products and Chemicals, Inc., Allentown, PA.
R. G. Kunz, A. F. Yen, and T. C. Hess.
Chemical Engineering Vol 84, No 16, p 61-71, August 1, 1977. 7 fig, 9 tab, 27 ref.

Descriptors: *Mathematical models, *Heat exchangers, *Water analysis, *Cooling water, *Industrial water, Recirculated water, Hydrogen ion concentration, Chemical properties, Alkalinity, Dilution, Conductivity, Pollutant identification, Scaling, Hardness(Water).
Identifiers: Cooling-tower water, Makeup water.

Mathematical equations are presented for the calculation of evaporation, makeup, and blowdown in an open recirculating cooling system. The average composition of cooling-tower makeup water is presented. Alkalinity, pH, and hardness are defined as the most important parameters which contribute to impurities in cooling-tower water. Methods for measuring and controlling electroneutrality are described. Procedures for predicting the pH of recirculating water on the basis of cycles of concentration are described. A formula for predicting the amount of sulfuric acid necessary to adjust the pH to a given level is presented. Predicted values for conductivities of makeup waters are compared with observed values. The Langelier and Ryznar indices for representing the tendency for a system to deposit scale are defined. Dissolved materials such as phosphates, calcium, silica, iron, copper, and aluminum, which may precipitate on heat transfer surfaces in a cooling tower, are discussed. An example problem in which evaporation, makeup, blowdown, electroneutrality, pH, total dissolved solids, and conductivity are calculated for five cycles is presented. (Schulz-FIRL)
W78-00064

DETERMINATION OF TRACE QUANTITIES OF ORGANIC SUBSTANCES FROM INDUSTRIAL WASTES IN WASTE WATERS (OPREDELENIE SLEDOV ORGANICHESKIKH VESHCHESTV-PROMYSHLENNYKH OTKHODOV V STOCHNYKH VODAKH),
For primary bibliographic entry see Field 5A.
W78-00065

VARIATION OF NITRATE VS. PHOSPHATE RATIO IN THE PACIFIC WATER,
Meteorological Coll., Kashiwa (Japan).
T. Sagi.
Papers in Meteorology and Geophysics, Vol 28, No 1, p 9-27, March 1977. 4 fig, 12 tab, 16 ref, 1 append.

Descriptors: *Nitrates, *Phosphates, *Pacific Ocean, Sea water, On-site data collections, Sampling, Nutrients, Chemicals, Water chemistry, Oceans, Regression analysis, Data processing, Oceanography.
Identifiers: *Nitrate-phosphate ratios.

A linear relationship was confirmed, not only between phosphate and AOU, but also between nitrate and AOU. From these results, phosphate and nitrate may be said to consist, respectively, of 2 parts; i.e., the AOU dependent one, which is oxidative, and the AOU non-dependent one, which is conservative. A linear relation also was confirmed between conservative nitrate and conservative phosphate in the Pacific waters. Observational results showed that the relation between conservative nitrate and conservative phosphate can be formulated simply as a linear equation. However, in some cases, some deviations were found from the equation. (Sims-ISWS)
W78-00070

LONGITUDINAL DISPERSION WITH DEAD ZONES,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
E. M. Valentine, and I. R. Wood.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13028, p 975-990, September 1977. 10 fig, 9 tab, 3 append.

Descriptors: *Dispersion, *Streamflow, *Path of pollutants, *Model studies, Mathematical models, Solutes, Pollution, Water pollution, Flow, Eddies, Movement, Mixing, Diffusivity, Streams, Rivers, Hydrology, Turbulence.
Identifiers: Longitudinal dispersion, Dead zones.

The dispersion process for an instantaneous line source of solute in a two-dimensional turbulent shear flow with dead zones was formulated to 2 differential equations, one for the solute in the flow zones, and the other for the solute trapped in the dead zones on the bed. Exchange of material occurs between dead zones and flow. Using the Aris moment transformation, the equations were converted to a more tractable system of equations which were solved by numerical methods with the aid of a digital computer for zeroth, first, second, and third moments of the longitudinal concentration distribution. Various forms of dead zone volume were imposed, and its effects on the dispersion process were demonstrated. It was shown for the numerical model employed that dead zones not only increase the rate of dispersion but also delay the occurrence of Fickian type dispersion. (Sims-ISWS
W78-00075

DEVELOPMENT AND RESORPTION OF A THERMAL DISTURBANCE IN A PHREATIC AQUIFER WITH NATURAL CONVECTION,
Neuchatel Univ. (Switzerland). Centre de Hydrogeologie.
B. Mathey.
Journal of Hydrology, Vol. 34, No. 3/4, p 315-333, August 1977. 9 fig, 4 tab, 9 ref.

Descriptors: *Aquifers, *Thermal water, *Injection wells, Storage, Underground storage, Water temperature, Groundwater, Wells, Water wells, On-site investigations, Model studies, Mathematical models, Heat, Heated water, Heat flow, Convection, Heat balance, Groundwater movement, Piezometers.
Identifiers: *Colombier-Robinson Aquifer(Switzerland), *Heat storage, Heat dispersion.

Development and resorption of a thermal disturbance with natural convection in a phreatic aquifer during a 5-month injection-pumping cycle were studied. Evaluation of thermal balance revealed insignificant losses but an important 'dilution' of the disturbance by thermal conduction. (Sims-ISWS)
W78-00083

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY: THE CHARACTER OF PARTICLE DISPERSION AND WATER MOVEMENT IN MASSACHUSETTS BAY AND ADJACENT WATERS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological.
T. A. Nelsen, D. A. Mayer, P. G. Hatcher, and W. N. Hess.
Estuarine and Coastal Marine Science, Vol. 5, No. 4, p 455-465, July 1977. 9 fig, 10 ref.

Descriptors: *Bays, *Water circulation, *Massachusetts, *Coasts, On-site investigations, Currents(Water), Measurements, Tracers, Current meters, Instrumentation, Dredging, Dispersion, Salinity, Estuaries, Tidal effects, Tracking techniques, On-site data collections, Water temperature, Profiles.
Identifiers: *Cape Cod Bay(Mass), Dredge spoil, Drogues.

The New England Offshore Mining Environmental Study (NOMES) was conducted in Massachusetts Bay during June 1973. The project was designed to study the dispersal of fine particles during proposed sand and gravel dredging operations. Current meter and drogue measurements revealed a strong north-south current shear zone. The mean motion within 10 km of the beach was predominately northward, while seaward of this limit the mean flow was mostly southward. Silt-size glass spheres and synthetic sphalerite (ZnS) particles were used as tracers to determine the behavior of suspended particles. The sphalerite data showed particle dispersion toward Boston Harbor, eastward toward Stellwagen Bank and the Atlantic, and southward hugging the Massachusetts shore, and following a counter-clockwise gyre in Cape Cod Bay. (Humphreys-ISWS)
W78-00086

PESTICIDE POLLUTION STUDIES.
Public Health Service, Atlanta, GA. Div. of Water Supply and Pollution Control.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 756, Price codes: A03 in paper copy, A01 in microfiche. Progress Report, March 1963. 30 p, 8 fig, 2 tab.

Descriptors: *Water pollution, *Pesticides, *Projects, Surveys, Insecticides, Water pollution sources, Sampling, Chemical analysis, Analytical techniques, Water quality, Fish, Biology, Agriculture, Hydrology, Pollutants.

The Pesticide Pollution Project of the Division of Water Supply and Pollution Control, Public Health Service, U.S. Department of Health, Education, and Welfare began in 1959 as a result of multiple stimuli which focused attention on the vital need for information concerning the impact of pesticides on water quality. These stimuli include reports of pesticide-caused fish kills, the recovery of DDT from surface waters in various parts of the country, and public reaction to the fire ant eradication activities of the U.S. Department of Agriculture. In addition, scientists concerned with the occurrence of carbon chloroform extractables in water have long pointed to the need for more precise and definitive characterization of these materials. In general, the pesticides are a part of this group of organic materials. The administration and field activities of this Project are directed from the Atlanta Regional Office of the Department of Health, Education, and Welfare. Until July 31, 1962, analytical services were performed under contract by Clemson College, Clemson, South Carolina. Since that date, these activities have been carried out in the Project's own laboratory in Atlanta. This report of the Pesticide Pollution Studies covered the period from inception of the project in 1959 to February 1963. This was an informational report only, not to be considered part of the scientific literature, but rather a progress report to keep interested persons informed. Major findings were set forth without presentation of complete data. Some conclusions were tentative and subject to change, and many of the detailed analyses were not complete. (Sims-ISWS)
W78-00098

CHARACTERISTICS OF WASTE WATERS FROM PACKINGHOUSES,
Marquette Univ., Milwaukee, WI.
A. E. Zanioni, and R. J. Kipp.
Industrial Water Engineering, p. 18-21, August/September 1977.

Descriptors: *Flow rates, *Food processing industry, *Oil wastes, *Water analysis, Biochemical oxygen demand, Industrial wastes, Standards, Sewage, Wisconsin, Treatment facilities.
Identifiers: *Meat packing wastes, Grease, Waste loads.

A discussion is given initially on objectives and methods of an industrial wastewater survey. Some important advantages of using manual sampling of flows are listed, virtually all data presented were derived from samples obtained manually and analyses performed according to procedures in 'Standard Methods.' A detailed schematic and discussion of wastewater sources in a typical packinghouse operation are presented. The killing operation, the cleaning of casings and the paunch manure removal operation cause 70 to 90 percent of the total pollution load discharged. Twenty-four hour waste water surveys were conducted at five different packing houses in the State of Wisconsin over the last few years. Tabulated along with discussions of each table are the results of the survey including: (1) comparison of the wastewater characteristics, (2) screenings retained on 20 mesh, (3) fluctuations in wastewater loadings, (4) comparison of average peak loadings, and (5) comparison of losses; data given in terms of BOD, SS, TKN, and grease. (Prodehl - EPA, Corvallis)
W78-00100

WASTEWATERS DISCHARGED FROM AN ABATTOIR,
Water Pollution Research Lab., Stevenage (England).
H. E. Jones.
The Surveyor, Vol 107, p. 159-160, March 26, 1948. 1 tab, 3 ref.

Descriptors: *Food processing industry, *Livestock wastes, *Waste identification, *Water analysis, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Ammonia, Suspended solids, Ohio, *Pollutant identification.
Identifiers: *Meat packing wastes, *Slaughterhouses, Waste loads.

The tendency to centralize the meat industry accentuates the problem of slaughterhouse waste disposal, especially in rural areas. From the material published in the United States on slaughterhouse and packinghouse wastes it appears that the amount of polluting matter discharged for a given number of animals is greater at small plants where recovery is less efficient. An investigation of pollution of the Ohio River found that the combined wastes from slaughterhouses had an oxygen demand of approximately 1,000 ppm and a population equivalent of about 18 per hog unit killed per day. At plants where meat products were prepared and packed the population equivalent was about 24 per hog unit killed per day. A tabulation of results from an investigation of a cattle, sheep, and pig slaughterhouse and processing plant is presented showing flow, SS, BOD, ammonia, and equivalent volume of domestic sewage for different sections of the plant. (Prodehl - EPA, Corvallis)
W78-00108

DESIGN OF A GREASE RECOVERY PLANT FOR A MEAT PACKER,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 5D.
W78-00109

THE CHARACTERISTICS OF WASTES FROM CHICKEN PACKING PLANTS,
Rutgers - The State Univ., New Brunswick, NJ.
H. Heukelekian, H. E. Orford, and J. L. Cherry.
Sewage and Industrial Wastes, Vol. 22, No. 4, p. 520-521, April 1950, 5 tab.

Descriptors: *Waste identification, *Waste water treatment, *Food processing industry, Biochemical oxygen demand, Suspended solids, Treatment facilities, Flow rates, Industrial wastes, Sedimentation, Water analysis, Delaware.
Identifiers: *Poultry processing wastes, Waste loads.

A survey of the pollution problems arising from chicken packing plants was made on a cooperative basis with the Delaware State Department of Health. This investigation entailed studies of the plant processes, the strengths and flows of the various wastes, the effect of different types of treatment, and the effectiveness of existing waste treatment facilities. Four packing plants were involved and tabulated data are shown for volumes of flow, BOD, and suspended solids for existing plant processes and for alternate methods of treatment. Some conclusions were: (1) wastes emitted at different times vary in strength. (2) Major portions of BOD and SS are derived from battery washings (manure). (3) Removal of SS from mixed wastes by sedimentation was 85 percent. The BOD removal was 25 to 35 percent. (4) Scraping the batteries reduced the waste load and volume of sludge. (5) The sludge rapidly becomes putrescible. (6) Alum treatment resulted in substantial removal of SS. (7) Sand filtration of the settled mixed wastes resulted in rapid clogging and impaired the efficiency of BOD reduction. (8) Digestion of the sludge is feasible. (Prodehl - EPA, Corvallis)
W78-00111

WASTES FROM POULTRY DRESSING ESTABLISHMENTS,
Public Health Service, Kansas City, MO.
R. Porges.
Sewage and Industrial Wastes, Vol. 22, p. 521-535, April, 1950. 4 tab, 6 ref.

Descriptors: *Water analysis, *Waste identification, *Poultry, Biochemical oxygen demand, Flow measurement, Food processing industry, Laboratory tests.
Identifiers: *Poultry processing wastes, Waste loads, Waste sources.

During an investigation of water pollution in the Kansas River Basin numerous poultry dressing establishments were appraised to determine the amount of pollution produced. The usual procedure was to establish a flow gauging station, installing a weir whenever possible, and check waste discharges against water meter readings. Sampling was taken at 15 minute intervals by assigned survey personnel. Laboratory analyses, which were performed according to 'Standard Methods', consisted of the following determinations: (1) pH, (2) BOD standard 5-day, 20C, (3) suspended solids (total, fixed and volatile), (4) turbidity, (5) chlorides, (6) alkalinity. Volume and

laboratory analyses of combined wastes are shown in tabular form, including population equivalents. Sources of, quantity, and character of wastes are discussed for each major plant process. Poultry dressing wastes are similar to those encountered at slaughterhouses and meat packing plants. Oxygen depletion, sludge deposition, and coloration are the principal effects of these wastes on receiving waters. (Prodehl - EPA, Corvallis)
W78-00112

FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES,
Guelph Univ. (Ontario). Dept. of Veterinary Microbiology and Immunology.
J. B. Derbyshire.
Journal of Milk and Food Technology, Vol. 39, No. 3, p. 214-217, March, 1976. 5 tab, 8 ref.

Descriptors: *Effluents, *Viruses, Soil contamination, Groundwater, *Agricultural runoff, Water pollution, Public health, Aeration, *Farm wastes, Liquid wastes, Waste water disposal.
Identifiers: *Swine wastes, *Dairy wastes.

Various aspects of viral pollution of the environment associated with disposal of liquid farm manure of agricultural land are being investigated. Techniques have been developed for concentration and recovery of animal viruses from various field samples. Seventeen of 22 samples of liquid manure from a swine fattening house yielded enteroviruses, adenoviruses, and a coronavirus. One enterovirus was isolated from six samples of waste from a swine farrowing house, but no virus was isolated from 18 samples of liquid cattle manure obtained from a dairy farm. A swine enterovirus was isolated from surface soil samples collected up to 8 days after liquid manure was spread on agricultural land. A swine enterovirus was also isolated from 2 of 26 samples of surface runoff collected from sites at which liquid pig manure was routinely spread on agricultural land. Thirty-three samples of surface water and 36 samples of ground water were collected in areas in which liquid pig manure was routinely spread on farm land, and a swine enterovirus was isolated from one surface water sample. Field and laboratory experiments indicated that enteroviruses are more rapidly inactivated in aerated liquid manure than in untreated manure. (Merryman-East Central)
W78-00116

WASTE DISPOSAL IN BEEF FEEDLOTS,
New Zealand Agricultural Engineering Inst., Lincoln.
For primary bibliographic entry see Field 5G.
W78-00117

SOLUBLE CATIONS BENEATH A FEEDLOT AND AN ADJACENT CROPPED FIELD,
Agricultural Research Service, Lincoln, NE.
L. F. Elliott, T. A. Travis, and T. M. McCalla.
Soil Science Society of America Proceedings, Vol. 40, No. 4, p 513-516, July-Aug., 1976. 2 tab, 8 ref.

Descriptors: *Feed lots, *Cations, Sampling, Soils, Groundwater, Soil water movement, Sodium, Potassium, Calcium, Magnesium, Zinc, Copper, Iron, Manganese, Water pollution sources, *Path of pollutants, Solubility, Farm wastes.

The purpose was to determine potential or possible movement of cations to groundwater by measuring cations in the soil solution beneath a feedlot and an adjacent cropped field. Soil solution samples were studied for a 12 month period. Concentrations of sodium, potassium, calcium, magnesium, zinc, copper, iron, and manganese were determined. Only calcium, magnesium, and manganese were higher in the feedlot soil solution than in the cropped field at the lower depths tested. At these depths, calcium and magnesium were 2 to 4 times higher in soil solution from the feedlot than from the cropped field. While manganese was consistently higher beneath the feedlot than the field, manganese levels were low. Although some dissolved cations were slightly above EPA recommended values, only slight dilution by the aquifer would be required. If the feedlot is kept stocked and the manure interface is kept intact, pollution of the aquifer by any of the cations tested is unlikely. (Rowe-East Central)
W78-00121

POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND,
Agricultural Research Service, Morris, MN.
R. A. Young, and C. K. Mutchler.
Journal of Er vironmental Quality, Vol. 5, No. 2, p 174-179, 1976. 2 fig, 7 tab, 7 ref.

Descriptors: *Water pollution, *Agricultural runoff, Erosion, Nutrients, *Farm wastes, Rates of application, Waste disposal.
Identifiers: Land application, *Frozen ground, Snowmelt runoff.

Studies were begun at Morris, Minnesota in 1971 to determine the contribution of manure application on frozen ground to the nutrient content of snowmelt runoff. Eight experimental plots, 4.06 m wide by 23.35 m long, with a 9% average slope, were set up on land furnished by the University of Minnesota's West Central Experiment Station. Two plots were planted in newly seeded alfalfa with an oat cover crop. Two plots were left in 6-year-old alfalfa. Manure treatments on the 4 corn plots consisted of 44.8 metric tons/ha solid dairy manure, wet basis, (1) applied in fall and plowed under, (2) applied in fall on frozen ground, (3) applied in spring on top of snow and (4) check plot, no manure applied. Treatments on the 4 alfalfa plots (both the newly seeded and the 6-year-old) consisted of 44.8 metric tons/ha solid dairy manure, wet basis, (1) applied in fall on frozen ground, and (2) applied in spring on top of snow. During the second year of the experiment, the spring manure treatment on the established alfalfa plot was eliminated and the plot was used as a check with no manure applied. Third year treatments on the 4 alfalfa plots were changed to: (1) check, (2) 1.27 cm liquid dairy manure applied in fall on frozen ground, (3) 1.27 cm liquid dairy manure applied in spring on top of snow, and (4) 0.64 cm liquid dairy manure applied in fall followed by another 0.64 applied in spring. Study results indicated that concentrations of nutrients in runoff water were much higher from the manured plots than from the check plots, but the total nutrient losses in surface runoff from the manured plots were not much greater due to the efficiency of the manure in retarding runoff and soil loss. Manure spread on top of snow rather than before snowfall was generally better for reducing soil, water, and nutrient losses. Applying manure to frozen plowed land reduced soil losses 100% and runoff up to 80%. (Albertson-East Central)
W78-00129

NITROGEN AND PHOSPHORUS: FOOD PRODUCTION, WASTE AND THE ENVIRONMENT.
New York State Coll. of Agriculture and Life Sciences, Ithaca.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1975. 372 p. K. S. Porter, Editor.

Descriptors: *Water pollution, *Nitrogen, *Phosphorus, *Agricultural runoff, Economics, Regulation, Model studies, *Farm wastes, *Pollution abatement.
Identifiers: Waste management.

Studies are described that concern the interwoven issues of maintaining agricultural efficiency and protecting the environment. Special consideration was directed toward the substances nitrogen and phosphorus. Sources of nitrogen and phosphorus found in streams and lakes in central New York were identified. Estimates of the quantities involved were made and their effects on lakes were assessed with regard to management alternatives. Management of manure from treatment to direct disposal on land, and the application of fertilizer were studied. The economic consequences of applying controls to reduce nutrient losses from farm land were estimated. Finally, social issues, such as public attitudes toward pollution and the efficiency of institutions responding to such attitudes were examined in a comprehensive sociological investigation. An effort was made to consider all the major ramifications of nutrient flows in agricultural watersheds. Consequently, the members of the research team represented the following academic disciplines: agricultural economics, agricultural engineering, agronomy, limnology, sociology, and systems analysis. The report was written for both the interested layman and the scientific community. (See W78-00131 thru W78-00133) (Merryman-East Central)
W78-00130

THE INFLUENCE OF HUMAN ACTIVITY ON THE EXPORT OF PHOSPHORUS AND NITRATE FROM FALL CREEK,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
D. R. Bouldin.
In: Nitrogen and Phosphorus: Food Production, Waste and the Environment. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1975. p 61-120. 12 fig, 23 tab, 16 ref.

Descriptors: *Water pollution sources, *Phosphorus, Agricultural runoff, Sewage, Watershed management, Farm wastes.
Identifiers: Fall Creek Watershed(NY).

A discussion is given of the influence of human activities on the phosphorus and nitrate removed from the Fall Creek watershed in the stream discharge. Samples were taken during both high and low discharge rates at approximately 20 locations on an irregular basis. The following conclusions were drawn concerning phosphorus: (1) In Fall Creek, the concentration of soluble phosphorus was about 30 micrograms per liter and the particulate matter contained about 110 microgram P/l. Most of the latter phosphorus was carried out of the watershed during the short intervals of time when the discharge rate was very high. (2) The soluble phosphorus is probably the form most important to the biology of the lakes. (3) About 50% of the soluble phosphorus was attributed to non-human activities, about 25% was attributed to farming operations. (4) Based on the Fall Creek data and numerous other considerations, the loading of soluble phosphorus to lakes in central New York can be approximated by the sum of the following inputs: (a) Sewered populations: (i) phosphorus in laundry detergents 1.0 (plus or minus 0.5) kg P/cap/yr. (ii) No phosphorus in laundry detergent 0.5 (plus or minus 0.4) kg P/cap/yr. (b) Unsewered population: 0.1 to 0.4 of the values for sewered population on a per cap/yr basis. (c) Nonagricultural land: 15D mg/m2/yr, where D is meters of stream flow per m2 year. Probably the range is 10D to 20D. (d) Agricultural land (in excess of 15R): 18D mg/m2yr, where D is meters of stream flow per m2yr. Probably the range is 10D to some unknown upper limit. The following conclusions were drawn in relation to nitrogen: (1) No samples were found any place at any time in which the NO3-N concentration was a health hazard. (2) The seasonal pattern of nitrate concentrations was similar among the years with minimum concentrations occurring during the summer and maximum concentrations occurring during the winter. (3) Corn land and domestic sewage were judged to be the most likely major sources of NO3. (See also W78-00130) (Albertson-East Central)
W78-00131

FLOWS OF NITROGEN AND PHOSPHORUS ON LAND,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
K. S. Porter, D. A. Lauer, J. J. Meisinger, and D. R. Boulding.
In: Nitrogen and Phosphorus: Food Production, Waste and the Environment. Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, p 123-165. 1975. 11 fig, 8 tab, 16 ref.

Descriptors: *Nitrogen, *Phosphorus, Leaching, Ammonia, Groundwater, Crop response, *Agricultural runoff, Legal aspects, Economics, *Path of pollutants, *Water pollution sources, Air pollution, Farm wastes, Waste disposal.
Identifiers: Soil-plant system, Volatilization, Land disposal, Air quality.

An attempt is made to determine the relationship between management of farming operations and translocation of nitrogen and phosphorus from farmed land. General characteristics of nitrogen and phosphorus in relation to the soil-plant system are outlined and overall nitrogen and phosphorus budgets are briefly discussed. Two specific investigations are described, illustrating the removal of nitrogen from land, in one case by air and in the other by water. Studies of the flow of nitrogen and phosphorus on or from soil using detailed mathematical models are also described. These models considered the management of nutrients designed to minimize the losses, while evaluating the corresponding effect on crop yield, and consequent return. Results showed that nutrient losses from agriculture cannot be entirely eliminated, but some practical steps may be taken to reduce the rate of losses. Methods of cultivation and nutrient application should be encouraged which would reduce losses with least financial penalty and possibly with a gain. (See also W78-00130) (Albertson-East Central)
W78-00132

ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
G. L. Casler, and J. J. Jacobs.
In: Nitrogen and Phosphorus: Food Production, Waste and the Environment, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, p 169-215. 1975. 12 fig, 18 tab, 22 ref.

Descriptors: *Water pollution, Linear programming, Model studies, *Agricultural runoff, Feed lots, Dairy industry, Economics, Regulation, Farm wastes, Economics.
Identifiers: Cayuga Lake(NY), Barnyard runoff, Waste management.

An attempt was made to estimate the costs of reducing phosphorus inputs to Cayuga Lake from the Fall Creek watershed. In estimating costs, 3 sources of phosphorus were considered: (1) land runoff as related to soil erosion, (2) land runoff as related to manure applications, and (3) barnyardd runoff. The cost of reducing phosphorus losses from land runoff was estimated by using a linear programming model of agriculture in the Fall Creek watershed. Development of the model utilized the following information: (1) production alternatives, (2) costs and returns associated with each alternative, and (3) phosphorus loss from each production practice. Manure handling systems which include storage tend to decrease nutrient losses to water. However, costs of dairy manure handling would be increased by such storage and such problems as odor and flies would be increased. Consequently, trade-offs between nutrient losses to water and other environmental characteristics must be considered. Barnyard runoff was considered in relation to the 1973 EPA effluent limitation proposed guidelines for the feedlots category of point sources. These regulations were focused on large feedlots and on dairy operations having 700 or more dairy cattle. Farm business records and a runoff survey were utilized to obtain the: (1) distribution of farms for specified size groups; (2) barnyard area per cow for specified size groups; (3) location of the barnyard relative to a stream or road ditch; and (4) number of farms that have a barnyard. Using this information plus rainfall and cost data, the costs of constructing runoff control facilities for 3 herd sizes were computed. Study results indicated reduction of phosphorus from the effluent of various sewage treatment plants discharging to the lake or its tributaries appeared to be relatively low cost, and should be adopted. If further phosphorus reduction is needed, barnyard runoff control should be the next priority. Last of all, manure handling practices should be considered. (See also W78-00130) (Albertson-East Central)
W78-00133

CHROMIUM SPECIATION IN MUNICIPAL WASTEWATER AND SEAWATER,
Southern California Coastal Water Research Project, El Segundo.
T-K. Jan, and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 15-22, 1977. 5 tab, 1 ref.

Descriptors: *Water pollution sources, *Chemical wastes, *Outfall sewers, *Heavy metals, *Municipal wastes, *Chromium, California, Continental shelf, Resources development, Environmental effects, Waste disposal.
Identifiers: *Outer Continental Shelf, *Coastal zone, Hexavalent chromium, Resources management, Southern California.

The majority of dissolved chromium found in clean coastal seawater off southern California is hexavalent chromium. The sums of the concentrations of dissolved trivalent and hexavalent chromium measured in samples are in good agreement with the values for total dissolved chromium measured by an independent process. Subsurface seawater samples, known by their high levels of turbidity, ammonium-nitrogen, and particulate metals to have come from within the JWPCP wastewater plume, contained concentrations of particulate chromium up to 50 times control levels. In contrast, the concentrations of dissolved trivalent chromium in the plume samples were only 2 to 4 times background values, and those of dissolved hexavalent chromium showed no significant enhancements. There appears to be a relatively high natural background of dissolved hexavalent chromium in coastal seawater. The low percentage of municipal wastewater chromium that occurs in this toxic form (plus the apparent lack of conversion of other forms of chromium to it) indicate that significant increases in seawater concentrations of hexavalent chromium do not result from ocean discharge of these wastewaters. (See also W78-00134) (Sinha-OEIS)
W78-00135

INPUTS OF DDT AND PCB,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T. C. Heesen.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 23-30, 1977. 1 fig, 3 tab.

Descriptors: *Municipal wastes, *Water pollution sources, *Polychlorinated biphenyls(PCB's), *DDT, *Chlorinated hydrocarbon pesticides, California, Continental shelf, Resources development, Environmental effects.
Identifiers: *Outer Continental Shelf, *Southern California Bight, Resources management.

Work has focused on the pesticides DDT and Dieldrin and two industrially important polychlorinated biphenyls (PCB's), Arochlors 1242 and 1254. Attempts have been made to quantify the amounts of these substances in municipal and industrial wastewaters, vessel antifouling paints, surface runoff, and aerial fallout; amounts entering and leaving the Bight via ocean currents have also been estimated. Submarine introduction of DDT-contaminated particulates has been reduced by more than 95% since 1971. PCB emissions via submarine outfalls have decreased by an order of magnitude since 1972. Surface runoff has made only second-order contributions of chlorinated hydrocarbons to the Bight, almost all from storm flow. Since 1974 dry aerial fallout has been the dominant route by which total DDT is transferred from southern California to the coastal ecosystem; for 1254 PCB, this situation may have existed even earlier. However fallout rates of both contaminants in this region are slowly decreasing. (See also W78-00134) (Sinha-OEIS)
W78-00136

INPUTS OF CHLORINATED BENZENES,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T. C. Heesen.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 31-37, 1977. 3 tab, 9 ref.

Descriptors: *Water pollution sources, *Chlorinated hydrocarbon pesticides, *Municipal wastes, California, Continental shelf, Resources, Environmental effects.
Identifiers: *Outer Continental Shelf, *Southern California Bight, Ocean outfall, *Hexachlorobenzene, *Chlorobenzenes.

During the course of EPA-sponsored investigation into levels of chlorinated pesticides and PCB's in major municipal wastewaters of southern California, several other chlorinated compounds of potential concern were uncovered. The first was hexachlorobenzene (HCB), which was tentatively identified in spring 1974 samples. This material was repeatedly detected in semi-annual analyses of final effluents by electron-capture gas chromatography. The total body of data indicate that HCB is present in local wastewaters at levels one to two orders of magnitude below those measured for PCB. It appears that concern regarding chlorinated hydrocarbons in municipal and other wastewaters, should be expanded to cover the chlorobenzenes as well. Although attention has recently been focused on HCB, data indicate that other chlorinated benzenes of possible greater importance are also being discharged to our coastal marine waters. (See also W78-00134) (Sinha-OEIS)
W78-00137

TECHNIQUES FOR COLLECTING DDT AND PCB IN AERIAL FALLOUT,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00138

AERIAL FALLOUT OF METALS DURING A BRUSHFIRE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00139

SEDIMENTS AS SOURCES OF DDT AND PCB,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and D. McDermott-Ehrlich.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 49-55, 1977. 2 fig, 3 tab.

Descriptors: *Water pollution sources, *Sediments, *Outfall sewers, *DDT, *Polychlorinated biphenyls, California, Pesti-

cides, Fish, Resources development, Environmental effects, Continental shelf.
Identifiers: *Outer continental shelf, Southern California, Resources management.

The relatively high concentrations of DDT and PCB compounds found in bottom sediments and fish from the region of the Los Angeles County's Joint Water Pollution Control Plant (JWPCP) discharge off Palos Verdes have been described in past reports. During the last 4 years, the mass emissions of these contaminants from this submarine outfall system have been reduced through control of industrial inputs and general use restrictions. However, studies over the same years have revealed that DDT and PCB concentrations in the tissues of bottom-feeding fish of the region do not reflect these reductions. These findings are summarized here, along with a discussion of the role that contaminated bottom sediments appear to play in this situation. It is estimated that approximately 150 tons of total DDT are still contained in the upper 30 cm of these sediments in a 50 aq-km area off Palos Verdes Peninsula. These highly-contaminated sediments may cause excessive DDT levels to persist for many years in benthic fishes of the region. (See also W78-00134) (Sinha - OEIS)
W78-00140

CHARACTERISTICS OF MUNICIPAL WASTEWATER DISCHARGES, 1975,
Southern California Coastal Water Research Project, El Segundo.
H. A. Schafer.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 57-60, 1977. 4 tab.

Descriptors: *Water pollution sources, *Municipal wastes, *Outfall sewers, *DDT, *Heavy metals, *Polychlorinated biphenyls, California, Pesticides, Continental shelf, Resources development, Environmental effects.
Identifiers: *Outer continental shelf, Southern California, Resources management.

Municipal wastewater discharges are the principal sources of most pollutants entering southern California waters as a result of human activity. Between 1971 and 1974, all of the general constituents showed a slight decrease. Trace metals and PCB remained relatively constant, and DDT decreased by a factor of 10. However between 1974 and 1975, there were several significant changes: The combined annual mass emission rate of total suspended solids increased by about 10% although the total flow of wastewater increased less than 1%. The combined mass emission rates for all measured metals except silver were lower than the 1974 dates; these reductions, which ranged from 6% for cadmium to 25% for mercury, appear to be the result of improved source control of metals. Total DDT values continued to decline, and the combined mass emission rate for 1975 was 6% lower than the 1974 value. The average reported amount of total PCB declined 35%, however it is not certain whether this decrease reflects actual reductions in effluent concentrations or refinements in analytical procedures. (See also W78-00134) (Sinha - OEIS)
W78-00141

MEASUREMENTS OF SUBTHERMOCLINE CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00142

CURRENT VELOCITIES REQUIRED TO MOVE SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
T. Hendricks.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 71-76, 1977. 4 fig, 1 tab.

Descriptors: *Water pollution sources, *Sediment transport, *Dispersion, *Pollutants, Continental shelf, California, Resources development, Environmental effects.
Identifiers: *Outer continental shelf, Southern California, Current velocities.

The distribution of effluent-related sediments around and outfall, and the changes that have been observed in the properties of these sediments, suggest that the sediments may undergo substantial reworking by the near-bottom currents. The substantially reduced resuspension and initiation of motion velocities observed near the outfalls, relative to the more distant sediments in the same depth of water, suggest that outfall-related sediments may be reworked more frequently by the bottom currents, particularly as the organic content of these sediments increases. Estimates indicate that resuspension may occur during more than one-third of the year near the Whites Point outfall. Infrequent, large swell-perhaps occurring only a few times each decade--can rework all the sediments at this depth. At this time, the more organic, lighter weight, sewage particulates are more likely to be swept away and dispersed over a much larger area than natural particulates. (See also W78-00134) (Sinha - OEIS)
W78-00143

SLUDGE IN SANTA MONICA BAY,
Southern California Coastal Water Research Project, El Segundo.
H. A. Schafer, and W. Bascom.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 77-82, 1977. 3 fig, 2 tab, 1 ref.

Descriptors: *Water pollution sources, *Sludge, *Outfall sewers, *Pollutants, *Sediments, *Ecology, Environmental effects, Aquatic animals, Fish, Benthos, California, Continental shelf, Resources development.
Identifiers: *Outer continental shelf, Southern California, Resources management, Santa Monica Bay.

The ecological effects of the sludge issuing from the Hyperion 7-mile outfall are a matter of considerable public as well as scientific interest. The bottom in the outfall area has recently been reexamined and samples of sediments have been analyzed for pollutants and for marine life. The size of the area of bottom containing a significant amount of sludge is about 2 sq km, or about 1% of Santa Monica Bay. The area is in water over 100 meters deep and 12 km offshore at the head of a submarine canyon. The sludge discharge has changed the ecology by increasing the number of fish and benthic animals and by decreasing the number of species of benthic animals. The material does not seem to be moving as a body, however it must be constantly dissipating, probably through the consumption of organic materials by animals and the drift of small particles offshore into deeper water. These recent measurements show that the situation is stable, apparently not having changed substantially for at least the last 5 years. (See also W78-00134) (Sinha - OEIS)
W78-00144

MERCURY IN SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00145

CHANGES IN THE GRAIN SIZE OF SEDIMENTS ON THE PALOS VERDES SHELF,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 2J.
W78-00146

VIRUSES AND BACTERIA IN COASTAL WATERS AND SHELLFISH,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00147

UPTAKE AND EFFECTS OF CHROMIUM ON MARINE FISH,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00151

FIN EROSION DISEASE INDUCED IN THE LABORATORY,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00155

SUPERTANKERS AND SUPERPORTS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE).
National Technical Information Service, Springfield, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as NTIS/PS-76/0592, Price codes: E13 in paper copy, E13 in microfiche. National Technical Information Service, Habercom, G. E., Jr. (Ed.) Report NTIS/PS-76/0592, July 1976. 100 p, 75 ref.

Descriptors: *Bibliographies, *Environmental effects, *Water pollution sources, *Transportation, Resources development, Harbors.
Identifiers: *Outer continental shelf, *Supertankers, *Superports, Terminal facilities, Moorings.

Construction and operation of supertankers and requirements for port facilities are reviewed in these reports gathered from worldwide literature surveys. Environmental aspects, offshore mooring sites, and harbor preparation are among the features investigated. This published search was produced by searching the data base of Engineering Index, Inc., COMPENDEX. The 75 abstracts and citations contained in this document are copyrighted by Engineering Index, Inc. (Sinha - OEIS)
W78-00164

DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5E.
W78-00165

MEAT PACKINGHOUSE WASTEWATER: CHARACTERIZATION BY SOURCE,
Texas Univ. at El Paso. Dept. of Civil Engineering.
W. D. Vandertulip.
Master of Science Thesis, May 1975. 100 p, 16 fig, 21 tab, 28 ref, 3 append.

Descriptors: *Data collections, *Flow measurement, *Food processing industry, *Waste identification, Water analysis, Biochemical oxygen demand, Chemical analysis, Oil wastes, Chlorides, Texas, Waste water treatment.
Identifiers: *Meat packing wastes, *Rendering wastes, Paunch manure, Blood, Grease, Waste loads.

Processes that generate wastewater within the meat processing industry and waste loads from the different unit processes are discussed. The U.S. Dept. of Agriculture places meat slaughtering and packing second in potential daily load of pollution

in terms of lbs. of BOD; it is the number one polluter in the food and kindred products industry. Wastewater at a packinghouse is generated at many locations, each with its own peculiar chemical properties. Waste load data from various referenced authors are included. Kreis (1972) reported the COD, BOD5, and TOC of runoff from cattle holding pens to be 7510 mg/l, 2010 mg/l, and 1075 mg/l respectively. Crandall (1971) reported a value of 100,000 mg/l BOD5 for blood and Bauman (1971) reported the BOD5 of paunch manure as 50,200 mg/l; both data taken from the killing floor. Waste load data from referenced authors on other pollution sources are presented; high COD from grease from the rendering process and high chloride content from the pickling brine injection process are the main pollution contributors. Plant processes, flow measurement, and chemical analysis by 'standard methods' for the Peytons Meat Packing Plant, El Paso, Texas are discussed. Conclusions from data of the referenced authors and from the plant study are tabulated. (Prodehl-EPA, Corvallis)
W78-00166

INITIAL ASSESSMENT OF THE GROUND-WATER RESOURCES IN THE MONTEREY BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
K. S. Muir.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 657, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-46, August 1977. 33 p, 5 fig, 3 tab, 80 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater basins, *Groundwater resources, *Aquifer characteristics, *California, Water wells, Pumping, Drawdown, Chemical degradation, Water quality, Saline water intrusion, Municipal wastes, Septic tanks, Solid wastes, Landfills, Evaluation.
Identifiers: *Monterey Bay region(Calif).

Because urban growth has placed an increasing demand on the ground-water resources of the Monterey Bay region, Calif., an assessment of the ground-water conditions was made to aid the development of local and regional plans. Ground water provides 80 percent of the water used in the region, which includes six ground-water subbasins. In several of the subbasins, pumpage exceeds safe yield. Existing water-quality degradation results from seawater intrusion, septic-tank effluent, and irrigation-return water. Potential sources of degradation include municipal sewage disposal, leachates from solid-waste disposal sites, and poor-quality connate water. High-priority items for future study include location of recharge areas, detection of seawater intrusion, and well-monitoring of landfill sites. (Woodard-USGS)
W78-00188

SUMMARY GROUND-WATER RESOURCES OF LUZERNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00193

EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE WESTERN SNAKE PLAIN AQUIFER, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
H. R. Seitz, A. M. La Sala, Jr., and J. A. Moreland.
Open-file report 76-673, 1977. 34 p, 8 tab, 7 fig, 15 ref.

Descriptors: *Path of pollutants, *Injection wells, *Industrial wastes, *Septic tanks, *Urban runoff, Aquifers, Waste water disposal, Water quality, Water pollution sources, Nutrients, Bacteria, Sodium, Chlorides, Water temperature, *Idaho.
Identifiers: *Western Snake Plain aquifer(Idaho).

Approximately 3,100 drain wells injects irrigation waste water, urban runoff, septic-tank effluent, and industrial waste water into the Snake Plain aquifer in Minidoka, Gooding, Jerome, and Lincoln Counties, Idaho. About 29,000 acre-feet of irrigation waste water, 100 acre-feet of urban runoff, 400 acre-feet of septic-tank effluent, and 1,000 acre-feet of industrial waste water are injected annually. The quality of irrigation waste water is highly variable, depending upon its source, method and rate of application, amount of fertilizer added, and other factors. The quality of urban runoff water is generally much better than irrigation waste water. Septic-tank effluent is relatively high in nutrient concentrations. Chloride concentrations also are high, and bacterial concentrations are exceedingly high. The only industrial waste water sampled during this study had been used for cooling. No chemical changes were noted, but temperature was significantly increased. The data indicate that drain-well inflow does move appreciable distances through the aquifer and can be detected in downgradient wells. (Woodard-USGS)
W78-00197

LOW-FLOW CHARACTERISTICS AT GAGING STATIONS ON THE WISCONSIN, FOX, AND WOLF RIVERS, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
W. A. Gebert, and B. K. Holmstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 946, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 77-27, June 1977. 20 p, 2 fig, 4 tab, 3 ref.

Descriptors: *Low flow, *Low flow frequency, *Streamflow, *Gaging station, *Wisconsin, Data collections, Flow characteristics, Waste water disposal, Path of pollutants, Regulated flow.
Identifiers: *Log Pearson, *Unregulated streamflow, *Wisconsin River(Wis), *Fox River(Wis), *Wolf River(Wis).

Low-flow characteristics are presented at 11 gaging stations on the main stem of the Wisconsin, Fox, and Wolf Rivers in Wisconsin. To provide accurate and consistent low-flow characteristics for uniform evaluation of waste effluent, a long-term period of streamflow record (1915-75) was used for the analyses, The annual minimum 7-day mean flow that occurs on the average of once in 10 years (Q7,10) on the Wisconsin River ranged from 140 cfs (Cubic feet per second) at the gaging station at Rainbow Lake to 2,790 cfs at the Muscoda gaging station. On the Fox-Wolf Rivers, the Q7,10 ranged from 360 cfs at Fox River at Berlin to 950 cfs at Fox River at Rapide Croche dam. The analyses showed that the severe drought of the 1930's makes a substantial change in the Q7,10 discharge while the effect of regulation apparently makes little difference in the Q7,10 discharge at the Merrill gaging station. (Woodard-USGS)
W78-00204

NATURE AND EXTENT OF GROUND-WATER-QUALITY CHANGES RESULTING FROM SOLID-WASTE DISPOSAL, MARION COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
R. A. Pettijohn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 019, Price codes: A07 in paper copy, A01 in microfiche. Water-Resources Investigations 77-40, June 1977. 119 p, 49 fig, 15 tab, 26 ref.

Descriptors: *Landfills, *Leachate, *Path of pollutants, *Groundwater movement, *Solid wastes, Aquifers, Sampling, Observation wells, Water quality, Dispersion, *Indiana, Hydraulic conductivity, Chemical analysis, Infiltration, Metals, Organic wastes, Pumping, Self purification.
Identifiers: *Indianapolis area(Ind).

Studies of seven landfills in the Indianapolis, Indiana, area indicate that in five of the landfills movement of ground water is from the deep aquifers into the uppermost aquifer. In the other two landfills, movement of ground water is from the shallow aquifers to the deeper aquifers, so that leachate is transported into the deeper aquifers. In all the landfills, the predominant direction of ground-water movement is lateral. Placing solid waste into the landfills has occasionally altered the local, but not the regional, flow patterns. Groundwater mounding at shallow depths beneath two of the landfills has caused flow toward the edges of the two fills. Leachate at these fills is moving downward and outward and has affected water quality at shallow depths. Pumping near two other landfills has reversed the direction of regional ground-water flow, allowing leachate to move toward the pumping wells. Leachate at the three remaining landfills is moving downgradient and is discharging into single streams adjacent to each landfill. (Woodard-USGS)
W78-00205

EVALUATION OF GROUND-WATER QUALITY IN THE SANTA MARIA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. L. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 512, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-128, July 1977. 72 p, 18 fig, 8 tab, 18 ref.

Descriptors: *Groundwater, *Chemical degradation, *Pumping, *Groundwater recharge, *Hydrologic budget, Water quality, Solutes, Industrial wastes, Municipal wastes, Agricultural chemicals, Irrigation water, Rain water, Sewage treatment, Drawdown, Groundwater movement, Water pollution sources, Nitrogen, Evaluation, *California.
Identifiers: *Santa Maria Valley(Calif).

The quality and quantity of recharge to the Santa Maria Valley, Calif., ground-water basin from natural sources, point sources, and agriculture are expressed in terms of a hydrologic budget, a solute balance, and maps showing the distribution of select chemical constituents. Point sources includes a sugar-beet refinery, oil refineries, stockyards, golf courses, poultry farms, solid-waste landfills, and municipal and industrial wastewater-treatment facilities. Pumpage has exceeded recharge by about 10,000 acre-feet per year. The result is a declining potentiometric surface with an accumulation of solutes and an increase in nitrogen in ground water. Nitrogen concentrations have reached as much as 50 milligrams per liter. In comparison to the solutes from irrigation return, natural recharge, and rain, discharge of wastewater from municipal and industrial wastewater-treatment facilities contributes less than 10 percent. The quality of treated wastewater is often lower in select chemical constituents than the receiving water. (Woodard-USGS)
W78-00206

HYDROLOGY OF THE CREEPING SWAMP WATERSHED, NORTH CAROLINA, WITH REFERENCE TO POTENTIAL EFFECTS OF STREAM CHANNELIZATION,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00207

NATIONAL WATER QUALITY INVENTORY. 1974 REPORT TO THE CONGRESS. VOLUME I.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W78-00214

FACTORS AFFECTING DIMETHYLNITROSAMINE FORMATION IN SAMPLES OF SOIL AND WATER,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
A. L. Mills, and M. Alexander.
Journal of Environmental Quality, Vol. 5, No. 4, p 437-440, 1976. 5 fig, 2 tab, 16 ref.

Descriptors: *Pollutants, *Water pollution effects, *Soil contamination, *Enzymes, Microorganisms, Pesticides, Nitrites, Nitrates, Nitrogen compounds, Organic matter, Sewage.
Identifiers: *Nitrosamines, *Dimethylnitrosamine, *DMNA, *Carcinogens, Amines, Dimethylamine, DMA, Trimethylamine.

Nitrosamines are formed in soil, sewage, and lake water after certain nitrogen compounds are introduced. Dimethylnitrosamine (DMNA) appears when soils and waters are amended with nitrate or nitrite and either dimethylamine (DMA) or trimethylamine. Certain pesticides may also, when decomposing, give rise to one of the precursors of this carcinogenic nitrosamine. This study was designed to clarify the role played by microorganisms in the formation of DMNA from DMA in soil and water. It was found that DMNA formation occurred as readily in sterilized soil, sewage, and lake water samples as in nonsterilized samples. Although microorganisms may carry out an enzymatic nitrosation in some soils and waters, particularly those at near-neutral pH values, DMNA can form in soil and water even at near-central conditions by a nonenzymatic reaction. To determine whether organic matter promoted nitrosation, silt loam samples were freed of organic matter. The quantity of DMNA in the samples decreased as the organic matter concentration fell. These data suggest that organic matter is important in the promotion of nitrosation in the presence of the requisite precursors. Organic matter is not the only factor controlling nitrosamine formation; pH certainly plays a role. DMNA formation increased slightly as the pH decreased. (Lynch-Wisconsin)
W78-00215

CRITERIA FOR THE ECOLOGIC EVALUATION OF THE LOWER RIVER MAIN: II. INVESTIGATIONS OF THE ORGANIC METABOLIC PROCESSES, (IN GERMAN),
Forschunginstitut und Natur-Museum Senckenberg, Frankfurt am Main (West Germany).
W. Tobias.
Cour Forschungsinst Senckenb 18, p 1-137, 1976.

Descriptors: *Organic compounds, *Metabolism, Ecology, Oxygenation, *Degradation(Decomposition), Rivers, Water quality standards, Evaluation.
Identifiers: *Lower Main River(West Germany).

The ecology of the lowest reaches of the Main river (West Germany) is discussed. Problems of decomposition of organic compounds resulting from man's activities, including interactions of biological, chemical and physical processes within the watercourse are discussed. Kinzig stream (right-hand tributary close to the town of Hanau) contributes positively with its well oxygenated and richly mineralized water to the water quality of the Main. The left-hand tributaries Gersprenz and Rodau, and the Nidda on the right bank near Frankfurt are heavily polluted at their mouths. The influence of residual sewage effluents from purification plants on the condition of smaller running waters (Erlenbach) in the river system of the Nidda are considered. (See also W76-05057)—Copyright 1976, Biological Abstracts, Inc.
W78-00217

ATMOSPHERIC NITROGEN FIXATION BY FREE-LIVING MICROORGANISMS: PART 2. THE EFFECT OF TEMPERATURE AND MOISTURE ON THE DEVELOPMENT OF NITROGEN-FIXING MICROORGANISMS AND THE PROCESS OF BIOLOGICAL NITROGEN FIXATION,
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
I. L. Klevenskaya.
Izv Sib Otd Adad Nauk SSSR Ser Biol Nauk 1, p 59-62, 1976.

Descriptors: *Nitrogen fixation, *Bacteria, *Soil temperature, *Soil moisture, Pseudomonas, Microorganisms, Ecosystems.
Identifiers: Bacillus-mucilaginosus, Bacillus-oligonitrophilus, Pseudomonas-fluorescens.

The process of N fixation in the culture medium was determined to be most intensive at 26 C. The N-fixing capacity of some N fixers (Pseudomonas fluoresens, Bacterium sp., Bacillus oligonitrophilus, B. mucilaginosus) was revealed at temperatures close to 0 degrees. The significance of soil temperature and moisture for development of N-fixing microorganisms was found to be unequal in different ecosystems.--Copyright 1977, Biological Abstracts, Inc.
W78-00220

DISTRIBUTION OF HEAVY METALS IN THE SEDIMENT OF AN UNPOLLUTED ESTUARINE ENVIRONMENT,
Imperial Chemical Industries, Ltd. Brixham (England). Brixham Research Lab.
D. Taylor.
The Science of the Total Environment, Vol. 6, p. 259-264, 1976. 3 fig, 3 tab, 9 ref.

Descriptors: *Metals, *Estuaries, Cadmium, Colbalt, Copper, Lead, Manganese, Mercury, Nickel, Zinc, Spectrophotometry, Sediments, Spatial distribution, *Path of pollutants, Water pollution sources.
Identifiers: *Urr Water River(Solway Estrary United Kingdom).

Distributions of cadmium, cobalt, copper, lead, manganese, mercury, nickel and zinc in sediments of Urr Water, in the relatively-unpolluted Solway estuary, United Kingdom, provides a baseline for comparison with similar geochemical areas subject to pollution. Wet samples obtained at 19 stations from surface sediment layers were leached with acid (HCl: HNO3=3:1), at 140C. The metals were then determined by concentional atomic absorption spectrophotometry (using a cold vapor technique for mercury). Data for Urr Water are divided into two sections: dealing with the fresh water zones above the tidal limits (stations 1-7), and of the estuarine zone between the tidal limits and mouth (stations 11-19). Arithmetic means, maximum and minimum values for each metal are given for the estuary and river. Simple linear regression analysis shows that there is apparently little correlation between the silt content and any of the metal concentrations. This finding, in agreement with other recent work, confirms the view that an inverse relationship between particle size and trace metal content does not necessarily exist in all marine sediments. (Spaeth-Wisconsin)
W78-00224

ACID PRECIPITATION IN CANADA,
Department of the Environment, Ottawa (Ontario).
P. W. Summers, and D. M. Whelpdale.
Water, Air, and Soil Pollution, Vol. 6, No. 2-4, Sept.-Nov. 1976, p. 448-455. 2 fig, 1 tab, 12 ref.

Descriptors: *Air pollution, *Rain water, *Precipitation(Atmospheric), *Canada, Sulfates, Nitrates, Acidic water, Water pollution sources, Toxins, Electric powerplants, Projections.
Identifiers: *Acid rain, Oil Sands region(Alberta).

Data is reviewed on precipitation in Canada with respect to sulphate and nitrate contents and in some cases to pH levels. The occurrence of acid rain (atmospheric precipitation with high sulphate and/or nitrate contents) of five geographical regions is discussed as related to the main source areas of emissions, to meteorological conditions and to precipitation type. Two regions are particularly affected. In central Alberta, downwind of the natural gas processing plants, the rain is only slightly acid in spite of relatively high sulphate and nitrate concentrations in the region. However, a potential problem exists in the Oil Sands region of the province due to emissions from an oil extraction plant. The second receptor region is southern Ontario with possible extensions into southern Quebec and the Atlantic provinces. In this region, high sulphate (2.0-7.0 ppm on the average) and hig nitrate (1.0-6.0 ppm) concentrations contribute to the acidity of precipitation. With increases in the use of coal for generating electrical power in North America, it is predicted that emissions of both sulphate and nitrate concentrations will increase--especially if tall stacks are used in coal processing. Because many of these emissions will occur in the heavily populated industrial regions already receiving acid rain, the extent of the affected areas will increase. (Harris-Wisconsin)
W78-00227

THE FATE OF SELECT PESTICIDES IN THE AQUATIC ENVIRONMENT,
Southeast Environmental Research Lab., Athens, Ga.
J. R. Sanborn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-239 749, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-660/3-74-025, December 1974. 83 p. 43 tab, 64 ref. R-800736.

Descriptors: *Pesticides, *Herbicides, *Insecticides, *Fungicides, *Miticides, *Model studies, Pesticide residues, Biodegradation, Ecosystems, Fish, Gastropods, Algae, Daphnia, Mosquitoes, Insects, Pesticide toxicity, Dieldrin, 2, 4-D, Aroclors, Sorghum.
Identifiers: *Plasticizers, Uptake, Bux, Sevin, Carbofuran, Lindane, Orthene, Parathion, Alachlor, Propachlor, Bladex, Bentazon, Dicamba, Pyrazon, Trifluralin, Banomite, DOP, PCB's, Captan, Hexachlorophene.

A terrestial-aquatic model ecosystem was used to test the persistence and uptake of 17 organic pesticides and five industrial chemicals. Model utilized glass aquaria containing sand, water, Sorghm halpense, caterpillar larvae (Estigmene acrea), snails (Physa sp.), Daphnia magna, green filamentous algae (Oedogonium cardiacum), mosquito larvae, and a mosquito fish (Gambusia affinis). It was found that most chemicals, except the soil insecticide dieldrin, underwent extensive degradation. Dieldrin was found in every organism in the ecosystem, ranging from 0.495 ppm to 230 ppm (the higher figure in the snail). Dieldrin clearly is not metabolized to polar, water-soluble molecules by the organisms, nor is it degraded by chemical or physical processes. Investigation of the phthalate plasticizer, DOP, demonstrated substantial accumulation in the fish and snail. Three polychlorinated biphenyls (PCB's) accumulated in increasing amounts in the fish and snail as the number of chlorine substitutents was increased. Tables presented for each pesticide show concentrations in the organisms and water of model ecosystem. Insecticides tested were: Bux, Sevin, carbofuran, dieldrin, Lindane, Aroclor 5460, Orthene, Parathion. Herbicides were: alachlor, propachlor, Bladex, Bentazon, dicamba, 2,4-D, pyrazon, Trifluralin. The miticide Banomite, fungicide captan, and bacteriostat hexachoorophene were tested, as well as PCB's and phthalate ester plasticizers. (Lynch-Wisconsin)

W78-00231

BASIC DATA AND ANALYSES: SELECTED ASPECTS OF GREAT LAKES ENFORCEMENT.
Enviro Control, Inc., Rockville , Md.
For primary bibliographic entry see Field 5G.
W78-00232

A COMPARATIVE SURVEY OF PETROLEUM HYDROCARBONS IN LAKE SEDIMENTS,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
S. G. Wakeham.
Marine Pollution Bulletin, Vol. 7, No. 11, p. 206-210, November, 1976. 4 fig, 20 ref. ERDA E45-12225TA40.

Descriptors: *Lake sediments, *Organic compounds, *Oil pollution, *Urbanization, *Washington, Gas chromatography, Radioactivity techniques, Water pollution sources, *Path of pollutants, Pollutant identification.
Identifiers: Lake Washington(Wash), Lake Sammamish(Wash), Lake Quinault(Wash).

Hydrocarbon distributions in sediment cores from Lake Washington, Lake Sammamish, and Lake Quinault, Washington are studied in relation to urbanization in the surrounding area. The total aliphatic hydrocarbon concentrations in the three sediment cores were plotted as depth profiles and ages were determined at selected depths in the cores using Pb 210 dating. The sediment of Lake Quinault contain relatively-uniform hydrocarbon concentrations of 10-25 micrograms/g throughout the sediment column. The sediments of Lake Washington deeper than 30 cm are similar to those of Lake Quinault (micrograms/g 30), while the surface sediments contain up to about 1500 micrograms/g. Lake Sammamish has surface sediment values of 500 micrograms/g and 100 micrograms/g at depth in the sediment. Gas chromatograms show that those lake sediments with low hydrocarbon concentrations (less or equal to 100 micrograms/g) have hydrocarbons indicative of water which lacks petroleum contamination. Chromatograms of surface sediments from Lake Washington and Lake Sammamish indicate that they do have considerable petroleum contamination, although there is a slight input of hydrocarbons from terrestrial material. (Spaeth-Wisconsin)
W78-00233

POTAMOLOGICAL STUDIES ON THE RIVER INA OF THE RIVER SYSTEM OF YODO: II, (IN JAPANESE),
Osaka Kyoiku Univ. (Japan). Oceanography Lab.
M. Kobayashi, and A. Nakamura.
Mem Osaka Kyoiku Univ Nat Sci Appl Sci 22, p 85-102, 1973.

Descriptors: *Potamology, Rivers, Oxygen, Hydrogen ion concentration, *Water temperature, Water quality, Alkalinity, Chemical oxygen demand, Ions, *Pollutant identification, Water pollution sources.
Identifiers: Japan(River Ina).

The variations of water temperature and the quality of river water measured hourly for 24 h in Aug. 2-3, 1972, at the confluence near the Golf Bridge of the River Ina (Japan) were compared with those of Sept. 1-2, 1970 and Aug. 26-27, 1971, at the same place. The value of pH is comparatively large and changes with water temperature; the variation of Cl- is relatively small; and 4.3 alkalinity and Ca2+ change little. The average for 24 h may be accurately expressed by 7 -h means for 4.3 alkalinity and Ca2+, and approximately for pH. When the daily discharge is relatively large, the time-variatons of Cl- and COD (chemical O2 demand) concentrations are low; but with a smaller flow the fluctuations of Cl- is large and that of COD is roughly parallel to the variation in turbidity. Comparisons among the values of some water qualities suggest that each value of 4.3 alkalinity, Cl- and Ca2+ is correlated to the discharge at the time, and the value of COD gradually decreases from June-Feb. and increases from March-April. (See also W75-06701)--Copyright 1976, Biological Abstracts, Inc.
W78-00234

A CARBON FLOW MODEL OF EPIPELIC ALGAL PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00235

SOME CHARACTERISTICS OF HYDRILLA TUBERS TAKEN FROM LAKE OCKLAWAHA DURING DRAWDOWN,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-00248

DISSIPATION OF RESIDUES OF 2,4-D IN WATER, HYDROSOIL, AND FISH,
Fish and Wildlife, Warm Springs, GA. Fish Pesticide Research Lab.
For primary bibliographic entry see Field 5G.
W78-00251

THE DRIFT OF AQUATIC AND TERRESTRIAL INVERTEBRATES IN A STREAM OF MASSIF CENTRAL: THE COUZE PAVIN, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France). Lab. of Ecology and Invertebrate.
A. Neveu, and M. Echaubard.
Ann Hydrobiol 6(1), p 1-26, 1975.

Descriptors: *Aquatic drift, *Invertebrates, *Copepods, *Diptera, Streams, Biomass, Larvae.
Identifiers: Baetis, *Ephemerella, Hydracarian, Massif-central, Plecoptera, Stenophyllax, *Trichoptera, *France(Couze Pavin).

In the Couze Pavin (France) the summer surface drift represents 32-50% of the drifting organisms, the terrestrial fauna being relatively constant and near 25%. Diptera represent 37-75. 75.5% of the individuals from aquatic drift but only 12.6-27% of the biomass; Trichoptera represent only 1.5-9.5% in number but 24.7-43.7% in biomass. In number Diptera represent from 25.8-55.2% of the surface drift and 35.7-42.2% of the biomass. The drift is nocturnal for Ephemeroptera larvae (Baetis, Ephemerella), Plecoptera (Nemouridae) and Diptera (Simuliidae). It is diurnal for Trichoptera (Limnephildae, Stenophyllax). It is bimodal, diurnal and nocturnal for Coleoptera Elminithidae (Elmis), Diptera (Chironomidae), hydracarians. A full moon has a very clear depressive effect on drift intensity for aquatic larvae. Swelling of waters, however small, has a disturbing effect on the rhythms. Lakes pour a fair amount of zooplankton into the stream. The drift of Copepoda is nocturnal in relation to their vertical migrations.--Copyright 1976, Biological Abstracts, Inc.
W78-00252

AN ECOLOGICAL STUDY OF THE SWANPOOL, FALMOUTH: II. HYDROGRAPHY AND ITS RELATION TO ANIMAL DISTRIBUTIONS,
Bristol Univ. (England). Dept. of Zoology.
A. E. Dorey, C. Little, and R. S. K. Barnes.
Estuarine Coastal Mar Sci. 1(2), p 153-176, 1973.

Descriptors: Ecology, *Ecological distribution, *Hydrography, Hydrogen ion concentration, Brackish water, Ponds, Sea water, *Chlorine, Halocline, Seasonal.
Identifiers: England, Eucrangonyx, Falmouth, Plumatella, Procerodes, Swanpool, Victorella.

Swanpool at Falmouth, Cornwall (England) has a mean depth of 1.6 m and contains about 80,000 m3 of brackish water. It is estimated that in 1 yr 20-30 times this volume of fresh water and about 2 pool-volumes of sea water enter the pool. The freshwater flow is continuous, while the sea water enters only near high water of spring tides. The pool is about 5.05 m above chart datum as compared with the mean high water neap level of 4.2 m and the mean high water spring level of 5.3 m. Consequently the smaller spring tides in midsummer, and even some in midwinter, contribute little or no sea water to the pool, which may become unusually dilute at these times. A well-defined halocline normally persists throughout the year. In summer the hypolimnion is anoxic and its pH is near 7, while the less saline upper layers are saturated with O2 and their pH is frequently as high as 9. There are only small variations of temperature with depth, but in summer the pool temperature is often higher than the temperature of the inflowing fresh water by 5 C. The factors governing surface-average chlorinity, fluctuations of chlorinity and the elimination of chloride from the pool are discussed. So long as the pool is stratified, wind speeds would appear to be as important as rainfall in determining the surface chlorinities and the rate of loss of chloride back to the sea. The distribution of some animals (such as Procerodes, Victorella and Eucrangonyx) are shown to be related to the salinity system in ways that strongly suggest a causal relationship, but for others (such as Gammarus chevreuxi and Plumatella) it is less easy to formulate plausible explanations at this stage. The pool is briefly compared with similar brackish lagoons elsewhere and its place in existing classifications of brackish waters is discussed. (See also W72-05466)--Copyright 1974, Biological Abstracts, Inc.
W78-00258

HIGHWAY ICE AND SNOW REMOVAL AND DEICING SALT PROBLEMS AT LAKE TAHOE,
California State Dept. of Transportation, Sacramento.
D. Foster.
In: Proceedings: Lake Tahoe Research Seminar III, January 17, 1975, p. 3-27. 2 tab. NSF-RA-G'75-001, NSF ISR73-09293-A02.

Descriptors: *Snow removal, *Highway icing, *Highways, *Environmental effects, Surface runoff, Ice, Water quality control, Water pollution sources, Salts, Roads, California, Nevada, Pollutants, Water pollution, Soil contamination.
Identifiers: *Lake Tahoe Basin(Cal-Nev).

Problems associated with environmental effects caused by use of salt for highway snow and ice removal are discussed in regard to the Lake Tahoe Basin. Loss of vegetation along roadsides, and water pollution from highway runoff are possible dangers, together with corrosion of steel and deterioration of concrete on bridge supports and decks. Routine use of salt in California which did not begin until 1962-63, rose to 22,000 tons in 1969. In Caltrans District 3 costs in 1973-74 were $212,000, down from $339,546 the previous winter. Since 1962 the Division of Highways has had a 'bare pavement' policy. Alternative methods of snow and ice control have been tried or considered, including abrasives, vacuum equipment, chains, serrated packed snow, and chemicals other than salt. Abrasives, including sand and gravel, can lead to siltation. Chains have drawbacks, such as inconvenience, pavement and tire wear, and driver over-confidence. Seventeen compounds were tested as salt replacements; two were considered promising--Tetrapotassium-pyrophosphate and Urea--both are potential environmental hazards. (See also W78-00260) (Lynch-Wisconsin)
W78-00261

FAUNAL DISTRIBUTIONS IN SOFT SEDIMENTS OF THE SEVERN ESTUARY,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group; and Imperial Coll. of Science and Technology, London (England).
C. R. Boyden, and C. Little.
Estuarine Coastal Mar Sci. 1(3), p 203-223, 1973.

Descriptors: Distribution, Sediments, Estuaries, Sewage, Path of pollutants, Water pollution sources.
Identifiers: England, *Severn Estuary.

The pattern of the infauna on particulate shores of the southern coast of the Severn Estuary (England) has been examined. Although mud predominates as the major beach substratum within the Estuary, sand beaches occur in both the lower and upper reaches. Liquid mud is found at l.w. (low water) in the middle reaches. Suitability of substratum is shown to be the most important factor influencing animal distribution. The number of infaunal species found in this survey did not increase markedly towards the mouth, in contrast to the pattern displayed by rocky shore animals. Several species were rare or absent on mud beaches close to the entrance of the River Avon and the possibility that sewage contamination is responsible for this is discussed.--Copyright 1974, Biological Abstracts, Inc.
W78-00272

SOME FACTORS AFFECTING THE DISTRIBUTION OF ESTUARINE ISOPODS (CRUSTACEA),
University Coll. of Swansea (Wales). Dept. of Zoology.
C. E. Harvey, M. B. Jones, and E. Naylor.
Estuarine Coastal Mar Sci. 1(2), p 113-124, 1973.

Descriptors: *Crustaceans, Distribution, *Isopods, *Ecological distribution, Estuaries, Temperature, Salinity, Estuarine environments.
Identifiers: *United Kingdom(Wales).

The ecological distribution of intertidal isopods is described for a large estuary in South Wales (United Kingdom). Experiments on temperature and salinity tolerances and substrate preference permit an evaluation of the factors limiting the distribution of each species. The replacement of species along the estuary relates to differences in their tolerance of various physical conditions.--Copyright 1974, Biological Abstracts, Inc.
W78-00275

DEEPWATER DUMPSITE 106 BATHYMETRY AND BOTTOM MORPHOLOGY,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 2L.
W78-00311

PHYTOPLANKTON IN THE VICINITY OF DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-00317

DEEPWATER DUMPSITE 106: ZOOPLANKTON STUDIES,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab.
K. Sherman, D. Busch, and D. Bearse.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 233-303, June 1977. 15 fig, 18 tab, 15 ref.

Descriptors: *Zooplankton, *Ecology, *Waste disposal, *Environmental effects, *Baseline studies, Bioindicators, Water pollution sources.
Identifiers: *Outer continental shelf, *Ocean dumping.

The relative abundance and distribution of selected groups of zooplankton and the variation in dominant species between summer and winter within the water masses found in the dumpsite area are described. If the kinds and abundances of organisms routinely occurring at the site are identified, experiments can be designed to test the effects of the waste on appropriate, important species. Also, these data provide an information base which can be used for comparison which will attempt to detect environmental effects of ocean dumping. (Sinha - OEIS)
W78-00318

GELATINOUS ZOOPLANKTON AT DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
R. Harbison, L. Madin, and V. McAlister.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 305-307, June 1977. 1 tab.

Descriptors: *Zooplankton, *Water pollution sources, *Waste disposal, *Water pollution effects, *Baseline studies, *Environmental effects, Bioindicators.
Identifiers: *Outer continental shelf, *Ocean dumping, Salpa aspera.

SCUBA collections of macrozooplankton in the DWD-106 area during the two cruises in 1976 represented dissimilar assemblages of animals. There is a considerable difference between the zooplankton assemblages present in the dumpsite during two periods, two months apart. An even greater contrast exists between two cruises and the dumpsite sampling program carried out in July 1975. Salpa aspera was collected in large numbers in 1975, in midwater trawls taken between 0-800 m. No S. aspera were seen on SCUBA dives or any of four ALVIN dives (to a 1000 m maximum depth) made in the site in June 1976. Salpa aspera is a vertical migrator, and dense populations in the DWD 106 area could transport flocculent pollutants by filtering and ingesting them at the surface and releasing them in fecal pellets at greater depths during migration. However, the presence of S. aspera or any other particular species in the dumpsite, is clearly not seasonally consistent, or predictable. Therefore, biological transport or transformation by a specific zooplankton organism cannot realistically be incorporated into a general model of the fate and effects of pollutants at DWD 106. (Sinha - OEIS)
W78-00319

DISTRIBUTION AND ABUNDANCE OF MESOPELAGIC FISHES ON CRUISES 2 AND 3 AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Dept. of Zoology.
W. H. Krueger, R. H. Gibbs, Jr., R. C. Kleckner, A. A. Keller, and M. J. Keene.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 377-422, June 1977. 7 fig, 21 tab, 10 ref.

Descriptors: *Fish populations, Ecology, *Waste disposal, *Water pollution sources, *Baseline studies, *Environmental effects, Biomass.
Identifiers: *Outer Continental Shelf, *Ocean dumping.

Vertical aspects of distribution and abundance of the midwater fishes taken during July 1975 and February 1976 are reported. Whether or not the effects of pollution become discernible in the DWD-106 area, pollutants are doubtless carried out of the area by water movements and also by vertically migrating fishes and other organisms. Dumping at DWD-106 and other oceanic areas is most likely to result in long-term, perhaps distant accumulative effects, currently too obscure to be detected readily, but slowly affecting oceanic communities. (Sinha-OEIS)
W78-00321

A SUMMARY OF THE INPUT OF INDUSTRIAL WASTE CHEMICALS AT DEEPWATER DUMPSITE 106 DURING 1974 AND 1975,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
J. J. Bisagni, S. W. Congdon, and K. A. Hausknecht.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 3, Contaminent Inputs and Chemical Characteristics - Appendix, p 487-497, June 1977. 6 tab.

Descriptors: *Industrial wastes, *Chemical wastes, *Heavy metals, *Waste disposal, Water pollution effects, Baseline studies, Environmental effects.
Identifiers: *Outer continental shelf, *Ocean dumping.

The input of the major chemical components of the industrial waste materials at DWD 106 during 1974 and 1975 are summarized. Tabulated data show volume and quantity as well as components or constituents dumped. Four firms - duPont, American Cyanimid, Modern Transportation Co. and Chevron accounted for the industrial waste input at the site in 1974 and 1975. (Sinha - OEIS)
W78-00327

RESULTS OF STUDIES ON THE DISTRIBUTION OF SOME TRANSITION AND HEAVY METALS AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
K. A. Hausknecht.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 3, Contaminent Inputs and Chemical Characteristics - Appendix, p 499-541, June 1977. 16 fig, 12 tab, 45 ref.

Descriptors: *Waste disposal, *Industrial wastes, *Heavy metals, *Baseline studies, *Environmental effects, Water pollution, Delaware, Cadmium, Zinc, Copper, Manganese, Lead, Mercury.
Identifiers: *Outer continental shelf, *Ocean dumping, Pollution surveys, New York Bight.

The waste materials discharged at DWD 106 contain transition and heavy metals in concentrations that are several orders of magnitude higher than ambient levels in the water column. Since the introduction of these wastes into the ocean may result in potentially harmful changes in the concentrations or chemical speciation of toxic metals, water samples have been analyzed on two of the three characterization cruises conducted at DWD 106 to provide data on the ambient background levels of some of these metals in that region. This paper reports the distribution of zinc, mercury, cadmium, copper, lead, and manganese at DWD 106 based on data collected by R/V ALBATROSS IV in May 1974 and FRS OREGON II in February 1976. (Sinha - OEIS)
W78-00328

FINAL REPORT ON HEAVY METALS IN SMALL PELAGIC FINFISH, EUPHAUSID CRUSTACEANS AND APEX PREDATORS, INCLUDING SHARKS, AS WELL AS ON HEAVY METALS AND HYDROCARBONS (C15+) IN SEDIMENTS COLLECTED AT STATIONS IN AND NEAR DWD 106,
National Marine Fisheries Service, Milford, CT. Middle Atlantic Coastal Fisheries Center.
R. Greig, and D. Wenzloff.

In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 3, Contaminent Inputs and Chemical Characteristics - Appendix, p 547-564, June 1977. 1 fig, 4 tab, 8 ref.

Descriptors: *Waste disposal, *Baseline studies, *Environmental effects, *Water pollution, *Heavy metals, *Oil pollution, Industrial wastes, Crustaceans.
Identifiers: *Outer continental shelf, *Ocean dumping, Pelagic fish, Hydrocarbons, Finfish, Predators, New York Bight.

During a cruise (18 February - 3 March, 1976) of the FRV OREGON II to the deepwater industrial waste site designated as DWD 106, trawl and bongo net samples were collected to obtain small pelagic finfish and euphausid crustaceans. The resulting heavy metal data are provided in this report and are compared with similar data which resulted from earlier collections made in and near the DWD 106 and on the continental shelf of the New York Bight. Heavy metal values in deepwater sediments collected in 1976 were generally similar to those reported for collections made in 1974. Concentrations of metals in sediment from stations on the shelf in less than 200 m of water were similar to those collected from shelf stations in 1974. The amounts of C15+ hydrocarbons in sediments from DWD 106 are much less than those found in sediments at other dumpsites located in relatively shallow coastal waters. (Sinha - OEIS)
W78-00330

APPENDIX, (NOAA DUMPSITE EVALUATION REPORT),
National Marine Fisheries Service, Washington, DC. National Systematics Lab.
For primary bibliographic entry see Field 5E.
W78-00331

ATMOSPHERIC VANADIUM TRANSPORT TO THE OCEAN,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
R. A. Duce, and G. L. Hoffman.
Atmospheric Environment, Vol. 10, No. 11, 1976. p 989-996, 2 fig, 7 tab, 34 ref.

Descriptors: *Water pollution sources, *Environmental effects, *Vanadium, Atmosphere, Transportation, *Oceans, Model studies, *Path of pollutants, *Air pollution.
Identifiers: Atmospheric transport(Vanadium).

Evaluation of data shows most of the vanadium present in the northern hemisphere westerlies over the Atlantic and Pacific Oceans to be from anthropogenic sources. There have been no direct measurements of the flux of atmospheric vanadium to the ocean surface but model estimates indicate that approximately 10% of the anthropogenic atmospheric vanadium produced in continental areas is deposited in open ocean regions. It is suggested that this element may serve as a valuable tracer in theoretical and experimental models designed to evaluate transport of atmospheric pollutants to the open ocean. (Chilton-ORNL)
W78-00336

ZOOPLANKTON OF BACINSKA LAKES: A CONTRIBUTION TO THE KARSTIC LIMNOLOGY, (IN SERBO-CROATIAN),
Bioloski Inst., Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2H.
W78-00340

DISSOLVED AND PARTICULATE TRACE METALS IN THE RHINE ESTUARY AND THE SOUTHERN BIGHT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
J. O. Duinker, and R. F. Nolting.
Marine Pollution Bulletin, Vol. 8, No. 3, March 1977. p 65-71, 9 fig, 1 tab, 17 ref.

Descriptors: Environmental effects, *Water pollution sources, *Trace elements, Copper, Zinc, Iron, Manganese, Aluminum, Estuaries, Sedimentation, Chemical precipitation, *Metals.
Identifiers: Mobilization processes, *Rhine estuary, *Southern Bight.

The purpose of measurement of dissolved and particulate trace metals was to study the relative importance of precipitation and sedimentation processes as compared to mobilization processes in the estuary and their impact on trace metal levels in the Southern Bight. Distribution of the amounts of leacheable trace metals in the bight was similar to the distribution of suspended matter. Offshore stations had minimum values of copper, iron, manganese, zinc and aluminum with these values increasing towards the coast. Particulate metal concentrations were distributed in a more complex way. Copper and zinc distributions were similar as were those of iron, manganese and aluminum. Observations showed that the Rhine estuary acts as a sink for trace metals including dissolved species. This conclusion does not support the mobilization theory. Results indicate that pollution of the Southern Bight by a number of river-borne trace metals at the moment is primarily a coastal problem. (Chilton-ORNL)
W78-00344

QUALITY OF EFFLUENTS FROM VARIOUS MECHANICAL PULPING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong.
Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1976, Preprints, p 163-168A. 3 fig, 33 ref, 6 tab.

Descriptors: *Pulp wastes, *Water quality, Effluents, Wastes, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Toxicity, Pulp and paper industry, Treatment facilities.
Identifiers: *Mechanical pulping, Newsprint mills, Groundwood mills, Refiner groundwood mills, *Thermomechanical pulp mills.

Many newsprint mills are presently considering the replacement of their stone groundwood or refiner groundwood pulping process with a thermomechanical pulping (TMP) process. Aside from the obvious economic considerations, the environmental impact of such changes may need to be considered carefully also. At present, there is only limited information available on the comparative qualities of conventional mechanical pulping and TMP effluents. Present evidence indicates that TMP effluents may contain more BOD and toxic substances than conventional mechanical pulping effluents. (Witt-IPC)
W78-00368

SOME PHYSICAL, CHEMICAL, AND MICROBIOLOGICAL CHARACTERISTICS OF TWO BEACHES OF ANGLESEY,
University Coll. of North Wales, Bangor. Dept. of Marine Biology.
K. B. Pugh, A. R. Andrews, C. F. Gibbs, S. J. Davis, and G. D. Floodgate.
J Exp Mar Biol Ecol. 15(3), p 305-334, 1974.

Descriptors: *Bacteria, *Microbiology, *Beaches, Sands, *Nitrates, *Nitrogen, Chemical properties, Physical properties, Sand dunes, Waves.
Identifiers: Anglesey, *United Kingdom(Wales).

Observations during 1971 and 1972 of some of the physical, chemical and microbiological characteristics of contrasting Anglesey beaches, Newborough and Llanddona (United Kingdom), are reported. The fine sandy beach at Newborough was very unstable and topographical changes were recorded. In particular, the movement of a sand wave across the intertidal zone from low water to extinction at the foot of the dune system was observed. The more extensive fine sandy beach at Llanddona had greater stability. Chemically, each beach was variable both spatially and temporally, with ill-defined patterns of concentration changes. Sand from Newborough beach was low in organic C (0.07-0.40 mg C/g dry sand) and well aerated, and the soluble inorganic N in the ground water (up to 30 micrograms-at. N/l) was dominated by nitrate form (up to 22 micrograms NO3-N/l). By contrast, Llanddona sand had a more variable organic C content (0.22-2.25 mg C/g dry sand), was wetter, and poorly aerated with consequent sulphide lenses; its dissolved inorganic N (over 70 microgram-at. N/l) was completely dominated by the ammonium form. Microbiologically, the beaches possessed dissimilar bacterial floras, and sediment from Llanddona gave higher bacterial counts than that from Newborough. For both beaches estimated bacterial numbers decreased with depth as well as down the intertidal zone.--Copyright 1975, Biological Abstracts, Inc.
W78-00375

CHARACTERIZING EFFLUENT VARIABILITY FROM PAPER INDUSTRY WASTEWATER TREATMENT PROCESSES EMPLOYING BIOLOGICAL OXIDATION,
Tufts Univ., Medford, MA.
J. J. McKeown, and I. Gellman.
Progress in Water Technology, Vol 8, No 1, p 147-163, 1976. 12 fig, 1 ref, 6 tab.

Descriptors: *Pulp wastes, Discharge(Water), *Waste water treatment, *Biological treatment, Effluents, Pulp and paper industry, Wastes, Suspended solids, Biochemical oxygen demand, Activated sludge, Aerated lagoons, *Oxidation lagoons, Waste water(Pollution), *Oxidation.
Identifiers: Groundwood mills, Sulfite pulp mills, Kraft mills, Deinking mills, *Biological oxidation.

The variability existing in final effluents discharged from the pulp and paper industry is reviewed for several integrated mills with different pulping operations, including groundwood, sulfite, bleached kraft, and waste paper deinking mills. Effluent treatment systems associated with these manufacturing operations include activated sludge, aeration stabilization systems (single- and two-stage) with post-storage following several of the biological oxidation systems. Suspended solids and BOD (lb/day) are examined for frequency distribution, coefficient of variation, autocorrelation, and power spectrum. With few exceptions, effluent BOD and suspended solids frequencies are more centrally distributed using the logarithm of the data. Variations in the annual averages of BOD and suspended solids show wide ranges, indicating major differences in the manufacturing process and/or treatment systems. Insight into the trends and frequencies which exist in the effluent data was obtained from a time series analysis. (Swichtenberg-IPC)
W78-00378

HEAVY METALS IN THE DERWENT ESTUARY,
Tasmania Univ., Hobart. Dept. of Chemistry.
H. Bloom, and G. M. Ayling.
Environmental Geology, Vol 2, p 3-22, 1977. 12 fig, 15 tab, 73 ref.

Descriptors: *Heavy metals, Metals, Distribution, *Estuaries, *Cadmium, *Chromium, *Cobalt, *Copper, *Iron, *Lead, *Mercury, Manganese, Estuarine environment, Path of pollutants, Nickle, Zinc, Absorption, Bioindicators, Shrimp, Water pollution sources, Invertebrates, Toxicity, Sediments, Australia.
Identifiers: *Barnacles, Bioaccumulation, Tissue analysis, Tasmania, *Derwent Estuary(Tasmania).

Analyses of the concentrations of Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, and Zn in filtered waters,

suspended particulates, sediments, shellfish, fish, airborne particulates, and sewage confirmed that the Derwent Estuary was heavily contaminated, particularly with mercury, cadmium, lead, and zinc. Apparently most of the contamination originated from the earlier operation of a zinc refining plant. A study of shellfish growing in variously contaminated regions found that more than 20 species could be listed in order of their respective abilities to accumulate each heavy metal. The mussel was found to be a good indicator of cadmium and mercury contamination, but less valuable as an indicator of zinc. The surf barnacle was found to be one of the most sensitive biological indicators of cadmium contamination. (Klein)
W78-00393

HYDROCARBON BUDGETS FOR LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
S. G. Wakeham.
Limnology and Oceanography, Vol 22, No 5, p 952-957, 1977. 1 fig, 2 tab, 18 ref.

Descriptors: *Path of pollutants, *Organic compounds, Runoff, *Urban runoff, *Water pollution sources, Lakes, *Oil, Fuels, Oil pollution, Oil wastes, Rivers, *Sedimentation, *Washington.
Identifiers: *Lake Washington(Wash), *Hydrocarbon budget.

Fluxes of hydrocarbons through Lake Washington showed that urban stormwater runoff and river runoff were the major sources of petroleum hydrocarbons to the lake. Sedimentation was the primary removal process for these hydrocarbons. (Klein)
W78-00394

BIOLOGICAL TRANSPORT OF ZINC-65 INTO THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
W. G. Pearcy, E. E. Krygier, and N. H. Cutshell.
Limnology and Oceanography, Vol 22, No 5, p 846-855, 1977. 2 fig, 4 tab, 35 ref.

Descriptors: *Metals, *Zinc, *Path of pollutants, *Translocation, *Radioisotopes, Benthos, Movement, Mode of action, Water conveyance, Vertical migration, Food chains, Biological communities, Benthic fauna, Sampling.
Identifiers: *Biological transport, Pelagic fauna.

The specific activities of zinc-65 (65Zn:Zn) in pelagic and benthic animals collected off Oregon were correlated with depth of capture to estimate vertical biological transport rates. Results suggested that about 2 yr were required for transport of 65Zn from near-surface to abyssobenthic animals. Vertical transport appeared to be slower in upper waters, suggesting recycling of zinc within biological communities, and more rapid below 500 m. The long vertical transport time for zinc constrasted with the shorter times estimated for transport of zinc and other elements by fecal pellets. This raised questions about the importance of fecal pellets as a rapid transport mechanism for biologically required materials into the deep sea. (Klein)
W78-00395

MERCURY LEVELS IN BIOTA FROM MORRUM RIVER DURING A 10 YEAR CLEAN-UP PERIOD,
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
M. Olsson.
Institute of Freshwater Research, Drottningholm No. 52, p 71-90, 1977. 4 tab, 15 fig, 30 ref.

Descriptors: *Mercury, Rivers, *Metals, *Distribution, *Biota, Water pollution sources, Invertebrates, Fish, Absorption, Metabolism, Pulp wastes, Water quality, Sampling, Water quality control, Quality control, Path of pollutants.
Identifiers: Bioaccumulation, *Morrum River(Sweden).

No correlation was found between mercury levels and the food or choice of habitat of the different species. The ratios between the mercury levels found in 8 different species were the same in uncontaminated as in contaminated areas. The levels found in invertebrates seemed to depend mainly on intake from the water and possibly also on the metabolic rate of the organism. For the main part of the material collected downstream from the paper-mill the decrease in the mercury concentration with time seemed to be exponential. During the discharge period the highest levels occurred close to the paper-mill on the downstream side. After the discharge had ceased the highest levels were found lower down the river. The geographical change in the concentration maximum was probably due to the fact that the source of pollution became the sediments instead of the paper-mill and that water further down the river has passed over a larger area of the sediments. The decrease in mercury levels was rapid in fish. (Klein)
W78-00397

DISTRIBUTION AND TEMPERATURE ADAPTATION IN THE TELEOST FISH GENUS GIBBONSIA,
San Francisco State Univ., CA. Dept. of Biology.
B. J. Davis.
Marine Biology, Vol. 42, p 315-320, 1977. 3 fig, 4 tab, 18 ref.

Descriptors: *Coasts, *Teleosts, *Sampling, *Temperature, *Distribution, *Intertidal areas, *Thermal stress, Shores, Seasonal, California, Resistance. Speciation, Adaptation, Mode of action, Environmental gradient.
Identifiers: *Gibbonsia, Environmental ecology.

Along the California coast there exist three intertidal species of the genus Gibbonsia (G. elegans, G. metzi, G. montereyensis). These species had distinct but overlapping distributions. Collections were made seasonally from three areas. Each collection was divided into two groups - a critical thermal maximum and minimum were determined for one group and the other group was tested after a 3 week acclimation period. The three species showed genetically different adaptation abilities and these were correlated with species differences in latitudinal distributions. The species that experiences the widest seasonal temperature range proved capable of anticipatory adjustment to temperature while the two experiencing small seasonal changes showed only reactive adjustments. The species with the widest distribution showed the greatest ability to adapt to temperature extremes. After 1 week acclimation all three species demonstrated different mechanisms for heat and cold adaptation. (Klein)
W78-00399

EFFECTS AND UPTAKE OF CHLORINATED NAPHTHALENES IN MARINE UNICELLULAR ALGAE,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-00403

CONCENTRATION OF CADMIUM, COPPER, LEAD, AND ZINC IN THIRTY-FIVE GENERA OF FRESHWATER MACROINVERTEBRATES FROM THE FOX RIVER, ILLINOIS AND WISCONSIN,
Northern Illinois Univ., DeKalb. Dept. of Biological Sciences.
R. V. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No. 3, p 345-349, 1977. 1 tab, 6 ref.

Descriptors: *Speciation, *Distribution, *Metals, Invertebrates, *Crustaceans, *Copper, *Cadmium, *Zinc, *Lead, Path of pollutants, Freshwater, Food chains, Ecosystems, Analytical techniques, Aquatic life, Trophic level, Rivers, Sampling, Illinois, Wisconsin.
Identifiers: Bioaccumulation, Tissue analysis, Fox River(Ill-Wis).

The general relationship for 35 genera of aquatic invertebrates from the Fox River was Cd<Cu<Pb<Zn, except in crustaceans where Cd<Pb<Cu<Zn. Large variations in values among the taxa studied was, in part, a function of the sampling locations as well as the trophic position of a particular taxa within a food chain. (Klein)
W78-00404

PARALYTIC SHELLFISH POISONING IN TENAKEE, SOUTHEASTERN ALASKA: A POSSIBLE CAUSE,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
For primary bibliographic entry see Field 5C.
W78-00406

WATER QUALITY CRITERIA RESEARCH OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY, PROCEEDINGS OF AN EPA SPONSORED SYMPOSIUM ON MARINE, ESTUARINE AND FRESHWATER QUALITY, PRESENTED AT THE 26TH ANNUAL MEETING OF THE AIBS, AUGUST 1975.
Corvallis Environmental Research Lab., OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 091, Price codes: A09 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-76-079, 207 p, 1976, 81 fig, 38 tab, 221 ref.

Descriptors: *Water quality standards, *Publications, *Research and development, Model studies, Mathematical models, Chlorine, Ecosystems, Toxins, Freshwater, Marine biology, Toxicity, Estuaries, Lakes, Phosphorus, Nitrogen, Laboratory tests, Trace metals, Bioassay, Biological communities, Productivity, Water pollution sources.
Identifiers: *Water quality criteria(Environmental Protection Agency).

The proceedings included a cross-sectional representation of the broad base ecological effects research programs conducted by research laboratories of the EPA Office of Health and Ecological Effects. The presentations focused on microbial and abiotic degradation processes, the problem of trace metals, the effects of toxic organics, and the feasibility of new-stress-measuring methodologies in the marine environment. The freshwater segment of the symposium addressed the transport and biological modeling capabilities of the laboratories, cold climate aquatic biology, lake trophic states in the eastern United States, and the impact of toxic substances on freshwater systems. (See W78-00409 thru W78-00421) (Klein)
W78-00408

STRUCTURAL ANALYSIS OF STRESSED MARINE COMMUNITIES,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-00409

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
E. W. Davey.
In: Water Quality Criteria of the U.S. Environmental Protection Agency, Report EPA-600/3-76-079, p 13-22, 1976. 1 fig, 3 tab, 7 ref.

Descriptors: *Metals, *Toxicity, *Oceans, *Trace elements, *Elements(Chemical), Water pollution sources, Wastes, Bioassay, Water quality, Analytical techniques, Sampling, Path of pollutants, Inorganic chemicals, Environmental effects, Cadmium, Copper, Mercury, Zinc.
Identifiers: *Bioaccumulation.

A metals matrix indicated that information exists in only 36 elements and of these only 18 have toxicity data listed and of the 18 only four (Cd, Cu, Hg, and Zn) were significantly documented in terms of toxicity and bioaccumulation. A program was developed for acute and chronic marine bioassay information on a wide spectrum of elements. On the basis of known human toxicity, information indicating elemental impact in the marine environment and the form of the element in seawater, 50 elements were to be chosen for short-term, acute bioassays. Metal pollution sources were discussed. (See also W78-00408) (Klein)
W78-00410

PERSISTENCE IN MARINE SYSTEMS,
Environmental Research Lab., Narragansett, RI.
K. T. Perez.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 23-30, 1976. 3 fig, 2 tab, 10 ref.

Descriptors: *Benthos, *Biological communities, *Model studies, *Sampling, *Persistence, *Toxicity, *Systems analysis, *Simulation analysis, Bioassay, Path of pollutants, Water pollution sources, Environmental effects, Aquatic life, Methodology.
Identifiers: Laboratory microcosms.

A strategy for establishing limits for the consequences of changes in total systems caused by various disturbances was developed. Systems were viewed as holistic; laboratory marine microcosms were established; and persistence limits of a system were defined. (See also W78-00408) (Klein)
W78-00411

CRITERIA FOR MARINE MICROBIOTA,
Environmental Research Lab., Narragansett, RI.
V. J. Cabelli, A. P. Dufour, M. A. Levin, and P. W. Haberman.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 31-45, 1976. 5 fig, 6 tab, 18 ref.

Descriptors: *Biota, *Beaches, *Bioindicators, *E. coli, *Sewage bacteria, *Bacteria, *Animal physiology, *Water quality standards, Metabolism, Productivity, Coliforms, Pathogenic bacteria, Recreation facilities, Population, Microorganisms, Water pollution effects, Environmental effects, Public health.
Identifiers: *Klebsiella, *Aeromonas hydrophila, Human physiology.

Estuarine and coastal waters as microbial indicators were examined in assessing the ecological and human health impact of industrial, agricultural and sanitary pollutants but were found to not yet have been adequately quantified. Pollution associated effects on human health were found to be more amenable to quantification for guidelines and standards for water. A long-term epidemiological-microbiological program was developed and confirmed a close relationship of GI symptomology of swimmers at New York City beaches to E. coli, Klebsiella, and Aeromonas hydrophila densities. (See also W78-00408) (Klein)
W78-00412

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
For primary bibliographic entry see Field 5C.
W78-00413

TECHNIQUES TO ASSESS THE EFFECTS OF TOXIC ORGANICS ON MARINE ORGANISMS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-00414

THE EFFECT OF SUBTLE TEMPERATURE CHANGES ON INDIVIDUAL SPECIES AND COMMUNITY DIVERSITY,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-00415

MODELS FOR TRANSPORT AND TRANSFORMATION OF MALATHION IN AQUATIC SYSTEMS,
Environmental Research Lab., Athens, GA.
J. W. Falco, D. L. Brockway, K. C. Sampson, H. P. Kollig, and J. R. Maudsley.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 97-113, 1976. 9 fig, 4 tab, 11 ref.

Descriptors: *Toxins, Research and development, *Model studies, *Organic compounds, *Organophosphorous compounds, *Mathematical models, Design, Model studies, Laboratory tests, Ecosystems, Simulation analysis, Bacteria, Research equipment, Transfer, Biochemistry, Chemistry, Physical models.
Identifiers: *Malathion.

A mathematical model was developed for predicting the fate and transport of malathion in riverrine aquatic ecosystems. Two competing degradation pathways were modeled-alkaline hydrolysis and microbial breakdown. Incorporating data obtained from previous laboratory studies, the model was used to verify proposed degradation mechanisms by predicting the behavior of malathion in the AEcoS, a physical system designed to simulate environmental conditions as closely as possible. Although in general results were similar for the two systems, rates measured in the environmental simulator were slower than those measured in laboratory studies. (See also W78-00408) (Klein)
W78-00416

SHAGAWA LAKE RECOVERY CHARACTERISTICS AS DEPICTED BY PREDICTIVE MODELING,
Corvallis Environmental Research Lab., OR.
D. P. Larsen, and H. T. Mercier.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 114-137, 1976. 6 fig, 2 tab, 28 ref.

Descriptors: *Model studies, *Lakes, *Phosphorus, Mathematical models, Research and development, Physical models, Biomass, Algae, Water quality, Laboratory tests, Analytical techniques, Effluents, Environmental effects, Inorganic compounds, Ecosystems, Limnology, Water chemistry, *Minnesota, Forecasting.
Identifiers: *Predictive modeling, *Shagawa Lake(Minn).

Predictions obtained using several mass balance models describing changes expected in lake phosphorus concentrations resulting from an external phosphorus supply reduction to Shagawa Lake were compared with observations. Two of the models predicted a rapid recovery of the lake and underestimated present wintertime phosphorus concentrations by about 50%. A third model which includes an algal biomass component projected similar wintertime total phosphorus concentrations but showed how internal sources of phosphorus can delay the attainment of this level. Two of these models were used to project lake phosphorus concentrations expected if wastewater phosphorus concentrations were allowed to increase from the present 50 microg/liter to 400 micro g/liter and 1.0 mg/l. Both suggested that at effluent concentrations of 1.0 mg/l, the lake would exhibit phosphorus concentrations often associated with a eutrophic state. (See also W78-00408) (Klein)
W78-00417

A MATHEMATICAL MODEL OF POLLUTANT CAUSE AND EFFECT IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
W. L. Richardson, and V. J. Bierman, Jr.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, 1976. p 138-158. 17 fig, 2 tab, 9 ref.

Descriptors: *Mathematical models, *Model studies, *Water quality, *Methodology, *Physical models, *Chlorophyll, *Growth rates, *Lake Huron, *Data collections, *Biomass, Distribution, Nutrients, Population, Phytoplankton, Limnology, Research and development.
Identifiers: *Saginaw Bay(Lake Huron).

Field examination of water quality and development of cause and effect models for data interpretation was undertaken in Saginaw Bay. Models were designed to simulate the effect of nutrients on the growth, composition, and distribution of phytoplankton biomass. Methodology, including the practical considerations of applying an existing model, a phytoplankton chlorophyll-nutrient model, was the primary emphasis of the study. The average chlorophyll a biomass model was found to be an economical research tool in analyzing complex limnological interactions and useful in guiding additional research and data gathering activities. (See also W78-00408) (Klein)
W78-00418

MATHEMATICAL MODEL OF PHYTOPLANKTON GROWTH AND CLASS SUCCESSION IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
For primary bibliographic entry see Field 5C.
W78-00419

IMPLICATION OF RESOURCE DEVELOPMENT ON THE NORTH SLOPE OF ALASKA WITH REGARD TO WATER QUALITY ON THE SAGAVANIRKTOK RIVER,
Corvallis Environmental Research Lab., College, AK. Arctic Environmental Research Station.
E. W. Schallock.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 174-184, 1976. 3 fig, 1 tab, 20 ref.

Descriptors: Alaska, Industries, *Water quality, Aquatic life, *Environmental effects, *Industrial wastes, Sewage, Water quality, Oil, Water pollution sources, Precipitation(Atmospheric), *Arctic.
Identifiers: *Sagavanirktok River(Alas), *Alaska(North Slope).

The impact of industry on water quality of the Sagavanirktok (Sag) River, located on the North Slope of Alaska, and the ensueing effects on indigenous aquatic biota were investigated. Rapidly expanding industry, drawing on water and gravel, permafrost, and limited water precipitation were impact sources studied. (See also W78-00408) (Klein)

W78-00420

LAKE EUTOPHICATION: RESULTS FROM THE NATIONAL EUTROPHICATION SURVEY,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5C.
W78-00421

MONITORING THE ENVIRONMENT FOR ECOLOGICAL CHANGE,
Washington Univ., Seattle. Dept. of Biostatistics.
G. van Belle, and L. Fisher.
Journal Water Pollution Control Federation, Vol. 49, p. 1671-1679; 5 tab, 12 ref.

Descriptors: *Methodology, *Distribution, *Statistical models, *Statistical methods, *Frequency analysis, Data collections, Data processing, Bays, Sampling, Statistics, Biological communities, Ecosystems, Wisconsin, *Monitoring, *Pollutant identification.
Identifiers: Diversity index, *Green Bay(Wisc).

The statistical aspects of monitoring water systems in time and space for sudden ecological changes were considered. The data consisted of species-frequency lists collected at several sites at one or more times. The major statistical problem with analyzing the lists was the establishment of an appropriate frequency distribution under a suitable hypothesis. The paper employed a permutational approach to generate appropriate frequency distributions. Statistical tests were then developed to test whether biological communities or changes in biological communities were connected with ecological changes some distance removed from these communities. The procedures were illustrated by data from Green Bay, Lake Michigan. (Katz)
W78-00422

AQUATIC INSECTS AS BIOLOGICAL MONITORS OF HEAVY METAL POLLUTION,
Iranian Dept. of the Environment, Tehran.
R. B. Nehring.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 2, p. 147-154, 1976; 1 fig, 7 tab, 12 ref.

Descriptors: *Invertebrates, *Mayflies, *Aquatic insects, *Bioindicators, *Metals, *Heavy metals, *Toxicity, *Stoneflies, *Lead, *Copper, *Zinc, Pollutant identification, Resistance, Path of pollutants, Animal physiology, Bioassay.
Identifiers: Bioaccumulation, Ephemerella grandis, Silver, Pteronarcys californica.

A mayfly, ephemerella grandis, and a stonefly, Pteronarcys californica, were exposed to lead, zinc, copper, and silver to determine the acute metal toxicities. The insects tested were found to be more tolerant of the heavy metals than most fish. They concentrated the metals in relative proportion to the occurrence of the metals in the stream by some predictable, reproducible factor. These data, together with field tests, indicate aquatic insects may serve as effective biological monitors of heavy metal pollution where fish-kills are involved. (Katz)
W78-00426

METALS IN PLANTS AND WATERS IN THE OKEFENOKEE SWAMP AND THEIR RELATIONSHIP TO CONSTITUENTS FOUND IN COAL,
Governors State Univ., Park Forest South, IL. Coll. of Environmental and Applied Sciences.
D. J. Casagrande, and L. D. Erchull.
Geochimica et Cosmochimica Acta, Vol. 41, p 1391-1394, 1977. 2 tab, 10 ref.

Descriptors: *Peat, *Fossil fuels, *Coals, *Metals, *Swamps, Inorganic compounds, Organic compounds, Physiochemical properties, Analytical techniques, Distribution, Plant tissues, Ecosystems, Sampling, Calcium, Chromium, Copper, Iron, Mercury, Potassium, Magnesium, Manganese, Nickel, Lead, Zinc, Barium.
Identifiers: *Okefenokee Swamp, Tissue analysis, Peat-forming system.

The Okefenokee peat-forming systems were viewed as modern progenitors of coal. Plants form an intimate component of each peat-forming system and contribute organic and inorganic constituents to peat which ultimately becomes coal. Fourteen major and minor metals--Ba, Ca, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, and Zn--were determined in plants and waters from the swamp and marsh environments. The wide variations in: (1) present source vegetation between the two major environments; (2) past vegetational covers; (3) metal distributions between plants of different genera; (4) metal distributions between different anatomical components of the same species; and (5) importance of anatomical components (i.e. stems vs leaves, etc.) as organic contributors to the peat, all contributed to the erratic metal profiles previously observed in associated peat. Furthermore, the variations in metal distributions in peat-forming systems may contribute to the often wide variations in metal distributions in horizontal and vertical directions in the coal seam. (Klein)
W78-00429

THE DYNAMICS OF BIOLOGICALLY AVAILABLE MERCURY IN A SMALL ESTUARY,
Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.
S. N. Luoma.
Estuarine and Coastal Marine Science, Vol. 5, p 643-652, 1977. 8 fig, 2 tab, 12 ref.

Descriptors: *Mercury, *Shrimp, *Estuaries, *Worms, *Metals, Absorption, Runoff, Path of pollutants, Water pollution sources, Laboratory tests, Radioisotopes, Seasonal, *Hawaii, Estuarine environment, Public health.
Identifiers: *Polychaetes, *Bioaccumulation, Tissue analysis, Palaemon debilis, Nereis succinea, *Ala Wai Canal(HI).

Total mercury concentrations in shrimp (Palaemon debilis) and polychaetes (Nereis succinea) from Ala Wai Canal, a small Hawaiian estuary, fluctuated over nearly two orders of magnitude during 1973-1974. A simulation of mercury levels in shrimp from the estuary, based upon a mathematical model of 203Hg-HgC12 exchange in this species, showed that mercury concentrations in P. debilis were never at steady state during the sampling period. Shrimp appeared to rapidly concentrate solute mercury which periodically entered the estuary in storm runoff. Between rainstorms little of the mercury remaining in the estuary (primarily in sediment-bound form) appeared to be available to either the deposit-feeding shrimp or the worm. Because net loss of mercury from both species was slow relative to the rate of uptake, long periods of time were necessary to lose the mercury accumulated during the short rainstorms. (Klein)
W78-00430

POTENTIAL CONTRIBUTION OF ATMOSPHERIC FALLOUT TO THE PHOSPHORUS BUDGET OF COLUMBIA LAKE, CONNECTICUT,
Connecticut Univ., Storrs. Biological Sciences Group.
P. H. Rich, and B. L. Pallotti.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 5, p 692-697, May 1977. 4 fig, 4 tab, 12 ref. OWRT A-054-CONN(7).

Descriptors: *Fallout, *Phosphorus, *Lakes, *Connecticut, Model studies, Mathematical models, Runoff, Watersheds(Basins), Septic tanks, Fertilizers, Water pollution, Pollutants, Nutrients, Water pollution sources, Urbanization.
Identifiers: *Columbia Lake(Conn).

The Dillon-Rigler Model applied to a heavily 'urbanized' lake in New England predicted that less than one half the total input of total phosphorus enters as stream runoff. Of the remaining predicted input, about two thirds may be entering as atmospheric fallout. The balance is suspected to be septic tank seepage and lawn fertilizer runoff. Lake level management dominates the annual pattern of discharge from the watershed and basin and severely restricts the structure of the upper littoral zone. As a result, there may be an adverse effect upon the accuracy of the Dillon-Rigler Model. (Sims-ISWS)
W78-00438

ACCELERATED SALT TRANSPORT METHOD FOR MANAGING GROUND WATER QUALITY,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg, and J. W. Labadie.
Water Resources Bulletin, Vol. 12, No. 4, p 681-693, August 1976. 6 fig, 1 tab, 9 ref. OWRT B-086-COLO(4).

Descriptors: *Groundwater, *Management, *Water quality control, *Algorithms, Irrigation, Conjunctive use, Salinity, *Salts, Groundwater movement, Mathematical models, Systems analysis, Dissolved solids.
Identifiers: Screening model, Cost-effective, Water degradation, Salt accumulation.

Presented is a brief review of the problem of groundwater degradation from irrigation and of present approaches to controlling groundwater quality. As an alternative to these approaches, a management scheme called the Accelerated Salt TRANsport (ASTRAN) method is proposed as being a feasible solution to the problem of salt build-up in irrigated areas. A management algorithm for implementing the ASTRAN method is described. Results from modeling studies indicate that the ASTRAN method is cost-effective and encourages conjunctive use of ground and surface water. (Bell-Cornell)
W78-00442

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
J. F. Jones, B. P. Borofka, and R. W. Bachmann.
1976. Water Research, Vol. 10, p 117-122. 2 fig, 7 tab, 42 ref. OWRT A-049-IA(3).

Descriptors: *Eutrophication, *Phosphorus, *Nitrogen, *Land use, *Regression analysis, *Watershed, *Water quality, *Nutrients, *Drainage systems, *Nitrogen compounds, Marshland, Row crops, Pasture, Cities, Runoff, *Iowa.
Identifiers: Nitrate nitrogen(NO3-N), Ammonia nitrogen(NH3-N).

Measurements of plant nutrient loads for a number of tributary streams were made in a recent study of eutrophication in lakes in northwestern Iowa. The relationship between land use and nutrient output was studied over 2 years, 1971-1973, in order to understand consistent differences in phosphorus (P) and nitrogen (N) concentrations found in the streams. Outputs of N and P were determined by integrating flow and concentration measurements over time to yield annual losses from each watershed greater than 100 hectares. A land use (row crop, grasslands, marshlands and urban areas) and livestock (animal uniter per hectare) inventory was taken for 34 watersheds. A linear model was used to analyze the relationship between land use and N, P, nitrate nitrogen (NO3-N) and ammonia nitrogen (NH3-N). Regression analysis was used to conclude that P had a significant positive correlation with the number of animal units; that the percentage of the area in marshland had a significant negative correlation

with N 3-N concentrations, since these areas of anaerobic decomposition may reduce NO3-N by denitrification and gaseous loss of N2; that N 3-N was significantly related to the number of animal units. Additional regression analysis was conducted to study if animal placement in the watershed influenced P or NH3-N losses. Independent variables were year classes and whether feedlots or pastures had drainage to streams or tile intakes. The only sigificant variable was the number of feedlot animal units per hectare with drainage to streams or tiles. Statistically, P and N losses have not been identified with the percentage of watershed in row crops, grassland or urban areas, but sampling indicated high p, NO3-N and NH3-N in runoff from these areas. (Gentry - North Carolina)
W78-00449

PROTECTION OF VIRUSES DURING DISINFECTION BY ADSORPTION TO PARTICULATE MATTER,
Maine Univ. at Orono. Dept. of Civil Engineering.
G. D. Boardman, and O. J. Sproul.
Journal Water Pollution Control Federation, Vol. 49, No. 8, p 1857-1861, August, 1977. 7 tab, 9 ref. OWRT A-030-ME(3).

Descriptors: *Viruses, *Bacteriophage, *Disinfection, *Chlorination, *Adsorption, Laboratory tests, Kaolinite, Calcium carbonate, Aluminum, Sewage bacteria, Analytical techniques, Waste water treatment, Sewage treatment.
Identifiers: Virus inactivation, T sub 7.

Since viruses may survive waste water disinfection processes when they are adsorbed or embedded in solids, a study was undertaken to determine the actual extent of protection of viruses by adsorption onto particles during chlorination. Kaolinite, hydrate aluminum oxide, and calcium carbonate were used as adsorbents for the bacteriophage T sub 7. To produce the experimental systems, virus concentrations of between 200,000 PFU/ml and 400,000 PFU/ml were added to solutions which contained an adsorbent and were adjusted to pH 7. Centrifugation of solutions resulted in relatively high virus recovery. The virus was recovered by sonification of a 10-ml sample at an energy level of 22.5 watts for 30 seconds. Losses of virus prior to pH adjustment suggested that viral infectivity may be reduced at elevated pH values. Control studies on inactivation of T sub 7 with chlorination indicated that a chlorine dosage of 0.036 mg Cl/liter was sufficient for 100% inactivation. Inactivation by chlorination was not significantly affected by the presence of kaolinite, hydrated aluminum oxide, or calcium carbonate. It is suggested that total encapsulation of an infectious agent is necessary for protection from chlorination. (Schulz-FIRL)
W78-00450

AQUATIC INSECT DIVERSITY AND BIOMASS IN A STREAM MARGINALLY POLLUTED BY ACID STRIP MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-00451

A STUDY OF THE WASTE WASH WATER FROM EGG WASHING MACHINES,
Richard B. Russell Agricultural Research Center, Athens, GA.
For primary bibliographic entry see Field 5A.
W78-00458

EQUALIZATION OF LIQUID WASTES,
New Jersey Inst. of Tech., Newark. Dept. of Civil and Environmental Engineering.
I. Metzger.
In: Proceedings of the 21st Industrial Waste Conference, Purdue University, p 338-347, May 1966. Engr. Ext. Series No. 121.

Descriptors: *Flow rates, *Hydraulic equipment, Design data, Feasibility studies, Flow measurement, Hydraulic design, Laboratory tests, Water measurement.
Identifiers: *Equalization(Liquid wastes).

The problem resulting from shock loads can be alleviated by attempting to reduce the extremes in concentration and product a more uniform, or equalized, raw waste. Various methods used for equalization are discussed. The objective of this work was to develop a rational approach to the design of equalization tanks for continuous flow treatment. Flow-through considerations for the common sedimentation tank and rectangular equalization tank are presented. Experimental work using dye as a flow indicator show much improved flow characteristics from an experimental model tank using a triangular shaped outlet section. Flow-through curves for th conventional tanks and the experimental tank are given. (Prodehl - EPA, Corvallis)
W78-00484

5C. Effects Of Pollution

AQUATIC SURVEY OF BIG CREEK, RICH COUNTY, UTAH,–A CRITICAL HABITAT STREAM ON NATIONAL RESOURCE LANDS AFFECTED BY LIVESTOCK.
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-00004

AQUATIC SURVEY OF BIRCH CREEK, BEAVER COUNTY, UTAH--CRITICAL HABITAT STREAM ON NATIONAL RESOURCE LANDS AFFECTED BY LIVESTOCK,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
For primary bibliographic entry see Field 6G.
W78-00005

EFFECTS OF THE URBAN ENVIRONMENT ON HEAVY RAINFALL DISTRIBUTION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-00091

COASTAL WATER RESEARCH PROJECT ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1976.
Southern California Coastal Water Research Project, El Segundo.
Southern California Coastal Water Research Project Annual Report for the Year Endedd 30 June 1976, 1977. 268 p, 4 append.

Descriptors: *Water pollution sources, *Water pollution effects, *Baseline studies, *Outfall sewers, *Environmental effects, Continental shelf, *California, Resources development, Biomass, Diseases, Shellfish, Fish, Heavy metals, Pacific Ocean.
Identifiers: *Outer Continental shelf, *Resources management, Southern California, Species diversity index.

The annual report of the Southern California Coastal Water Research Project contains articles (separately abstracted) summarizing studies on the environmental effects of the disposal of municipal waste water on the continental shelf of Southern California. The articles are arranged under the following headings: sources of pollutants, distribution of pollutants, uptake in marine life, effects on marine life, the camera as an instrument, and benthic ecology. Four appendices give additional information on organization, meetings, publications and sampling at sea. (See W78-00135 thru W78-00163) (Sinha-OEIS)
W78-00134

CHROMIUM SPECIATION IN MUNICIPAL WASTEWATER AND SEAWATER,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00135

INPUTS OF DDT AND PCB,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00136

INPUTS OF CHLORINATED BENZENES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00137

TECHNIQUES FOR COLLECTING DDT AND PCB IN AERIAL FALLOUT,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00138

AERIAL FALLOUT OF METALS DURING A BRUSHFIRE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00139

SEDIMENTS AS SOURCES OF DDT AND PCB,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00140

CHARACTERISTICS OF MUNICIPAL WASTEWATER DISCHARGES, 1975,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00141

MEASUREMENTS OF SUBTHERMOCLINE CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00142

CURRENT VELOCITIES REQUIRED TO MOVE SEDIMENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00143

SLUDGE IN SANTA MONICA BAY,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00144

CHANGES IN THE GRAIN SIZE OF SEDIMENTS ON THE PALOS VERDES SHELF,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 2J.
W78-00146

VIRUSES AND BACTERIA IN COASTAL WATERS AND SHELLFISH,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00147

MERCURY IN MUSSELS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00148

MERCURY IN BENTHIC ANIMALS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00149

METALS IN SCALLOPS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00150

UPTAKE AND EFFECTS OF CHROMIUM ON MARINE FISH,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood, and J. L. Wright.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 123-128, 1977. 2 fig, 2 tab, 1 ref.

Descriptors: *Water pollution effects, *Chromium, *Heavy metals, *Fish, California, Continental shelf, Environmental effects, Water pollution sources, Resources development.
Identifiers: *Outer continental shelf, Southern California, Hexavalent chromium, Citharichthys stigmaeus.

Objectives of the study were to examine the effects of concentrations of hexavalent chromium below 5 mg/l and to determine the effects of trivalent cromium precipitate on the sanddab. It appears that (1) dissolved hexavalent chromium is biologically available to the speckled sanddab but the trivalent hydroxide precipitate is not; (2) accumulation of hexavalent chromium in this species occurs at very low exposure levels, appears to be unregulated, and is proportional to exposure concentrations; and (3) the levels of dissolved hexavalent chromium that affect feeding behavior, limit growth, disrupt tissue structure, or cause mortality are substantially higher than those likely to be encountered in the ocean. (See also W78-00134) (Sinha - OEIS)
W78-00151

CHEMICAL STUDIES OF OFFSHORE OIL PLATFORMS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-00152

FIN EROSION PREVALENCE AND ENVIRONMENTAL CHANGES,
Southern California Coastal Water Research Project, El Segundo.
A. J. Mearns, and M. J. Sherwood.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 139-141, 1977. 1 fig, 1 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Hydrogen sulfide, *Fish diseases, *Sediments, Metals, California, Continental shelf, Resources development, Water pollution sources.
Identifiers: *Outer continental shelf, Southern California, Fin erosion, Microstomus pacificus, Resources management.

Anomalies of several types are present in southern California trawl-caught benthic fishes. Data collected in 1975 and early 1976 are consistent with information obtained in past surveys in that among the diseases with external symptoms, the one most frequently observed is fin erosion, and the species most often affected is the Dover sole Microstomus pacificus. Dover sole with fin erosion have been most prevalent on the Palos Verdes shelf, the site of a major municipal wastewater outfall system. Data suggest that new cases of fin erosion are still being initiated on the shelf. Within recent years there have been a number of changes in the chemistry and biology of the benthic environment on the Palos Verdes shelf one of which involves hydrogen sulfide. Data collected indicated that the sulfide field decreased from approximately 7-10 sq km in 1973 to less than 1 sq km in 1975. If the hydrogen sulfide was a significant factor in initiation of the disease, recent reductions in the prevalence of fin erosion in Dover sole would be expected. Since this trend is not evident it appears that hydrogen sulfide in the Palos Verdes sediments is not a major factor in the initiation of the disease. (See also W78-00134) (Sinha - OEIS)
W78-00153

COMPARISON OF FIN EROSION DISEASE: LOS ANGELES AND SEATTLE,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood, and B. B. McCain.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 143-147, 1977. 3 tab, 2 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Fish diseases, Outfall sewers, Polychlorinated biphenyls, California, Washington, New York, Continental shelf, Resources development.
Identifiers: *Outer continental shelf, Southern California, Resources management, Fin erosion, New York Bight, Chlorinated hydrocarbons, Microstomus pacificus, Platichthys stellatus.

Levels of chlorinated hydrocarbons and trace elements were measured in Dover Sole (Microstomus pacifucus) from southern California and in starry flounder (Platichthys stellatus) from the State of Washington. A preliminary comparison of the trace constituents in fish with and without fin erosion suggest that total PCB is elevated in the tissues of diseased individuals of both species. Similar trends for both species were not identified for p,p'-DDE or the metals considered here. The results do imply cause and effect; however, if similarities in tissue levels of trace contaminants in the two species occur, it is possible that the common constituent is involved in the disease in both regions. The common factor identified in this preliminary study is total PCB. (See also W78-00134) (Sinha - OEIS)
W78-00154

FIN EROSION DISEASE INDUCED IN THE LABORATORY,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 149-153, 1977. 3 tab, 1 ref.

Descriptors: *Water pollution effects, *Fish diseases, *Sediments, *Environmental effects, Outfall sewers, Metals, California, Resources development, Water pollution sources.
Identifiers: *Outer Continental Shelf, Southern California, *Chlorinated hydrocarbons, Resources management, Microstomus pacificus, Palos Verdes sediments.

This experiment shows that changes in fin condition can be induced in Dover sole in the laboratory by exposing apparently healthy individuals to contaminated Palos Verdes sediments. The changes resemble early stages of fin erosion seen in field specimens. In general, levels of chlorinated hydrocarbons in the exposed fish fall between the levels reported for Palos Verdes specimens with no apparent fin erosion and those with moderate to severe fin erosion. Although not indicative of cause and effect, the results of this test, in conjunction with measurements of chlorinated hydrocarbons in field specimens, suggest that certain levels of one or more chlorinated hydrocarbons may be associated with the onset of the fin erosion disease symptoms. The uptake of chlorinated hydrocarbons by the test fish suggests that chlorinated hydrocarbons can be accumulated directly from the sediments. See also W78-00134) (Sinha-OEIS)
W78-00155

ACUTE RESPONSES OF MARINE INVERTEBRATES TO CHROMIUM,
Southern California Coastal Water Research Project, El Segundo.
P. S. Oshida, and J. L. Wright.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 155-159, 1977. 2 ref.

Descriptors: *Water pollution effects, *Toxicity, *Chromium, California, Environmental effects, Water pollution sources, Continental shelf.
Identifiers: *Outer Continental Shelf, Southern California, Resources management, Ophiothrix spiculata, Themiste sp., Sicyonia ingentis, Neanthes arenaceodentata.

The toxicity of chromium against local marine invertebrates has been tested. Both static and flow-through seawater systems have been used in the effort to determine relative sensitivities to chromium of a shrimp, a brittle star, and a sipunculid worm. Limited but informative experiments were conducted with hexavalent chromium as potassium dichromate and trivalent chromium as chromic chloride. Studies indicate that adult Sicyonia ingentis and Themiste sp. appear to be insensitive to chromium at the low levels usually found in the ocean. However, Ophiothrix spiculata and Neanthes arenaceodentata are sensitive and, hence, may be effective bioassay animals for the study of chromium toxicity. The brittle star and polychaete were the most sensitive to chromium and revealed this sensitivity in anomalous behavior and reproduction. (See also W78-00134) (Sinha-OEIS)
W78-00156

EFFECTS OF CHROMIUM ON REPRODUCTION IN POLYCHAETES,
Southern California Coastal Water Research Project, El Segundo.
P. S. Oshida.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 161-167, 1977. 1 fig, 4 tab, 1 ref.

Descriptors: *Water pollution effects, *Chromium, *Toxicity, *Reproduction, *Worms, Waste disposal, Industrial wastes, Municipal wastes, California, Continental shelf, Environmental effects, Water pollution sources.
Identifiers: *Outer Continental Shelf, Southern California, Resources management, Neanthes arenaceodentata.

Chromium is discharged into the marine waters off southern California in industrial and municipal wastewater effluents. Major goals in the investigation of effects in the marine environment have been to identify the forms of chromium that are biologically available, to determine the level at which chromium has an observable effect on marine biota, and to determine the environmental levels of chromium that can be considered safe

with the respect to the health of this biota. Tests include monitoring the survival, behavior, and reproduction of Neanthes arenaceodentata, a local marine worm, exposed to several concentrations and forms of chromium. Any assessment of the results of the two long-term hexavalent chromium toxicity tests has to be made with reservations, as the second experiment is still in progres. (See also W78-00134) (Sinha - OEIS)
W78-00157

FAUNA OF OFFSHORE STRUCTURES,
Southern California Coastal Water Research Project, El Segundo.
M. J. Allen, and M. D. Moore.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 179-186, 1977. 5 fig, 1 tab, 4 ref.

Descriptors: *Environmental effects, *Offshore platforms, *Ecosystems, *Resources development, *Outfall sewers, Ecology, California, Continental shelf.
Identifiers: *Outer Continental Shelf, Southern California, Offshore structures, Resources management, Oil platforms, Artificial reefs.

The fauna around the offshore structures is considerably more abundant than that of the surrounding soft-bottom area. The species composition at the artificial structures differs from that of the soft bottom, because these attract species that require a hard surface for attachment or crevices for refuge. At least in shallow water, the fauna around the oil platforms are more abundant and diverse than that of the outfalls, and hard-bottom control areas. The species composition at both structures varies with depth. (See also W78-00134) (Sinha - OEIS)
W78-00158

RESPONSE AND RECOVERY OF THE BENTHOS AT ORANGE COUNTY,
Southern California Coastal Water Research Project, El Segundo.
C. S. Greene.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 197-203, 1977. 3 fig, 2 ref.

Descriptors: *Environmental effects, *Outfall sewers, *Waste disposal, *Water pollution, *Resources development, *Baseline studies, Toxicants, Metals, Polychlorinated hydrocarbons, Metals, California, Continental shelf, Water pollution sources.
Identifiers: *Outer Coninental Shelf, Southern California, Subthermocline diffusers, Resources management.

In 1971, Orange County Sanitation Districts terminated the discharge of municipal wastewaters through a shallow, inshore submarine outfall and began discharging through a modern subthermocline diffuser. This provided a unique opportunity to study the progress of the 'stress' and 'recovery' that would most likely occur around these outfalls and to obtain an insignt into the rates at which these processes progressed. After 4.5 years of operation the subthermocline diffuser system has had a measurable effect on the animals living in the sediments around it. This effect is manifested in the enhanced abundances of several 'indicator-like' species in response to increased inputs of organic material. Because of the apparently scoured condition of the sediments, the enhanced levels of potentially toxic trace metals and PCB may normally be somewhat higher than measured and should be watched. (See also W78-00134) (Sinha - OEIS)
W78-00159

PARTIAL RECOVERY OF THE BENTHOS AT PALOS VERDES,
Southern California Coastal Water Research Project, El Segundo.
C. S. Greene.
In: Southern California Coastal Water Research Project Final Report for the Year Ended 30 June 1976, p 205-210, 1977. 4 fig.

Descriptors: *Benthos, *Environmental effects, *Outfall sewers, *Sediments, Waste disposal, Hydrogen sulfide, Water pollution sources, California, Continental shelf, Resources development.
Identifiers: *Outer continental shelf, Southern California, Resources management, Palos Verdes sediments.

The basic biological parameters around deepwater outfalls, such as those on the Palos Verdes shelf, have changed in response to modifications in the physical/chemical environment. These parameters-- the areal distributions of the number and kinds of organisms and the biomass (amount of biological material)--are known to change in response to the stresses of pollution and are, therefore, considered to be reliable indicators of the conditions that exist on this shelf. A group of species that has been associated with extremely stressful conditions around outfalls has become greatly reduced in numerical abundance, and species that would not or could not previously occupy these sediments are now present in high quantity (biomass). Although the chemical nature of the sediments is still far from natural, the observed biological events indicate that this environment has improved as a biological habitat. (See also W78-00134) (Sinha - OEIS)
W78-00160

COMPARISON OF THE BENTHOS AT SEVERAL WASTEWATER DISCHARGE SITES,
Southern California Coastal Water Research Project, El Segundo.
A. J. Mearns, and C. S. Greene.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 211-216, 1977. 3 tab, 3 ref.

Descriptors: *Benthos, *Water pollution effects, *Environmental effects, *Biomass, Waste disposal, Outfall sewers, California, Continental shelf, Water pollution sources, Resources development.
Identifiers: *Outer continental shelf, Southern California, Species diversity index, Resources management.

The benthos at five specific outfall areas were compared for biomass, abundance, number of species, diversity, and richness. The result is a scan of some of the effects of wastewater on a 300-km section of the southern California coast. The comparison indicates that the major effect of the wastewaters on the benthic infauna in the outfall area is to increase the abundance or organisms and to decrease the diversity. (See also W78-00134) (Sinha - OEIS)
W78-00161

REGIONAL AND LOCAL VARIATION OF BOTTOM FISH AND INVERTEBRATE POPULATIONS,
Southern California Coastal Water Research Project, El Segundo.
M. J. Allen, and R. Voglin.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 217-221, 1977. 1 fig, 1 tab, 4 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Invertebrates, *Demersal fish, Outfall sewers, Continental shelf, California, Resources development, Water pollution sources.
Identifiers: *Outer continental shelf, Southern California, Species diversity index, Resources management.

During the past year, catch statistics from over 2,400 samples taken off the coast between Santa Barbara and San Diego and near some of the offshore islands were analyzed. Contemporary surveys provided the bulk of the samples analyzed. However, regional and temporal variations are large and reflect differences in gear and fishing technique as well as real differences in abundance and diversity. Although data suggest that the Los Angeles and Orange County coastal areas have been supporting the most abundant and diverse fish fauna, some qualifications are necesary. Catches in any area vary seasonally and from year to year. (See also W78-00134) (Sinha - OEIS)
W78-00162

LIFE HISTORY OF THE DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
M. J. Allen, and A. J. Mearns.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1976, p 223-228, 1977. 2 fig, 14 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Life history studies, *Growth rates, Outfall sewers, California, Continental shelf, Resources development, Water pollution sources.
Identifiers: *Outer continental shelf, Southernia, Fin erosion disease, Microstomus pacificus, Geographic range, *Dover sole.

One of the marine fishes in southern California with clearly identifiable health problems as a result of wastewater pollution is the Dover sole (Microstomus pacificus). The species is one of the most frequently occuring and abundant flatfishes in southern California at depths from 50 to 200 m and is therefore an important member of fish communities of the deeper portion of the mainland shelf. It shows obvious responses to wastewater discharge; populations near outfalls are generally more abundant, exhibit a higher prevalence of fin erosion disease, and show growth rates that are lower than those of other mainland coastal populations but higher than those of fish at Santa Catalina Island. Southern California populations may be largely the result of larval recruitment from spawning populations north of Point Conception, but this has yet to be confirmed. The fact that growth rates are lower in southern California than to the north suggests that southern California, which is near the southern end of the specie's geographic range, may not have optimal conditions for producing and maintaining commercially important stocks of Dover Sole. (See also W78-00134) (Sinha - OEIS)
W78-00163

SUPERTANKERS AND SUPERPORTS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE).
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-00164

ESTIMATING BIOAVAILABILITY OF SEDIMENT-BOUND TRACE METALS WITH CHEMICAL EXTRACTANTS,
Geological Surve, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-00196

NATIONAL WATER QUALITY INVENTORY. 1974 REPORT TO THE CONGRESS. VOLUME I.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W78-00214

FACTORS AFFECTING DIMETHYLNITROSAMINE FORMATION IN SAMPLES OF SOIL AND WATER,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00215

DECOMPOSITION OF AQUATIC BIOTA AND SEDIMENT FORMATION: ORGANIC COMPOUNDS IN DETRITUS RESULTING FROM MICROBIAL ATTACK ON THE ALGA CERATIUM HIRUNDINELLA,
Freshwater Biological Association, Ambleside (England).
P. A. Cranwell.
Freshwater Biology, Vol. 6, No. 1, February 1976, p 41-48. 1 fig, 4 tab, 36 ref.

Descriptors: *Sedimentation, *Decomposing organic matter, *Microbial degradation, Detritus, Aerobic conditions, Simulation analysis, Algae, Lake sediments, Lakes.
Identifiers: *Ceratium hirundinella, *Lake Blelham Tarn(United Kingdom), Autochthonous organic matter.

In a study designed to measure the impact of autochthonous organic matter decomposition on the formation of lake sediments, the freshwater algal Ceratium hirundinella was collected from Lake Blelham Tarn, a 17-ha productive pond in the English Lake District of the United Kingdom during the summer bloom period. The sample was submitted to two sets of decomposition conditions: aerobic conditions and one of decreasing oxygen concentration. The benzene-methanol extract of the matter remaining after the microbial attack on the algal samples from both experiments was separated into its components. Comparison of the components thus obtained from the fresh algal material facilitated recognition of algal compounds of sufficient stability to act as indicators of an algal contribution to sedimentary organic lake materials. The dominant C29, C31 and C33 n-alkanes and also cholesterol were recognized as the most suitable of these indicators. Similarities in occurrence of the indicator compounds in degraded algal organic matter and in sediments of productive lakes are believed to represent a contribution of autochthonous material to the sediment. (Harris-Wisconsin)
W78-00218

EFFECT OF ILLUMINATION CONDITIONS ON VEGETATIVE MULTIPLICATION OF THE CELLS AND SEXUAL REPRODUCTION OF TWO SPECIES OF CENTRICAL DIATOMACEOUS ALGAE,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
A. M. Roshchin.
Soviet Plant Physiology, Vol. 23, No. 4, July-August 1976, p. 601-605. 4 tab, 7 ref. Translated from Fiziologiya Rastenii, (Same vol and date) p. 715-719.

Descriptors: *Photoperiodism, *Cytological studies, Diatoms, Plankton, Algae, Light, Germination, Light duration, Plant physiology.
Identifiers: *Coscinodiscus janischii A. S., *Chaetoceros curvisetus Cl., *Vegetative cell multiplication, *Germ cell formation.

The influence of photoperiod light on vegetative cell multiplication as well as on germ cell formation of the planktonic diatomaceous algae Coscinodiscus janischii A. S. and Chaetoceros curvisetus Cl. was investigated, with continuous and periodic illumination used in the experiments with both species. The rate of vegetative cell multiplication in C. janischii increased with an increase of illumination from 0.5 to 2.5 x 103 lx,. An increase in illumination to 4 x 103 did not increase vegetative cell multiplication. The greatest number of germ cells was formed at 2.5 x 103 lx, with spermatogonia 15 times more numerous than oogonia. A decrease of illumination caused germ cell formation to decline more sharply than the multiplication of vegetative cells. Decrease in a photoperiod at the illumination of 2.5 x 103 lx negatively affected both vegetative cell multiplication and germ cell formation, but the rate of germ cell formation decreasd more sharply than the vegetative cell multiplication rate. Maximal vegetative cell multiplication in Ch. curvisetus occurred under continuous illumination. It was lower under periodic illumination (8 and 16 hours). Germ cell formation did not occur under illumination of 2.5 x 103 lx or under conditions of either continuous darkness or continuous light, but only during periodic illumination. On basis of these data, C. janischii is characterized as a long-day species and Ch. curvisetus as a short-day species. (Harris-Wisconsin)
W78-00219

RESPONSE OF POTAMOGETON PECTINATUS L. TO NORFLURAZON,
Massachusetts Univ., East Wareham. Lab. of Experimental Biology.
For primary bibliographic entry see Field 5G.
W78-00221

THE INFLUENCE OF EXTREMELY HIGH CONCENTRATIONS OF INORGANIC P AT VARYING PH ON THE GROWTH AND PHOTOSYNTHESIS OF UNICELLULAR ALGAE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
E. S. Nielsen, and T. Rochon.
Internationale Revue Der Gesamten Hydrobiologie, Vol. 61, No. 4, p. 407-415, 1976. 9 fig, 5 ref.

Descriptors: *Phosphates, *Photosynthesis, Chemical wastes, Water pollution sources, Growth rates, Populations, Chlorella, Diatoms, Cultures, Hydrogen ion concentration, Inorganic compounds, Lakes.
Identifiers: *Chlorella pyrenoidosa, *Nitzschia palea, *Lake Frederiksborg Slots(Denmark), *Lake Esrom(Denmark).

Effects of phosphate concentration on photosynthetic rate were studied on cultures of Chlorella pyrenoidosa and Nitzschia palea from Lake Frederiksborg Slots and Lake Esrom S. Denmark. Phosphate concentrations of 2500 mg P/l at pH 7.5, decreased the rate of C. pyrenoidosa, while the resistance of N. palea was far lower. At pH's of 6.3-7.3, the growth rate of C. pyrenoidosa multiplied by a factor of 6.6 per day at all concentrations up to 500 mg P/l. It decreased to 4.0 at 2000 mg. P.l., and was constant during the whole experiment. Growth rates of C. pyrenoidosa are similar at 5 mg P/l whether the experiments are at pH 5.8-6.3 or at pH 8.6-9.5. The growth rate of C pyrenoidosa is independent of pH at low concentrations of phosphate in contrast to high concentrations. At 5 mg P.l (starting at pH 6.2), N. palea grew at a daily multiplication factor of 1.5. At pH 9.1, the factor became 3.3. At pH 5.5, the phosphate concentrations of 500 mg P.l, no growth took place with N. palea. The rate increased with increasing pH. At pH 8.7, the cell number increased daily by a factor of 2.0. At phosphate concentrations varying between 16 and 500 mg P/l, pH varied between 8.2 and 8.5 the first two days, and 32 mg P.l is above the optimum phosphate concentration. (Spaeth-Wisconsin)
W78-00222

IMPACT OF ACID PRECIPITATION ON FRESHWATER ECOSYSTEMS IN NORWAY,
Norsk Inst. for Vannforskning, Blindern.
R. F. Wright, T. Dale, E. T. Gjessing, G. R. Hendrey, and A. Henriksen.
Water, Air, and Soil Pollution, Vol. 6, No. 2-4, Sept.-Nov. 1976, p. 483-499. 12 fig, 1 tab, 45 ref.

Descriptors: *Air pollution, *Rain water, *Precipitation(Atmospheric), *Environmental effects, Sulphates, Nitrates, Acidic water, Water pollution sources, Acidity, Vegetation effects, Habitats, Population.
Identifiers: *Norway, *Acid rain.

Polluted atmospheric precipitation which occurs over large areas of Scandinavia contains high concentrations of H(+), SO and NO ions in addition to heavy metals such as Cu, Zn, Cd, and Pb that mainly originate in the industrialized areas of Great Britain and central Europe. A study, based on a survey of 155 random-sampled lakes in southern Norway, measures the impact of acid precipitation caused by this pollution on the chemistry and biology of Norwegian freshwaters. Since much of Norway is underlain with lightly resistant granitic rock covered with only thin, inconsolidated glacial till, the inland waters are chacterized by low conductivities, low concentrations of major ions and low buffer capacities, all of which make its freshwaters highly vulnerable to atmospheric pollutants. The continually-growing inputs of atmospheric acid pollutants have resulted in significant increases in conductivity and hardness and decreases in pH levels. The atmospheric sulphate has replaced bicarbonate as the major anion in many lakes. High concentrations of Al in acid lakes suggest that pH levels in watershed soils have dropped below 5, causing the mobilization and washout of Al. Increasing acidity beginning at pH 6.0 has caused a decline in the number of phytoplanktonic, zooplanktonic and zoobenthic species plus a decrease in the abundance of green algae. Increased water acidity has also interfered with reproduction and spawning of fish. (Harris-Wisconsin)
W78-00226

ACID PRECIPITATION IN CANADA,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W78-00227

PHOTOIMPULSIVE CHARACTERISTICS OF THE PHOTOSYNTHESIS OF CHLORELLA VULGARIS,
Institut Fiziki, Krasnoyarsk (USSR).
A. P. Trenkenshu, F. Ya. Sid'ko, and V. N. Belyanin.
Soviet Plant Physiology, Vol. 23, No. 4, July-August 1976, p. 590-596. 4 fig, 15 ref. Translated from Fiziologiya Rastenii, (same vol and date), p. 702-709.

Descriptors: *Photosynthesis, *Chlorella, *Growth rates, Plant pigments, Laboratory tests, *Chlorophyll, Cytological studies.
Identifiers: *Photosynthetically active radiation, Chlorella vulgaris, Chlorophyll-a, Impulsive illumination, Photoimpulsive irradiation.

The dependence of the rate of growth, chlorophyll-a cell content and efficiency of photosynthesis upon the frequency of impulses and intensity of the effective flux of photosynthetically active radiation (PAR) was investigated for the alga Chlorella vulgaris. Duration of light and dark periods for three photoimpulse regimes in these experiments was 2 x 10-3, 6 x 10-3, and 10-2 seconds. The value of irradiance during the illumination periods varied between 50 and 1400 W/m2 PAR. The results show that the relative rate of growth of Chlorella under impulsive illumination is lower than under continuous illumination for radiances up to 600-650 W/m2 PAR. The smallest difference between growth rates in these two illumination regimes (continuous light contrasted with impulsive light) was found at a light impulse of 2 msec duration. Decrease in dry biomass with increase in irradioation was observed for both regimes. However, photoimpulsive irradiation was characterized by a more significant decrease of pigment concentration than

the continuous irradiation. The decrease in values for dry biomass and pigment concentration under the influence of flux irradiation is especially significant within 50 to 300 W/m2 PAR range. The maximal photobiosynthesis efficiency (18%) occurred at 90-110 W/m2 PAR where the alga was exposed to alternating periods of light and dark of 2 msec duration. (Harris-Wisconsin)
W78-00229

OBSERVATIONS ON SOME INTERESTING FRESHWATER ALGAE FROM THE NETHERLANDS,
Vrije Univ., Amsterdam (Netherlands). Afdeling Plantensystematiek.
A. J. Dop, and M. Vroman.
Acta Botanica Neerlandica, Vol. 25, No. 5, October 1976, p. 321-328. 31 ref.

Descriptors: *Algae, *Systematics, Ecology, Benthic flora, Investigations, Ponds, Eutrophication, *Chlorophyta, *Chrysophyta, Phaeophyta, Water pollution effects.
Identifiers: *Xanthophyceae, *Botshol Pond(Netherlands).

Systematic and ecological investigations on 17 benthic algae species were carried out by placing glass slides in natural habitats. Several records are new for the Netherlands. Most observation were made on material from the Botshol, and irregularly shaped eutrophic pond of about two square kilometers located nine kilometers south of Amsterdam. Two species of Chlorophyceae were found: Dicranochaete reniformis Hieronymus, Ectogeron elodeae Dangeard. A single Xanthophyceae was found: Mischococcus confervicolum Naegeli. The following species of the Chrysophyceae were found: Spareridiothrix compressa Pascher and Vlk, Phaeoplaca thallosa Chodat, Lagynion scherffelii Pascher, Lagynion janei Bourrelly, Stephanoporus tubulosus Pascher, Chrysophaera gallica Bourrelly, Chrysopyxis cf. bipes Stein, Chrysochaete brittannica (Godward) Rosenberg, Epipyxis borgei (Lemmermann) Hilliard et Asmund, Epipyxis utriculus Elrenberg. Ruttnera spectabilis Geitler, Apistonema pyrenigerum Pascher, and Phaeothamnion borzianum Pascher. The following specie of the Phaeophydeae was found: Porterinema fluviatile (Porter) Waern. Culturing experiments are being done to determine if freshwater clones of Apistonema are part of the life cycle of Hymenomonas rosela. (Spaeth-Wisconsin)
W78-00230

THE FATE OF SELECT PESTICIDES IN THE AQUATIC ENVIRONMENT,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W78-00231

A CARBON FLOW MODEL OF EPIPELIC ALGAL PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
D. W. Stanley.
Ecology, Vol. 57, p. 1034-1042, 1976. 5 fig, 22 ref. NSF GV-33853.

Descriptors: *Mathematical models, *Productivity, *Ponds, *Arctic, *Algae, Model studies, Photosynthesis, Respiration, Carbon cycle, *Alaska, *Tundra, Biomes, Primary productivity, Sediments.
Identifiers: Epipelic algae, Barrow(Alas).

Epipelic algal production in arctic tundra ponds near Barrow, Alaska was simulated by a mathematical model utilizing experimental data. Using relatively simple equations and two environmental input variables (light and temperature) the model produces seasonal curves of epipelic algal photosynthesis, simulates the phasing and amplitude of diurnal cycles of productivity, and keeps track of the large day-today variation that commonly occurs in primary production in natural systems. Output from the model was used to construct a hypothetical carbon budget for the epipelic algae. There is a close agreement between the model's estimate of total annual epipelic production and the production estimated from the measured data example: 9.4 g C sq m yr and 10.1 g C sq m yr for the pond in 1971). Of the net annual epipelic production, 3% was consumed by grazers at the sediment surface. The remaining 97% was buried. Only 15.1% of the net annual production was consumed in the form of buried algae by the grazers. Year-to-year differences in total epipelic productivity attributed by the model to variations in light and temperature. (Harris-Wisconsin)
W78-00235

ENVIRONMENTAL CONTROL OF PRIMARY PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
D. W. Stanley, and R. J. Daley.
Ecology No. 57, p. 1025-1033, 1976. 7 fig, 33 ref. NSF Grant GV-33853.

Descriptors: *Tundra, *Ponds, *Photosynthesis, *Primary productivity, Biomes, Algae, Temperature, Light intensity, Phosphates, Diatoms, Photoperiodism, *Alaska, Water pollution effects.
Identifiers: Point Barrow(Alas), Epipelic algae.

The study, a part of the US Tundra Biome (IBP), was designed to investigate the photosynthetic response of tundra pond alga to various combinations of temperature, light intensity and phosphate concentration. The ponds used in the study were 50 m in diameter and 20 cm in depth and were located near Barrow, Alaska. The rates of light-saturated photosynthesis showed a broad, single peak in mid-July for epipelic algae and a bi-modal distribution centered around early and late summer for plankton. While the plankton productivity data showed very little diurnal change, peaks in epipelic productivity were skewed toward late afternoon. The epipelic algae also had a higher temperature optimum for photosynthesis than the planktonic algae. In most of the experiments the light saturated photosynthetic rate for plankton was higher at 14C than at 20C, whereas the reverse was true in the epipelic samples. Light inhibition at supraoptimal illumination never occurred in the epipelic measurements, but was common at low temperatures in the planktonic experiments. Planktonic photosynthesis was not inhibited only at the highest temperature tested (20C). None of the short-term phosphate addition experiments resulted in significant changes in either planktonic or epipelic photosynthetic rate at any light or temperature. However, this was not taken as an indication that the Barrow ponds were not phosphorus-limited. (Harris-Wisconsin)
W78-00237

RELATIONSHIPS BETWEEN THE PHYTOPLANKTON AND THE ZOOPLANKTON IN THE RESERVOIRS OF THE KARST REGION IN CROATIA, (IN SERBO-CROATIAN),
Z. Pavletic, I. Matonickin, Z. Maloseja, and I. Habdija.
Acta Bot Croat. 33, p 147-162, 1974.

Descriptors: *Eutrophication, Cyanophyta, Chrysophyta, Karst, *Phytoplankton, Reservoirs, Turbulence, Algae, *Zooplankton, Seasonal, Chlorophyta.
Identifiers: *Yugoslavia, Bajer Reservoir(Croatia).

The spring and autumn plankton at 6 locations in the Omladinsko jezero Reservoir (Yugoslavia) included 135 spp. and, at 5 locations in the Bajer Reservoir in Groski kotar, included 157 spp. from 1970-1972. Different degrees of eutrophication account for these differences. The ratios of phytoplankton to zooplankton were 116:19 and 122:35, respectively. Chrysophytes predominated with a ratio of 58:69 between the 2 lakes. Photophilic blue-green algae and green plankton algae were more numerous in spring than in autumn. This was mainly true for the Omladinsko jezero Reservoir, although the Bajer Reservoir had more green algae in spring than in autumn. The effects of water turbulence on the specific ecological conditions in each case are discussed.--Copyright 1975, Biological Abstracts, Inc.
W78-00238

PRODUCTIVITY OF EPIPELIC ALGAE IN TUNDRA PONDS AND A LAKE NEAR BARROW, ALASKA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
D. W. Stanley.
Ecology, Vol 57, 1976, p. 1015-1024. 7 fig, 1 tab, 27 ref. NSF GV-33853.

Descriptors: *Tundra, *Ponds, *Biomass, *Productivity, Arctic, Benthic flora, Chlorophyta, Cyanophyta, Phytoplankton, Oil spills, *Alaska, Lakes, Water pollution effects.
Identifiers: *Epipelic algae, Point Barrow(Alas), *Lake Ikroavik(Alas).

The biomass and productivity of benthic algae growing on the sediments (epipelic algae) was measured in several tundra ponds and a lake near Point Barrow, Alaska. Chlorophyta and cyanophyta dominated the epipelic flora of most tundra ponds. The most commlankton was dominated by Chrysophycae and Cryptophyceae. Diatoms and green algae were not numerically signficaon genera were Microcystis, Gomphonema, Aphanozomenon, Chlamydomonas, Closterium and Ankistrodesmus. The Phytopnt. The epipelic algae were primarily concentrated in the upper 2 cm of the pond. Epipelic production was limited to a 3-month growing season and reached peak in mid-July. Epipelic productivity ranged from 10-4 g C sq m during a two-year period of observation (1971-73) compared with 1 g C sq m for the pond phytoplankton. An experimental oil spill in one of the ponds reduced epipelic productivity for one year duration to less than one-fourth (3 mg C sq m) of the productivity of surrounding ponds. Fertilization of another ponds caused an increase in epipelic photosynthesis rates to 45 mg C sq m, or two times greater than the rates in the nearby pond for the same period. In Lake Ikroavik, due to lower light, temperature and nutrient values, the photosynthesis rate of epipelic algae never rose above 3 mg C sq m per hour or 2.3 g C sq m per year. (Harris-Wisconsin)
W78-00239

LONG-TERM EFFECTS OF GLYPHOSATE APPLICATIONS TO PHRAGMITES,
New Jersey Agricultural Experiment Station, New Brunswick. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5G.
W78-00250

PHYSICAL OCEANOGRAPHY OF DEEPWATER DUMPSITE 106 FEBRUARY-MARCH, 1976,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 1A.
W78-00315

PHYTOPLANKTON IN THE VICINITY OF DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
E. M. Hulburt, and C. M. Jones.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in

Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 219-231, June 1977. 2 fig, 3 tab, 7 ref.

Descriptors: *Waste disposal, *Ecology, *Phytoplankton, *Environmental effects, *Baseline studies, Bioindicators, Water pollution effects, Water pollution sources.
Identifiers: *Outer continental shelf, *Ocean dumping.

Investigations of phytoplankton species composition, distribution with depth, and response to pollutant materials were conducted as part of two cruises to DWD 106 in the summer of 1976. On both the DALLAS cruise of June 1975 and the third KNORR cruise of August - September, 1975, phytoplankton abundance and species composition varied with depth. The complete summary of species for each vertical series of samples, 6 in June, and 3 in August - September, show many species and indicate additions of new species to the listings with increased depth. These summaries are presented. No apparent differences were noted in cells before or after the dump. In particular, at least half a dozen cells of different species were actively swimming, oblivious to the barge water in which they were kept for approximately six hours before examination. (Sinha - OEIS)
W78-00317

GELATINOUS ZOOPLANKTON AT DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5B.
W78-00319

APEX PREDATORS IN DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab.
J. G. Casey, and J. M. Hoenig.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 309-376, June 1977. 9 fig, 9 tab, 312 ref.

Descriptors: *Waste disposal, *Water pollution effects, Ecology, *Baseline studies, *Environmental effects, Bioindicators, *Predation, Bibliographies.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Apex predators.

The study of the apex predators in DWD 106, undertaken to assemble baseline data on pelagic predators, consisted of three parts. First the literature was reviewed to produce a working bibliography. Then historical longline catch data for the area in and around the dumpsite were collected, tabulated and analysed. The final stage of the study consisted of three longline research cruises to the dumpsite to gather data on the species present and to collect tissue samples for microconstituent analyses. The bibliography is included. (Sinha-OEIS)
W78-00320

OBSERVATIONS FROM THE DSRV ALVIN ON POPULATIONS OF BENTHIC FISHES AND SELECTED LARGER INVERTEBRATES IN AND NEAR DWD-106,
National Marine Fisheries Service, Washington, DC. Systematics Lab.
D. M. Cohen, and D. L. Pawson.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 423-450, June 1977. 2 fig, 16 tab, 9 ref.

Descriptors: *Waste disposal, *Fish populations, *Baseline studies, Water pollution effects, *Environmental effects, Invertebrates.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Benthic fish.

The present report is based chiefly on nine submersible dives made to the bottom using DSRV ALVIN in or near DWD-106 during the period 25 July - 3 August, 1975. The benthic fish fauna of the DWD-106 area does not appear to be impacted by the present mode and amount of dumping. The decline with depth of overall population density and species diversity is a base-line feature. Patchiness of overall fish distribution and of particular species is also a base-line feature. (Sinha-OEIS)
W78-00322

EPIBENTHIC INVERTEBRATES,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
C. Jones, and R. Haedrich.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 451-458, June 1977. 1 fig, 3 tab, 9 ref.

Descriptors: *Waste disposal, *Benthos, *Water pollution effects, *Baseline studies, *Environmental effects, Ecology, Invertebrates.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Epibenthic invertebrates, Ophiomusium lymani, Amphiphuira bullata.

Investigations of epibenthic invertebrate species composition, abundance and biomass were conducted as part of two cruises in the Northwest Atlantic ocean during the spring and fall of 1973. Trawl catches were analyzed for abundance and biomass. Species diversity and evenness were computed for the combined area. Patchiness was computed upon the frequency with which a species was present in the trawls. Complete species lists and cruise activities are listed. The faunal assemblage was dominated by echinoderms, with the ophiuroid, O. lymani as the dominant member of the community. In order, to predict the effects of future dumping on the epibenthic invertebrate community, detailed autoecological studies of the most dominant organisms and on-site epibenthic trawls at the dumpsite would be valuable. (Sinha-OEIS)
W78-00323

EPIFAUNAL MEGABENTHOS IN DWD 106,
Woods Hole Oceanographic Institution, MA.
G. T. Rowe, R. L. Haedrich, P. T. Polloni, and C. H. Clifford.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 459-464, June 1977. 2 tab, 6 ref.

Descriptors: *Benthos, Ecology, *Biomass, *Waste disposal, *Water pollution effects, *Baseline studies, *Environmental effects.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Mid-Atlantic bight, Anemone, Cerianthus sp., Ophiomusium lymani.

During 1975 a series of ALVIN dives was made in DWD 106. Photographic transects were made across the bottom for the purpose of quantifying the abundance of the large invertebrates living on the bottom. The most prevalent species was the cosmopolitan ophiuroid Ophiomusium lymani. A major component of the biomass is the filter feeding, burrowing anemone Cerianthus sp., suggesting that considerable suspended matter, rich in organic matter, is available in the bottom water at DWD 106. Densities were not dissimilar, however, to those found off Massachusetts (Grassle et al., 1975), again suggesting there is little difference between DWD 106 and other regions of the slope and rise of the mid-Atlantic bight. (Sinha-OEIS)
W78-00324

FINAL REPORT ON BENTHIC INFAUNA OF DEEPWATER DUMPSITE 106 AND ADJACENT AREAS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
J. B. Pearce, J. V. Caracciolo, and F. W. Steimle, Jr.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 465-480, June 1977. 2 fig, 4 tab, 20 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Baseline studies, *Environmental effects, *Industrial wastes, Benthos, Ecosystems.
Identifiers: *Outer Continental Shelf, *Ocean dumping.

Deepwater Dumpsite 106 (DWD 106) is located approximately 120 miles southeast of New York Harbor in depths exceeding 2000 meters. Since 1968, several industries in the New York-New Jersey area, including American Cyanamid and DuPont, have used this area as a repository for acid wastes, industrial chemicals and radioactive waste products. NOAA, in 1974, initiated a series of seasonal baseline investigations to assess the impact of previous dumping activities on the ecosystem of this area, and to serve as a basis against which future environmental change can be evaluated. This report represents a final analysis of the 1974 data and data obtained on the second DWD 106 survey conducted in February-March, 1976. Data show no significant differences in numbers of individuals, numbers of species or diversity in comparisons of stations within DWD 106 with control stations. Since stressed environments are often characterized both by low diversity and low concentrations of dissolved oxygen, there is, at this time, no reason to believe that toxic wastes disposed of at site 106 have impinged upon the fauna collected at sampling sites. With continued dumping and degradation of this toxic material, there is a possibility of development of a stress situation in the future. (Sinha-OEIS)
W78-00325

NEUSTON FISH AT DWD 106,
Woods Hole Oceanographic Institution, MA.
R. Haedrich.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 2, Biological Characteristics, p 481-485, June 1977. 2 tab.

Descriptors: *Waste disposal, *Baseline studies, *Environmental effects, *Water pollution effects, *Bioindicators, Fish, Ecology.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Lanternfish, Myctophids, Chronic effects.

Certain myctophids (Lanternfish) are of particular interest in potentially polluted oceanic areas because they migrate vertically from a daytime depth of a thousand or more meters to the surface layer each night to feed. Since they must pass through the polluted waters, data concerning numbers, length, and sex of individuals, in comparison with the same data from unpolluted areas, should indicate chronic effects of dumping upon the population. No significant differences were seen in total neuston fish catches within and outside the dumpsite. However, mesopelagic fish appeared more abundant outside the dumpsite. Since 'within' and 'outside' were determined only geographically, these observations must be interpreted with care. The highest rate of fishless tows occurred on the night after a dump. There is considerable ambiguity in the situation, however, as it is not known whether the tows were still in waters affected by the dumped material. (Sinha-OEIS)
W78-00326

A SUMMARY OF THE INPUT OF INDUSTRIAL WASTE CHEMICALS AT DEEPWATER DUMPSITE 106 DURING 1974 AND 1975,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 5B.
W78-00327

FINAL REPORT ON HEAVY METALS IN SMALL PELAGIC FINFISH, EUPHAUSID CRUSTACEANS AND APEX PREDATORS, INCLUDING SHARKS, AS WELL AS ON HEAVY METALS AND HYDROCARBONS (C15+) IN SEDIMENTS COLLECTED AT STATIONS IN AND NEAR DWD 106,
National Marine Fisheries Service, Milford, CT. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-00330

APPENDIX, (NOAA DUMPSITE EVALUATION REPORT),
National Marine Fisheries Service, Washington, DC. National Systematics Lab.
For primary bibliographic entry see Field 5E.
W78-00331

SCOPE FOR METABOLISM AND GROWTH OF SOCKEYE SALMON, ONCORHYNCHUS NERKA, AND SOME RELATED ENERGETICS,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
J. R. Brett.
Journal of the Fisheries Research Board of Canada, Vol. 33, p 307-313, 1976. 3 fig, 2 tab, 25 ref.

Descriptors: *Environmental effects, *Temperature, *Metabolism, Salmon, Growth rates, Feeding, Energy budget.

The concept of scope for activity was developed as the difference between active and standard metabolic rates. Metabolic and feeding requirements of fingerling sockeye salmon are compared over a range of temperatures from 1-24C. The relation that these requirements bears to temperature shows that the energy of standard metabolism amounts to approximately two thirds of the maintenance requirement at 1C, falling to one third at 23C. The active metabolic rate of sockeye was seen to rise exponentially with increasing temperature up to 15C where in levels off, decreasing slightly at higher temperatures. It was concluded that a simple means for determining growth scope is afforded from ration measurements, and that the general scope for activity concept is supported in the fashion that Fry first eleborated in 1947. (Chilton-ORNL)
W78-00332

SEASONAL RESPIRATORY VARIATION AND ACCLIMATION IN THE PEA CLAM, PISIDIUM WALKERI STERKI,
Case Western Reserve Univ., Cleveland, OH. Dept. of Biology.
A. J. Burky, and K. A. Burky.
Comparative Biochemistry and Physiology, Vol. 55A, p 109-114, 1976. 2 fig, 1 tab, 29 ref.

Descriptors: *Environmental effects, *Seasonal, Respiration, *Clams, Temperature, Size.
Identifiers: Biological activity, Oxygen consumption, Pea clams.

Seasonal respiratory variation is presented for field acclimated clams at field temperatures and at experimental temperatures of 10 and 20C. The oxygen consumption rates were computed in terms of shell-free tissue weight and shell-free tissue nitrogen. As field temperatures rose above 10C, an inverse relationship between respiration and temperature was observed. Data showed that seasonal acclimation of early spring indicates over-compensation for the over-wintering generation and the summer-fall data indicates reverse acclimation for the summer generation. No size-rate differences were observed for measurements of oxygen consumption. Information on seasonal respiratory variation and acclimation to temperature by ectotherms under natural conditions is identified as the best indication of the activity level of organisms in relation to their biological and physical environments. (Chilton-ORNL)
W78-00333

THERMAL TOLERANCE AND RESISTANCE OF THE NORTHERN ANCHOVY, ENGRAULIS MORDAX,
University of Southern California, Los Angles. Allan Hancock Foundation.
G. D. Brewer.
Fishery Bulletin, Vol. 74, No. 2, 1976. p 433-445, 10 fig, 4 tab, 48 ref.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, Resistance, Mortality.
Identifiers: *Anchovy, Tolerance, Thermal tolerance, Acclimation temperature.

The study, prompted by proposed discharge of thermal effluent into Los Angeles-Long Beach Harbor, details aspects of thermal tolerance and resistance of the embryo, larval, juvenile, and adult stages of the northern anchovy. Experimentally determined upper lethal temperature was 29.5C. Acclimation temperatures of 24C and above had little effect on increasing the incipient upper lethal temperature. Experiments on the resistance of juvenile and adult anchovy to high lethal temperatures showed no significant difference in the mean resistance times for fish of different sizes or for fish maintained under different photoperiods. Females were found to be more resistant than males and animals tested in the morning showed greater resistance than those tested in the evening. Larvae held at temperatures below 11C for short periods became inactive. Normal development was inhibited below 11.5C and above 27.0C. Growth in the yolk-sac stage was maximal between 14 and 20C. Regardless of acclimation temperature, all stages of anchovy can endure sudden temperature increases and decreased between limits of 14.5 and 23.0 without significant lethality from direct temperature effects alone. (Chilton-ORNL)
W78-00335

THE FEEDING BEHAVIOR OF MYTILUS EDULIS IN THE PRESENCE OF METHYLMERCURY ACETATE,
Texas A and M Univ. College Station. Dept. of Biology.
P. Dorn.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 6, 1976. p 714-719, 1 fig, 2 tab, 19 ref.

Descriptors: *Environmental effects, *Water pollution effects, Toxicity, *Mercury, *Mussels, *Feeding rates.

Experimental animals, Mytilus edulis, were held at 12C and 29% salinity. C14 labelled diatoms were fed to Mytilus in concentrations of 0.4, 0.8, 1.2, 1.6, 2.0 and 2.8 mg/l methyl mercury acetate. Control animals showed that mussels are capable of ingesting and retaining 145-34,045 diatom cells/day. All concentrations of methyl mercury resulted in decreased feeding. This decrease in feed was related to physiological stress. It was suggested that decreased feeding may be caused by disruption of ciliary activity. (Chilton-ORNL)
W78-00338

OXYGEN PRODUCTION-CONSUMPTION OF THE PELAGIC SARGASSUM COMMUNITY IN A FLOW-THROUGH SYSTEM WITH ARSENIC ADDITIONS,
University of South Florida, St. Petersburg. Dept. of Marine Science.
N. J. Blake, and D. L. Johnson.
Deep-Sea Research, 1976, Vol. 23. p 773-778, 3 fig, 1 tab, 14 ref.

Descriptors: Environmental effects, *Water pollution effects, *Arsenic, *Oxygen, Productivity, Respiration, Metabolism.
Identifiers: *Sargassum.

Preliminary results of productivity, respiration, and arsenic species transformation measurements of the Sargassum community in a maintained flow-through system are presented. Net production ranged from 0.14 to 0.76 mg 02/g/h and respiration from 0.22 to 0.86 ml 02/g/h. It was shown that respiration is not constant under complete darkness. Although net production was fairly symmetrical about the mid-point of apparent local noon, respiration soon after sunset was twice that just before sunrise. Arsenic additions did not result in any measurable effect upon the metabolism of the community. More As(III) was observed in the outflow than was present in the inflow within 3 h after the addition of the arsenic solution had begun. Total arsenic into the system balanced total arsenic in the outflow. It was not substantiated whether the production of As(III) resulted from immediate reduction of As(V) in the inflow or represented exchange of As(V) for As(III) in the biological reservoir of the community. When the steady-state distribution of arsenic chemical species was altered, there was a relatively rapid system response in the direction of re-establishing the ambient As(III)/As(V) distribution ratio. (Chilton-ORNL)
W78-00342

EFFECTIVENESS OF TRITIUM AND PU 239 IN PRODUCING CHROMOSOME ABERRATIONS IN CHIRONOMUS RIPARIUS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
B. G. Blaylock, and J. R. Trabalka.
Report IAEA-SM-202/302, 1976. 6 p. In: Biological and Environmental Effects of Low-Level Radiation. Vol. II. p 45-50, 1 tab, 10 ref.

Descriptors: Environmental effects, *Genetics, *Chromosomes, *Plutonium, *Tritium, Irradiation, Larvae, Radioisotopes, Diptera.
Identifiers: *Chironomus riparius.

The purpose of the study was to compare the frequency of chromosome aberrations produced in the salivary gland chromosomes of Chironomus riparius by the low-energy beta rays from tritum with those produced by the alpha radiation from Pu 239. Fl larvae showed aberrations in cases where their progenitors had developed in concentrations of 30, 125, and 250 microCi/mlitre of tritiated water. The frequency of these aberrations was approximately the same as the frequency produced by an equivalent dose of chronic external gamma radiation. No aberrations were observed in Fl larvae from 0.02 microCi/mlitre concentrations of Pu 239. The lowest calculated dose at which aberrations were detected for tritiated water was 180 rads while the dose calculated for the Pu 239 concentration of 0.02 microCi/mlitre was 120 rads. It was concluded that these preliminary data do not support a high relative biological effectiveness for chromosome aberrations produced in the gonads of Chironomus exposed to chronic irradiation from Pu 239. (Chilton-ORNL)
W78-00343

DISSOLVED AND PARTICULATE TRACE METALS IN THE RHINE ESTUARY AND THE SOUTHERN BIGHT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5B.
W78-00344

METHYLMERCURY IN A FRESHWATER FOODCHAIN,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. W. Huckabee, R. A. Goldstein, S. A. Janzen, and S. E. Woock.
In: International Conference on Heavy Metals in the Environment, Toronto, Ontario, Canada, October 27-31, 1975. p 199-216, 6 fig, 1 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution effects, Heavy metals, *Mercury, Fish, *Food chains, Absorption, Zooplankton, Daphnia.
Identifiers: *Methylmercury, Body burden.

To assess the relative importance of mercury uptake from ambient water and mercury uptake from food, a series of tests were conducted with the natural foodchain Daphnia pulex and Gambusia affinis. It was found that zooplankton accumulate methlmercury at least 10-15 times faster than fish but that a similar relationship does not hold true for elimination rates. Ingestion of mercury contaminated food accounted for less than 15% of the zooplankton uptake. For the fish, the relative importance of the ambient water and the food chain was mostly a function of ingestion rate indicating that the food chain can be a contributor to methylmercury body burden in mosquito fish. (Chilton-ORNL)
W78-00346

PROBLEMS IN ESTABLISHING THE RELATIONSHIP BETWEEN PUMPING RATE AND OXYGEN CONSUMPTION RATE IN THE HARD CLAM, MERCENARIA MERCENARIA,
Oak Ridge National Lab., TN. Environmental Sciences Div.
W. Van Winkle.
Comparative Biochemistry and Physiology, Vol. 50A, 1975, p 657-660, 1 fig, 2 tab, 11 ref.

Descriptors: Biology, Biochemistry, *Oxygen demand, *Oxygen requirements, *Clams.
Identifiers: Mercenaria mercenaria, Pumping rate, Gills.

Data and a line of reasoning are presented to indicate the problems concerning pumping rate and oxygen consumption on the basis of pumping-rate measurements and external, oxygen-concentration measurements alone. The author presents an analysis of two possibilities for gill tissue oxygen consumption rate relative to total oxygen consumption oxygen rate following an increase in total oxygen consumption rate from an average rate where gill tissue account for 20% of the total. The need for more direct physiological evidence (simultaneous measurements of pumping rate, external oxygen levels and blood oxygen levels) indicating whether or not pumping rate is dependent upon oxygen requirements is expressed. (Chilton-ORNL)
W78-00348

PREFERENTIAL ADSORPTION OF CS137 TO MICACEOUS MINERALS IN CONTAMINANTED FRESHWATER SEDIMENT,
Oak Ridge National Lab., TN. Environmental Sciences Div.
C. W. Francis, and F. S. Brinkley.
Nature, Vol. 260, No. 5551, April 1976, p 511-513, 2 fig, 13 ref.

Descriptors: Environmental effects, *Adsorption, *Cesium, Freshwater, *Sediments, Particle size, Cycling, Kaolinite, Quartz, Radioisotopes, Water pollution.
Identifiers: Preferential adsorption, Density gradient.

Sediment particles, containing predominately kaolinite and quartz, were fractionated by density-gradient centrifugation in a large scale zonal rotor. A decreasing Cs137 concentration with increasing particle density was observed. This was attributed to an increasing concentration of quartz. The highest Cs137 concentration was observed in the density fraction whose major mineral was kaolinite. More than 80% of the total Cs137 burden was associated with this fraction. It was concluded that the consequence of selective adsorption of cesium to cesium-fixing minerals in environmental conditions strongly influences the availability of Cs137 cycling to the biotic component of a particular ecosystem. (Chilton-ORNL)
W78-00349

THERMAL EFFECTS, (LITERATURE REVIEWS),
Oak Ridge National Lab., TN. Environmental Sciences Div.
C. C. Coutant, and S. S. Talmadge.
Journal Water Pollution Control Confederation, Vol. 49, June 1977, p 1369-1425, 10 tab, 610 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Aquatic life, *Water pollution effects, Reviews, *Bibliographies.
Identifiers: *Literature reviews.

The report is a literature review of 1976 research and biological concerns relating to the effects of temperature on aquatic organisms. 610 references are listed. Text presents papers of interest which were given at symposia during the year. Attention is given tc studies involving siting of power plants, producers (effects of temperature on growth and production, community responses) consumers (reproduction, development, morphology, distribution, temperature tolerance, growth, feeding and digestion, temperature and other stresses, temperature selection and avoidance, activity, and predator-prey relations), decomposers, diseases and parasites, and beneficial uses. (Chilton-ORNL)
W78-00352

EFFECTS OF TEMPERATURE ON FOOD INGESTION RATE AND ABSORPTION, RETENTION, AND EQUILIBRIUM BURDEN OF PHOSPHORUS IN AN AQUATIC SNAIL, GONIOBASIS CLAVAEFORMIS LEA,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. W. Elwood, and R. A. Goldstein.
Freshwater Biology, Vol. 5, 1975, p 397-406, 5 fig, 1 tab, 22 ref.

Descriptors: Environmental effects, *Temperature, *Feeding rates, *Phosphorus, *Absorption, Retention, *Snails, Aquatic animals.
Identifiers: Equilibrium burden.

Feeding rates of Goniobasis clavaeformis Lea were measured at 10, 13.8, 15, and 19.3C and the effects of sublethal temperatures on feeding rates and phosphorus dynamics were determined. Feeding rate was observed to increase with increasing temperature up to 14C and to decrease above 14C. Elimination rate of absorbed phosphorus increased with increasing temperatures to 19.3C. Mean retention time of phosphorus in the gut showed the same temperature relationship as that of ingestion rate. The equilibrium body burden of the snail was maximum between 11 and 12C and decreased at temperatures above 12C. The comparatively low absorption efficiency of phosphorus over the range of experimental temperatures indicates that this species does not have a total compensatory mechanism for maintaining a constant equilibrium load as temperature increases. (Chilton-ORNL)
W78-00353

TEMPERATURE PREFERENCE STUDIES IN ENVIRONMENTAL IMPACT ASSESSMENTS: AN OVERVIEW WITH PROCEDURAL RECOMMENDATIONS.
American Fisheries Society, Bethesda, MD.
Journal of the Fisheries Research Board of Canada, Vol. 34, p 728-761, 224 ref. The Proceedings of a Symposium and Panel Discussion held at the Northeast Fish and Wildlife Conference, Hershey, Pa., April 27, 1976. Richards, F. P., Reynolds, W. W., and McCauley, R. W. (eds).

Descriptors: *Environmental effects, *Thermal pollution, Temperature, *Conferences, Assessments, Aquatic life, Water pollution.
Identifiers: Temperature preference(Aquatic life).

The symposium was intended to serve as a primer for those unfamiliar with temperature preference studies and as a source of up-to-date information for those actively working in the field. The proceedings includes five formal papers which cover the basic areas of physiological responses to changing temperature, theoretical background of behavioral responses to temperature, a tabulation of published results, application of these results to impact assessments, and a review of laboratory apparatuses and methodologies. Bibliographies have been collated to eliminate redundancy and to provide easy reference. Comments from a panel discussion have been edited and are paraphrased in the proceedings. (See W78-00355 thru W78-00359) (Chilton-ORNL)
W78-00354

PHYSIOLOGICAL AND BEHAVIORAL REACTIONS OF FISHES TO TEMPERATURE CHANGE,
John B. Pierce Foundation Lab., New Haven, CT.
L. I. Crimshaw.
Journal of Fisheries Research Board of Canada, Vol. 34, 1977, p 730-734, 2 fig.

Descriptors: *Environmental effects, *Thermal pollution, Temperature, *Fish behavior, Fish physiology, Water pollution effects.
Identifiers: Acclimation, Temperature regulation.

Data indicates that there is an underlying similarity between the central nervous system mechanisms regulating body temperature in all vertebrates. Both physiological and behavioral thermoregulatory mechanisms are similarly controlled in that peripheral and anterior brainstem temperatures are integrated to produce a restorative response of appropriate direction and magnitude. There are indications that behavioral tempeature regulation is similar in fish and mammals, in terms of accuracy and underlying control mechanisms but that this is not true for physiological responses. In teleost fishes, short-term deviations from ambient temperatures are seen to alter respiratory requirements, produce acid-base imbalance, and cause disturbances in fluid-electrolyte regulation. Acclimation to given temperatures tends to bring about changes that counteract these disturbances. (See also W78-00354) (Chilton-ORNL)
W78-00355

SUMMER STREAM METABOLISM VALUES FOR CEDAR CREEK, KANSAS,
Emporia Kansas State Coll. Dept. of Biology.
C. W. Prophet, and J. D. Ransom.
Southwest Nat. 19(3), p 305-308, 1974.

Descriptors: *Metabolism, Streams, *Kansas, Summer, *Primary productivity, Biological communities, *Respiration, Oxygen, Estimating.
Identifiers: *Oxygen change method, *Cedar Creek(Kan).

Summer gross primary productivity and community respiration along Cedar Creek in Chase County, Kansas, were estimated by the daily oxygen change method. Mean gross primary productivity increased from upstream to downstream while the opposite trend was true for community respiration. Observed daily gross primary productivity varied from less than 1.0-32.3 gO2/m2/day and community respiration varied from 5.52-26.4 g O2/m2/day.--Copyright 1975, Biological Abstracts, Inc.

W78-00359

ACUTE TOXICITY OF AMMONIA-BASE NEUTRAL SULFITE PULP MILL WASTE LIQUOR TO RAINBOW TROUT,
Rollins Animal Disease Diagnostic Lab., Raleigh, NC.
J. M. Griffin, and J. L. West.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 5, p 608-612, May, 1976. 11 ref, 1 tab.

Descriptors: *Fish, *Pulp wastes, *Toxicity, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, *Bioassay, Ammonia, Pulp and paper industry, Effluents, Lignins, Specific gravity, Sulfur compounds, Biochemical oxygen demand, Hydrogen ion concentration, Lethal limit, Sulfite liquors.
Identifiers: *Spent sulfite liquors, Sulfur dioxide.

In laboratory static bioasays, the mean LC(50) for fingerling rainbow trout of ammonia-base spent sulfite liquor was 0.82%. Ammonia concentration ranged from 0.5 to 9.0 mg/liter, and was highest on the first day, decreasing on the second and third days, and increasing again on the fourth day. Regression analysis indicated high correlation between 5 of 8 spent liquor constituents and LC(50). The lignin content correlated most highly with LC(50), followed by specific gravity, sulfur dioxide, ammmonia, and BOD. Transmittance, pH, and filterable solids did not correlate with LC(50). (Speckhard-IPC)
W78-00363

QUALITY OF EFFLUENTS FROM VARIOUS MECHANICAL PULPING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5B.
W78-00368

TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
C. C. Walden, T. E. Howard, and J. C. Mueller.
Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1976, Preprints, p 217-227B. 1 fig, 63 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, Effluents, Pulp and paper industry, Foreign countries, Canada, Wastes, Industrial wastes, Water pollution sources, Bleaching wastes, Fish, Aquatic life, Activated sludge, Oxidation lagoons, Foam fractionation, Waste water treatment, Water pollution treatment, Waste treatment, Water pollution control.

The construction of three pulp mills in the Fraser River watershed (Canada) during the 1960's prompted toxicity studies of Canadian pulp and paper mill discharges. Acute toxicity of most pulp mill effluents to aquatic fauna has been documented. Continuing studies are confirming the additive nature of toxic loads within the bleach plant. Compounds in pulp mill effluents that are toxic to fish are tabulated and discussed. Substantial efforts have been made in assessing the effluent concentration below which no stress is exerted on aquatic organisms. The evidence gathered over the last 10-15 years indicates that this concentration is about 0.05-0.10 of the 96-hr LC(50) values. Two of the mills installed extended activated sludge systems and the third an aerated stabilization basin. Detoxification by the stabilization basins was more consistent than by the two activated sludge systems, and the two mills with the activated sludge systems have converted them to aerated stabilization basins. Foam fractionation for detoxifying mill effluents is also being considered. (Witt-IPC)
W78-00369

LONG-TERM EFFECTS OF REPEATED LOGGING ON AN APPALACHIAN STREAM,
Northeastern Forest Experiment Station, Parson, WV.
For primary bibliographic entry see Field 4C.
W78-00376

HEAVY METALS IN THE DERWENT ESTUARY,
Tasmania Univ., Hobart. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-00393

BIOLOGICAL TRANSPORT OF ZINC-65 INTO THE DEEP SEA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00395

LIMING: AN OVERESTIMATED METHOD FOR PREVENTING THE SPREAD OF THE CRAYFISH PLAGUE,
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
K. Svensson, K. Soderhall, T. Unestam, and B. -O. Andersson.
Institute of Freshwater Research, Drottningholm report No 55, p 132-135, 1977. 1 fig, 3 tab, 3 ref.

Descriptors: *Crayfish, *Lime, *Calcium compounds, *Animal diseases, *Pathogenic Fungi, *Fungicides, Animal physiology, Animal pathology, Crustaceans, Invertebrates, Toxicity, Resistance, Laboratory tests, Bioassay, Aquiculture, Lethal limit.
Identifiers: *Crayfish plague, Astacus astacus, Aphanomyces astaci, *Slaked lime.

The lethal effect of liming with slaked lime, Ca(OH)2, on the crayfish, Astacus astacus L., was studied. It was obvious from both laboratory and field experiments that this method had little or no effect on the animals unless saturated solutions were used. A long exposure in an aquarium about 16 hours at pH values above 11.5 was required to kill the total crayfish population. In a natural environment, a small crayfish stream, such conditions do not occur unless water flow is extremely slow. Recommendations were given on how to apply liming in order to limit the spread of the crayfish plague. (Klein)
W78-00396

MERCURY LEVELS IN BIOTA FROM MORRUM RIVER DURING A 10 YEAR CLEAN-UP PERIOD,
Naturhistoriska Riksmuseet, Stockholm (Sweden). Section for Invertebrate Zoology.
For primary bibliographic entry see Field 5B.
W78-00397

CORTICOID STRESS RESPONSE TO HANDLING AND TEMPERATURE IN SALMONIDS,
Oregon Cooperative Fishery Research Unit, Corvallis.
R. J. Strange, C. B. Schreck, and J. T. Golden.
Transactions of the American Fisheries Society, Vol. 106, No. 3, p 213-218, 1977. 5 fig, 34 ref.

Descriptors: *Salmonids, *Temperature, *Fish physiology, Cutthroat trout, *Chinook salmon, Juvenile growth stage, Resistance, Thermal stress, Fish behavior, Laboratory tests, Water temperature, Biochemistry.
Identifiers: *Corticoid stress response, *Plasma corticoid levels.

Plasma corticoid concentrations in juvenile chinook salmon netted and confined in a small livecage rose from approximately 100 ng/ml to about 500 ng/ml in 24-h, then fell to 250 ng/ml at 48h. In juvenile chinook salmon dip netted into a bucket containing aerated water and sampled serially at 90-s intervals, plasma corticoids increased from less than 10 ng/ml to approximately 100 ng/ml in 20 min. In juvenile cutthroat trout acclimated to 13C and subjected to rapid increase in water temperature to 26C, plasma corticoid concentration increased from about 20 ng/ml to 70 ng/ml in 25 min. and remained elevated for more than 3 h. Juvenile cutthroat trout acclimated to diurnal temperature cycles (13-23C) had no substantial changes in plasma corticoid concentration throughout the cycles. Juvenile cutthroat trout acclimated to 23C had the same initial corticoid concentration as the cutthroat trout acclimated to 9C. When both groups were subjected to identical netting and confinement, the corticoid concentrations in fish from the two temperatures responded in a similar fashion until 70 min of confinement when trout from the warmer water failed to maintain increasing corticoid concentrations. (Klein)
W78-00398

DISTRIBUTION AND TEMPERATURE ADAPTATION IN THE TELEOST FISH GENUS GIBBONSIA,
San Francisco State Univ., CA. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-00399

LABORATORY DETERMINATION OF ACUTE AND SUBLETHAL TOXICITIES OF INORGANIC CHLORAMINES TO EARLY LIFE STAGES OF COHO SALMON (ONCORHYNCHUS KISUTCH),
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
G. L. Larson, F. E. Hutchins, and L. P. Lamperti.
Transactions of the American Fisheries Society, Vol. 106, No. 3, p 268-275, 1977. 6 fig, 2 tab, 19 ref.

Descriptors: *Toxicity, *Inorganic compounds, *Chlorine, *Salmonids, *Growth stages, *Growth rates, Mortality, *Coho salmon, Resistance, Path of pollutants, Juvenile life stage, Temperature, Salinity, Water quality, *Lethal limit.
Identifiers: *Inorganic chloramines, Bioaccumulation, Toxicants.

The 96-h TL50 was shown to vary according to the life stage of coho salmon studied. The most sensitive stage was just after the fry stage. Temperature and alkalinity did not affect acute toxicity. Acute toxicity was not affected by pH 7.0 and 7.5, but increased at pH 8.1. Continuous exposure to inorganic chloramine concentrations up to 47 micro g/liter did not affect the survival, development, or hatching ability of coho salmon embryos. Alevins exposed to 23 and 47 micro g/liter of toxicant exhibited lethargic behavior shortly after hatch. All of the alevins exposed to 47 micor g/liter chloramines died within 9 weeks after hatch. In the other test groups little mortality occurred that could be attributed to the toxicant. Growth of alevins exposed to 23 and 47 micro g/liter was reduced as compared to that of the controls. Although the alevins exposed to 47 micro g/liter died, those exposed to 23 micro g/liter chloramines reached the fry stage. Attainment of this development stage was delayed and possible ecological consequences of such delays were discussed. Growth of juveniles was reduced at 22-23 micro g/liter chloramines. The threshold for reduction of growth occurred between 11 and 22-23 micro g/liter, but this was probably influenced by fish size, history of exposure to the toxicant, and the age-season comples. (Klein)
W78-00400

THE EFFECTS OF INTERMITTENT CHLORINATION ON RAINBOW TROUT AND YELLOW PERCH,
Wisconsin Univ.-Milwaukee. Dept. of Zoology; and Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
A. S. Brooks, and G. L. Seegert.

Transactions of the American Fisheries Society, Vol. 106, No. 3, p 278-286, 1977. 1 fig, 4 tab, 19 ref.

Descriptors: *Chlorine, *Chlorination, *Toxicity, *Mortality, *Rainbow trout, Resistance, *Yellow perch, Salmonids, Perches, Water quality, Laboratory tests, Design, Lethal limit, Bioassay, Thermal stress, Thermal water, Water temperature.

Rainbow trout and yellow perch were exposed to residual chlorine for single 30-minute and triple 5-minute doses. Tests were conducted at 10, 15, and 20C with both species plus 25 and 30C for the perch. Single exposure 30-minute LC50 values for the perch ranged from 0.70 mg/liter at 30C to 8.0 mg/liter at 10C. Triple 5-minute exposure LC50 values for the perch were 22.6 and 9.0 mg/liter at 10 and 20C, respectively. Two groups of trout tested at 20C yielded 30-minute LC50 values of 0.60 and 0.43 mg/liter. Triple exposure 5-minute LC50 values for the trout were 2.87 mg/liter at 10C and 1.65 mg/liter at 20C. Mortality occurred immediately after exposure to chlorine in the 30-minute perch tests at 10 and 15C, but was delayed 2-12 hours at the higher temperautres. This pattern was reversed in the 5-minute triple exposure tests, Rainbow trout exhibited rapid mortality in all tests except the 10C triple exposure series where mortality was delayed 12-24 hours. For both species, concentrations resulting in no mortality were approximately one-half the LC50 value. (Klein)
W78-00401

ACUTE TOXICITIES OF SELECTED HERBICIDES TO FINGERLING CHANNEL CATFISH, ICTALURUS PUNCTATUS,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
F. M. McCorkle, J. E. Chambers, and J. D. Yarbrough.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No. 3, p 267-270, 1977. 1 tab, 7 ref.

Descriptors: *Toxicity, *Herbicides, *Chlorinated hydrocarbon, *Pesticides, *Toxins, *Catfishes, *Channel catfish, *Organic compounds, Mortality, 2,4-D, 2,4,5-T, Monuron, Dalapen, Immature growth stage, Endrin, Laboratory tests, Metabolism.
Identifiers: Bioaccumulation, Alanap, Chloramben, Diuron, DSMA, EPTC, Fluometuron, Metribuzin, MSMA, Nitralin.

A scan of the acute toxicities of eighteen common herbicides to one-year-old channel catfish (Ictalurus punctatus) was conducted. Herbicides causing less than 10% mortality in 48 hr at 10 ppm were: alanap, chloramben, 2,4-D acid, 2,4-D dimethyl amine salt, dalapon, diuron, DSMA, EPTC, fluometuron, metribuzin, monuron, MSMA, nitralin, and 2,4,5-T. The 96-hr LC50 values in ppb for four herbicides found toxic were: propanil, 3796; trifluralin, 417; bensulide, 379; and DNBP, 118. The toxicity of Dyanap, a mixture of DNBP and alanap, was lower than that of DNBP; there was no apparent synergism between DNBP and alanap in the mixture. (Klein)
W78-00402

EFFECTS AND UPTAKE OF CHLORINATED NAPHTHALENES IN MARINE UNICELLULAR ALGAE,
Environmental Research Lab., Gulf Breeze, FL.
G. E. Walsh, K. A. Ainsworth, and L. Faas.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 3, p 197-302, 1977. 2 tab, 15 ref.

Descriptors: *Chlorine, *Organic compounds, *Industrial wastes, *Toxicity, *Productivity, *Algae, Path of pollutants, Mode of action, Metabolism, Ecosystems, Food chains, Oil industry, Environmental effects, Absorption, *Bioassays.
Identifiers: *Chlorinated naphthalenes, Bioaccumulation, Chlorine content.

A chlorinated haphthalene formulation that contained a mixture of mono- and dichloro isomers was more toxic to marine algae than were formulations of tri-, tetra-, penta-, and hexachloro isomers. However, uptake was directly related to chlorine content. The penta- and hexachloronaphthalenes are generally the most toxic to animals, and if algae were exposed to these compounds in nature, it is possible that they could serve as vehicles for transfer to aquatic animals. Transfer through food webs could begin with algae and result in effects at higher trophic levels. (Klein)
W78-00403

CONCENTRATION OF CADMIUM, COPPER, LEAD, AND ZINC IN THIRTY-FIVE GENERA OF FRESHWATER MACROINVERTEBRATES FROM THE FOX RIVER, ILLINOIS AND WISCONSIN,
Northern Illinois Univ., DeKalb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W78-00404

INVESTIGATIONS INTO THE ACUTE TOXICITY AND SOME CHRONIC EFFECTS OF SELECTED HERBICIDES AND PESTICIDES ON SEVERAL FRESH WATER FISH SPECIES,
Marist Col., Poughkeepsie, NY. Environmental Science Program.
R. E. Rehwoldt, E. Kelley, and M. Mahoney.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 3, p 361-365, 1977. 4 tab, 7 ref.

Descriptors: *Freshwater fish, *Organophosphorous compounds, *Chlorinated hydrocarbon pesticides, *2,4-D, *Toxicity, *2,4,5-T, *Organic compounds, Path of pollutants, Metabolism, Fish physiology, Fish reproduction, Striped bass, Carp, Eels, White perch, *Herbicides, Bioassay, Laboratory test, *Aldrin.
Identifiers: Bioaccumulation, Tissue analysis, *Malathion, *Methyl parathion, Banded killyfish, Pumkinseed, Guppy, Acetylcholinesterase.

Chronic exposure to 2,4-D or 2,4,5-T to striped bass, carp, guppy, banded killyfish, pumpkinseed, white perch and the American eel resulted in no observable physiological sysmptoms, nor was any raising of the toxic level in these fish shown. TLm values were not significantly different after exposure to sub-lethal amounts of these reagents. No substantial differences in weight/time relationships between the exposed fish and the control fish were demonstrated. Chronic exposure to the organophosphorous compounds resulted in substantial reductions fo brain acetylcholinesterase levels. Guppies were used in breeding experiments. (Klein)
W78-00405

PARALYTIC SHELLFISH POISONING IN TENAKEE, SOUTHEASTERN ALASKA: A POSSIBLE CAUSE,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
S. T. Zimmerman, and R. S. McMahon.
Fishery Bulletin, Vol. 74, No. 3, p 679-680, 1976. 11 ref.

Descriptors: *Productivity, *Pathology, *Animal diseases, *Human diseases, *Toxicity, *Shellfish, *Clams, *Mussels, Mode of action, Population, Invertebrates, Environmental effects, *Alaska, Bioluminescence, Public health, Protozoa.
Identifiers: *Gonyaulax catenella, *Paralytic shellfish poisoning, Bioaccumulation, Tissue analysis, S. giganteus, M. edulis, Marine protozoa.

A localized Gonyaulax catenella bloom followed by a paralytic shellfish poisoning (PSP) outbreak in Alaskan waters was investigated. High levels of toxin were found in the butter clam and the mussel after a high bioluminescence (of which G. catenella was found in a high population) was seen and subsequent shellfish poisoning in humans was reported. Toxin filtering and containing rates were measured in the butter clam. According to background events, shellfish toxication just prior to illnesses was indicated. The occurrence of the G. catenella bloom approximately 1 week before the PSP outbreak indicated that although this species is normally found in low densities in Alaska, it can occur in high enough numbers to rapidly toxify clams. (Klein)
W78-00406

EFFECT OF NO. 2 FUEL OIL AND SOUTH LOUISIANA CRUDE OIL WATER-SOLUBLE FRACTIONS ON HEMOGLOBIN COMPENSATION AND HYPOXIA TOLERANCE IN THE POLYCHAETOUS ANNELID, NEANTHES ARENACEODENTATA (MOORE),
Scripps Institution of Oceanography, La Jolla, CA. Marine Biology Research Div.
S. S. Rossi, and J. W. Anderson.
Marine Science Communications, Vol 3, No 2, p 117-131, 1977. 2 fig, 1 tab, 15 ref.

Descriptors: *Organic compounds, *Toxicity, *Fuels, *Oil wastes, *Oil pollution, *Worms, Animal physiology, Path of pollutants, Mortality, Lethal limit, Dissolved oxygen, Respiration, Laboratory tests, Resistance.
Identifiers: *No. 2 Fuel Oil, *South Louisiana crude oil, Hemoglobin compensation, Hypoxia, Polychaetes, Annelids, Neanthes arenaceodentata, Toxicant.

Exposure to sublethal concentrations of No. 2 Fuel Oil water-soluble fractions (WSFs) did not affect the ability of Neanthes arenaceodentata to increase its body hemoglobin content in response to hypoxia. Similar treatment using water-soluble fractions of South Louisiana crude oil likewise indicated little disruption of compensatory ability. Reduced dissolved oxygen (D.O.) concentrations did not significantly alter to toxicity of No. 2 Fuel Oil WSFs to N. arenaceodentata. Low D.O. concentrations markedly increased the toxicity of So. La. crude oil WSFs, producing a synergistic effect. Results were defined relative to the concentration of naphthalenes and total dissolved hydrocarbons in experimental media. Possible effects of petroleum hydrocarbons on the respiratory physiology of marine infauna were briefly considered. (Klein)
W78-00407

WATER QUALITY CRITERIA RESEARCH OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY, PROCEEDINGS OF AN EPA SPONSORED SYMPOSIUM ON MARINE, ESTUARINE AND FRESHWATER QUALITY, PRESENTED AT THE 26TH ANNUAL MEETING OF THE AIBS, AUGUST 1975.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-00408

STRUCTURAL ANALYSIS OF STRESSED MARINE COMMUNITIES,
Corvallis Environmental Research Lab., OR.
R. C. Swartz, J. D. Walker, W. A. DeBen, and F. A. Cole.
In: Water Quality Criteria Research of the U.S. Protection Agency, Report EPA-600/3-76-079, p 3-12, 1976. 3 tab, 11 ref.

Descriptors: *Sewage, *Speciation, *Distribution patterns, *Density, *Ecosystems, *Biological communities, *Sewage effluents, *Benthos, *Systems analysis, Population, Sampling, Wastes, Environmental effects, Water quality, Water pol-

lution sources, Water pollution effects, Laboratory tests, Model studies, Food chains, Resistance.
Identifiers: *Diversity, *Species composition.

The impact of sewage sludge on macrobenthic assemblages in the New York Bight and in experimental microcosms was described as an illustration of the effects of stress on species composition, density, diversity, and heterogeneity. Structure analysis provided a good method for assessing ecological alterations at specific sites, but quantitative criteria such as diversity indices was not recommended as universal regulatory standards. Field surveys were recommended to be closely coordinated with laboratory investigations of the toxicity and accumulation of pollutants from those species which dominated community structure and function prior to human perturbation. (See also W78-00408) (Klein)
W78-00409

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
D. P. Middaugh, and W. P. Davis.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 46-62, 1976. 1 fig, 5 tab, 47 ref.

Descriptors: *Chlorine, *Chlorination, *Aquatic life, *Water purification, *Ecosystems, *Toxicity, Sewage treatment, Disinfection, Water quality control, Chemistry, Environmental effects, Phytoplankton, Productivity, Invertebrates, Estuaries, Analytical techniques, Water quality.
Identifiers: Bioaccumulation.

The use of chlorine as a disinfectant and antifouling agent was reviewed. Chemical reactions of chlorine in aquatic environments were discussed, with particular emphasis on the formation of halogenated organic constituents in freshwater and marine systems. Studies of the effect of chlorinated sewage effluents and cooling water from generating stations on marine organisms and ecosystems were summarized. (See also W78-00408) (Klein)
W78-00413

TECHNIQUES TO ASSESS THE EFFECTS OF TOXIC ORGANICS ON MARINE ORGANISMS,
Environmental Research Lab., Gulf Breeze, FL.
D. J. Hansen.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 63-76, 1976. 4 fig, 5 tab, 16 ref.

Descriptors: Research and development, *Design, *Bioassay, *Organic compounds, *Toxicity, *Toxins, *Estuaries, Aquatic life, Fish, Polychlorinated biphenyls, Pesticides, Aroclors, Ecosystems, Biological communities.
Identifiers: Cyprinodon variegatus, Toxaphene, Aroclor 1254.

Improvements in bioassay procedures were demonstrated using the effects of toxicants on the life-cycle of an oviparous estuarine fish, Cyprinodon variegatus. Effects of a polychlorinated biphenyl, Aroclor 1254, and the pesticide toxaphene on developing estuarine communities were investigated. (See also W78-00408) (Klein)
W78-00414

THE EFFECT OF SUBTLE TEMPERATURE CHANGES ON INDIVIDUAL SPECIES AND COMMUNITY DIVERSITY,
Environmental Research Lab., Narragansett, RI.
W. C. Johnson, II, and E. D. Schneider.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 77-94, 1976. 11 fig, 2 tab, 30 ref.

Descriptors: *Biological communities, *Speciation, *Water temperature, *Thermal stress, *Thermal pollution, *Temperature, Sampling, Distribution, Resistance, Toxicity, Population, Environmental effects, Effluents, Crustaceans, Invertebrates.
Identifiers: *Diversity.

Responses due to thermal perturbation at the species level included marked changes in population abundances in temperature shifts of 1C although yearly temperature ranged 5C in natural surroundings: various species varied in population response due to temperature change; early life history stages were particularly sensitive. Entire communities underwent significant change when prolonged low level warming occurred due to heat effluents. Interaction between species, as in the case of the green crab and soft clam, changed with thermal fluctuations. Species diversity changed with ambient temperature for certain community types. (See also W78-00408) (Klein)
W78-00415

MODELS FOR TRANSPORT AND TRANSFORMATION OF MALATHION IN AQUATIC SYSTEMS,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5B.
W78-00416

A MATHEMATICAL MODEL OF POLLUTANT CAUSE AND EFFECT IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
For primary bibliographic entry see Field 5B.
W78-00418

MATHEMATICAL MODEL OF PHYTOPLANKTON GROWTH AND CLASS SUCCESSION IN SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Gross Ile, MI. Large Lakes Research Station.
V. J. Bierman, Jr., and W. L. Richardson.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 159-173, 1976. 10 fig, 18 ref.

Descriptors: *Mathematical studies, *Model studies, *Biomass, *Productivity, *Phytoplankton, Speciation, Zooplankton, Chlorophyll, Nutrients, Growth rates, *Lake Huron, Physiochemical properties, Phosphorus, Nitrogen, Silicon, Data collections.
Identifiers: *Model output, *Saginaw Bay(Lake Huron).

A mathematical model of phytoplankton production was applied to a set of physical, chemical and biological data from Saginaw Bay, Lake Huron. The model included four phytoplankton types, two zooplankton types, and three nutrients (P,N,Si). Model output correlated well with existing data for phytoplankton chlorophyll, total nitrogen, and dissolved forms of P, N, and Si. Model output did not agree with total P and total zooplankton data. (See also W78-00408) (Klein)
W78-00419

LAKE EUTOPHICATION: RESULTS FROM THE NATIONAL EUTROPHICATION SURVEY,
Corvallis Environmental Research Lab., OR.
J. H. Gakstatter, M. O. Allum, and J. M. Omernik.
In: Water Quality Criteria Research of the U.S. Environmental Protection Agency, Proceedings, Report EPA-600/3-76-079, p 185-205, 1976. 11 fig, 3 tab, 7 ref.

Descriptors: *Lakes, *Water quality, *Productivity, *Eutrophication, *Primary productivity, *Phosphorus, *Nitrogen, Water quality, Drainage systems, Watersheds(Basins), Land use, Water pollution sources, Inorganic compounds, Trophic level.

In the eastern U.S., a large percentage of the surveyed water bodies were impacted by municipal sewage treatment plant effluent and were in various states of enrichment. Primary production in 67% of the water bodies surveyed east of the Rocky Mountains was phosphorus-limited and 30% were nitrogen-limited according to algal assay results. Land use in the watershed was shown to be a significant factor in determining levels of phosphorus and nitrogen in streams in selected areas studied in the eastern United States. Average total phosphorus concentrations were about 10 times greater in streams draining agricultural areas than in streams draining forested areas; total nitrogen concentrations were about 5 times greater. The percentage of total nitrogen in the inorganic form was substantially higher in streams draining agricultural lands than in those streams draining forested lands. Phosphorus loading data for 23 selected survey lakes were applied to three general models relating annual total phosphorus loading rates to lake trophic conditions. The 'fit' of observed conditions to predictions made by each model was compared and discussed. (See also W78-00408) (Klein)
W78-00421

TUMORS AND AMYLOIDOSIS IN MICE PAINTED WITH CRUDE OIL FOUND ON BATHING BEACHES,
Tel-Aviv Univ. (Israel). Dept. of Histology and Cell Biology; Tel-Aviv Univ. (Israel). Dept. of Pathology; and Sheba Medical Center, Tel-Hashomer (Israel).
L. Barr-Nea, and M. Wolman.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 3, p 389-391, 1977. 3 fig, 1 tab, 4 ref.

Descriptors: Animals, Animal physiology, *Oil wastes, *Oil pollution, *Animal diseases, *Toxicity, Beaches, Water pollution sources, Laboratory tests, Pathology, Morbidity, Recreation, Seashores, Organic compounds, Cytological studies, Public health.
Identifiers: *Mice(Tumors), *Amyloidosis, *Crude oil, Israel, Tissue analysis, Histology, Carcinigones.

Oil lumps collected on the beaches of Israel in 1970, 1971, and 1973 were extracted with pure acetone and the extracts were used to paint the skin of mice twice weekly for 12 months. The oil lumps originated from crude oil spilled from tankers. The less recently collected oils induced papillomata and lymphomata in some animals. They were also more active than the recent oil in the induction of generalized amyloidosis. Mice painted for 12 months with acetone alone developed amyloidosis to a similar extent as those painted with the oldest oil. In previously reported experiments, however, acetone was much less active than the oil in producing amyloidosis after 5 months of painting. The possibility that acetone and oil might act both synergistically or to be antagonistic at different phases of amyloidogenesis is discussed. (Klein)
W78-00423

ORGANOCHLORINE PESTICIDE RESIDUES ASSOCIATED WITH MORTALITY: ADDITIVITY OF CHLORODANE AND ENDRIN,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
J. L. Ludke.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 3, p. 253-260, 1976. 2 tab, 14 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Mortality, *Organic compounds, *Toxicity, *Birds, *Endrin, Biochemistry, Path of pollutants, Analytical techniques, Animal physiology, Laboratory tests.
Identifiers: *Chlordane, *Bobwhite quail, Additive effects, Bioaccumulation, Tissue analysis, Colinus virginianus.

No mortality occurred among birds (bob white quail) fed the control diet or those fed 10 ppm chlordane alone. Mortality among birds treated with 10 ppm endrin occurred on days 1 (N=1), 6 (N=7), 9 (N=5), and 10 (N=2). Mortality among birds of the chlordane-endrin treatment occurred on days 3 and 6-10 (N=14) of endrin exposure. Survivors were sacrificed on days 9 and 10 of endrin exposure. All birds treated with endrin alone or with chlordane followed by endrin lost weight. Controls and chlordane-treated birds did not lose weight, and lipid content of the carcasses was high. Chlordane-treated birds had lower carcass lipid content than did controls, but carcass mean weights were similar. Moribund individuals had lost considerable body weight and contained much less body fat than did individuals that were not exhibiting signs of intoxication when sacrificed. Birds that died from intoxication averaged weight losses of 32.2% (endrin-treated) and 31.4% (chlordane + endrin-treated) when comared with the control group. (Katz)
W78-00424

ACUTE TOXICITY OF PESTICIDE MIXTURES TO BLUEGILLS,
Fish and Wildlife Service, Columbia, MO. Fish-Pesticide Research Lab.
K. J. Macek.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 6, p. 648-652, 1975; 2 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Toxicity, *Mortality, *Organic pesticides, *Organic compounds, *Organophosphorous pesticides, Copper sulfate, Endrin, DDT, Dieldrin, Path of pollutants, Teleosts, Analytical techniques, Mode of action, Sunfishes, Bioassay.
Identifiers: Additive toxicity, *Bluegill, Tissue analysis, Bioaccumulation, Malathion, BHC, Baytex, Sevin, Chlordane, Diazinon, Dichloros, Endosulfan, EPN, Methoxychlor, Methyl parathion, Parathion, Perthane, Toxaphene, Zectran.

Eleven combinations of pesticides (mostly chlorinated hydrocarbons and organophosphorous compounds) tested had greater than additive toxicity to bluegills (Lepomis macrochirus). Sixteen combinations had no more than additive toxicity, and one - malathion and copper sulfate - had less than additive toxicity. DDT did not have greater than additive toxicity with any of the pesticides tested except BHC. Many organophosphorous insecticides being proposed as alternatives to more persistent pesticides were particularly active when combined with other chemicals. (Katz)
W78-00425

CONTINUOUS FLOW CULTURE OF BENTHIC DIATOMS AND ITS APPLICATION TO BIOASSAY,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5A.
W78-00427

WARNING TEST TO DETECT THE PRESENCE OF HIGHLY TOXIC CONCENTRATIONS OF POISONS IN WATER,
Landestelle fuer Gewaesserkunde und Wasserwirtschaftliche Planung, Baden-Wuerttemberg (West Germany).
For primary bibliographic entry see Field 5A.
W78-00428

THE DYNAMICS OF BIOLOGICALLY AVAILABLE MERCURY IN A SMALL ESTUARY,
Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-00430

EFFECT OF IODOPHORE ON THE SPERM AND EGGS OF RAINBOW TROUT, (EFFETS DES IDOPHORES SUR LES GAMETES ET LES OEUFS DE TRUITE ARC-EN-CIEL),
Institut National de la Recherche Agronomique, Jouy-en-Josas (France). Lab. de Physiologie des Poissons.
R. Billard, and G. de Montalembert.
Bulletin Francais de Pisciculture, No. 263, p 41-44, 1976. 2 fig, 1 tab, 4 ref.

Descriptors: *Iodine, *Salmonids, *Trout, *Toxicity, *Rainbow trout, Fertilization, Mortality, Fish eggs, Fish reproduction, Mode of action, Path of pollutants, Resistance, Water quality, Aquiculture, Fish farming, Fish hatcheries.
Identifiers: *Iodophors, Gametes, Spermatozoa.

Toxicity of iodophors added to the diluent for insemination or to fresh water (50 ppm of iodine) was examined on rainbow trout ova and eggs at various stages of insemination. Freshly collected ova were sensitive to iodophors; the loss of fertility was about 10 per cent. No fertilization occurred when iodophors were used at the time of insemination suggesting an unfavorable effect of iodophors on spermatozoa. However, no significant loss of eggs was observed when iodophors treatment was administered after 30 mn water hardening. (Klein)
W78-00431

OZONE DISINFECTION OF FLOWING WATER,
Oregon Dept. of Fish and Wildlife, Clackamas.
For primary bibliographic entry see Field 5F.
W78-00432

NITRITE-INDUCED METHEMOGLOBINEMIA IN RAINBOW TROUT,
Fish and Wildlife Service, Bozeman, Montana, Fish Culturist Development Center.
C. E. Smith, and R. C. Russo.
The Progressive Fish-Culturist, Vol. 37, No. 3, p. 150-152, 1975; 1 tab, 10 ref.

Descriptors: *Nitrites, *Rainbow trout, *Salmonids, *Trout, *Fish physiology, *Organic compounds, Nitrogen compounds, Mode of action, Laboratory tests, Freshwater fish, Water quality, Aquiculture.
Identifiers: *Methemoglobinemia, *Hemoglobin, Fish blood, Tissue analysis.

The minimum nitrite concentration required to induce methemoglobinemia (M-Hb) in rainbow trout (Salmo gairdneri) was investigated. When compared with controls, exposure to 0.096 mg/l NO2 for 8 days resulted in a significant elevation (P 0.01) of M-Hb. Exposure to higher NO2 concentrations for shorter time periods also resulted in increases in M-Hb. There was no significant difference in total Hb concentrations of test fish when compared with controls. (Katz)
W78-00434

FACTORS AFFECTING NUTRIENT LOADS IN SOME IOWA STREAMS,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5B.
W78-00449

AQUATIC INSECT DIVERSITY AND BIOMASS IN A STREAM MARGINALLY POLLUTED BY ACID STRIP MINE DRAINAGE,
Pennsylvania State Univ., University Park. Dept. of Biology.
S. M. Tomkiewicz, and W. A. Dunson.
Water Research, Vol. 11, No. 4, p. 397-402, 1977. 3 fig, 2 tab, 15 ref. OWRT A-042-PA(1).

Descriptors: *Acid streams, *Aquatic insects, *Acid mine water, *Water pollution effects, *Streams, Biomass, Varieties, Animal groupings, *Pennsylvania, Mine water, Acid mine water.
Identifiers: *Upper Three Runs(Pa).

The effect of a moderate degree of acid mine drainage on biomass and diversity of an aquatic insect population was investigated in Upper Three Runs Pennsylvania, where the pH was reduced from 6 to about 4.5. The acid feeder itself (pH near 3.2) was inhabited only by a chironomid, a megalopteran (Sialis) and the caddisfly Ptilostomis. The acidic water input into the stream caused a drop in the Shannon-Weiner diversity index from 3.10 to 1.95, and a drop in biomass from 6.5 g/sq m to 2.2 g/sq m. Further downstream the diversity index remained relatively constant and the biomass leveled off at about 1.2 g/sq m. The number of taxa declined steadily from 30 at the unpolluted station to 13 at the lowest site, 1.9 km downstream from the pollution source. Populations of Coleoptera, Ephemeroptera and Trichoptera showed little or no recovery as the acid pollution ameliorated slightly. Diptera and Plecoptera species (especially Nemoura) showed a decided recovery and numerical increases near pH 5.0. There were no fish populations in the stretch of stream investigated but brook trout and sculpins were numerous at the control station. The polluted reach of the stream would be able to support a small fish population if it were possible to acclimate or introduce genetically-suitable species. (Auen-Wisconsin)
W78-00451

EFFECTS OF SOME HERBICIDES APPLIED IN THE FOREST TO THE FRESHWATER FISHES AND OTHER AQUATIC ORGANISMS--III. EXPERIMENTS ON THE ASSESSMENT OF ACUTE TOXICITY OF HERBICIDES TO AQUATIC ORGANISMS,
Tokai Regional Fisheries Research Lab., Yokosuka (Japan).
Y. Matida, S. Kimura, H. Tanaka, and M. Yokote.
Bulletin of Freshwater Fisheries Research Laboratory, Vol. 26, No. 2, p 79-83, 1976. 3 tab, 4 ref.

Descriptors: *Herbicides, *Toxicity, *Aquatic life, *Organic compounds, *Sodium compounds, *Toxins, *Sulfur compounds, 2,4-D, 2,4,5-T, Caddisflies, Salmonids, Salmon, Aquatic insects, Insect resistance, Path of pollutants, Water pollution sources, Ammonium compounds, Laboratory tests.
Identifiers: Bioaccumulation, Sodium chlorate, Ammonium sulfamate, Sodium 2,2,3,3,-tetrafluoropropioate, Sowbugs, Cherry salmon.

Acute toxicity of sodium chlorae, 2,4-d and 2,4,5-T, ammonium sulfamate, and sodium 2,2,3,3,tetrafluoroproionate to sow bugs (Asellus hilgendorffii), caddisfly (Stenopsyche griseipennis), dace carp fry, and cherry salmon fingerlings were studied. Effects of grain formulation of sodium chlorate were larger than those of reagent grade sodium chlorate to the aquatic organisms. Toxic effects of sodium chlorate to the organisms were weak. A mixture of 2,4-D and 2,4,5-T showed strongly toxic effects even at a fairly low concentration such as 0.47-0.62 ppm. Toxic effects of ammonium sulfamate were weak to the aquatic organisms. Sodium 2,2,3,3,-tetrafluoropropionate showed no effect to the aquatic organisms. (See also W78-00455) (Klein)
W78-00454

EFFECTS OF SOME HERBICIDES APPLIED IN THE FOREST TO THE FRESHWATER FISHES AND OTHER AQUATIC ORGANISMS--IV. EXPERIMENTS ON THE ASSESSMENT OF

ACUTE AND SUBACUTE TOXICITIES OF 2,4,5-T TO THE RAINBOW TROUT,
Tokai Regional Fisheries Research Lab., Yokosuka (Japan).
M. Yokote, S. Kimura, H. Kumada, and Y. Matida.
Bulletin of Freshwater Fisheries Research Laboratory, Vol. 26, No. 2, p 85-93, 1977. 3 fig, 6 tab, 6 ref.

Descriptors: *Herbicides, *2,4,5-T, *Rainbow trout, *Trout, *Salmonids, *Toxicity, *Fish physiology, Mortality, Organic compounds, Path of pollutants, Chlorinated hydrocarbon pesticides, Pathology, Laboratory tests, Bioassays.
Identifiers: Bioaccumulation, Tissue analysis, Histology, Pegnol-1000, Toxicant.

Effects of reagent grade 2,4,5-T emulsified with Pegnol-1000 to the rainbow trout were greater than those of ragent grade 2,4,5-T acetone solution. Weedon at a concentration of 0.02 ppm obviously retarded the growth of the rainbow trout. A several number of fish died during the period of the experiment (12 weeks). The exposed fish showed pathological changes in the liver, kidney, heart, and skin. Reagent grade 2,4,5-T at a concentration of 0.05 ppm had no effect on the fish during the period of the experiment. But, histological changes of a slight degree were observed in the liver, kidney, heart, and skin. Pegnol-1000 at a concentration of 0.425 ppm showed no effect to the rainbow trout. (See also W78-00454) (Klein)
W78-00455

FURTHER TOXICOLOGIC STUDIES WITH COMMERCIAL AND CANDIDATE FLAME RETARDANT CHEMICALS. PART II,
Cornell Univ., Ithaca, NY. Dept. of Neurobiology and Behavior.
A. T. Eldefrawi, L. B. Brattsten, and D. J. Lisk.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p. 720-726, 1977. 4 tab, 12 ref.

Descriptors: *Organic compounds, *Toxicity, *Enzymes, *Proteins, *Fish physiology, Freshwater fish, Biochemistry, Inhibition, Metabolism, Inhibitors, Organic compounds, Path of pollutants, Mode of action, Mortality, Cytological studies, Bioassay.
Identifiers: *Goldfish, *Flame retardants, Bioaccumulation, Tissue analysis, Cholinesterase inhibition.

A number of commercial and candidate flame retardants were studied with regard to their toxicity to goldfish, inhibition of cholinesterase, inhibition of acetyl choline binding to its receptor and insecticidal properties. Several of the flame retardants were notably toxic to fish. Some of the compounds showed modest inhibition of cholinesterase and/or microsomal oxidases, but none inhibited acetyl choline receptor binding. Whereas several of the flame retardants showed little or no insecticidal properties when added alone to a housefly diet, piperonyl butoxide greatly synergised their toxicity to houseflies. (Katz)
W78-00456

THE ECOLOGICAL EFFECTS OF COAL STRIP-MINING: A BIBLIOGRAPHY WITH ABSTRACTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
S. Ralston, D. Hilbert, D. Swift, B. Carlson, and L. Mengies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 316, Price codes: A18 in paper copy, A01 in microfiche. Publication No. FWS/OBS-77/09, March 1977, 416 p. WELUT No. 13.1-76, FWS 14-16-0008-2107.

Descriptors: *Strip mine wastes, *Revegetation, *Pollution, Ecology, Coal, Rehabilitation, Land use, Great Plains, Environmental effects, *Bibliographies, *Abstracts.

The bibliography contains references with abstracts, on the ecological effects of coal strip-mining in western United States, with particular emphasis on the Northern Great Plains. It does not represent an exhaustive search of all possible literature, but its broad scope will make it useful to workers engaged in strip-mine rehabilitation. There are two parts to this bibliography; part I contains the references and abstracts, part II is an extensive 'key work in Title' index to the references. (Fish and Wildlife Service)
W78-00495

5D. Waste Treatment Processes

PHYSICAL AND CHEMICAL METHODS,
Research-Cottrell, Bound Brook, N.J.
Chemical Engineering, Vol. 84, No. 17, p 135-138, August, 1977. 1 fig, 14 ref.

Descriptors: *Adsorption, *Chemical reactions, *Membrane processes, *Ion exchange, *Industrial wastes, Activated carbon, Ozone, Oxidation, Organic wastes, Chemical wastes, Filtration, Reverse osmosis, *Waste water treatment, Recycling.
Identifiers: Chemical treatment.

Various physical and chemical methods of industrial waste water treatment are discussed. Industrial applications where adsorption with activated carbon is used to remove organic pollutants are described, including those used at Hercules Naval Stores, Calgon Corporation, American Cyanamid Company, and Du Pont. The activated carbon process patented by Du Pont involves the direct addition of powdered activated carbon to the waste water feed to the aeration tanks of the activated sludge system. Typical carbon dosages of 50-220 ppm reduce the COD in the effluent by 50%. A multiple hearth furnace is used for both carbon regeneration and sludge incineration. A moving-bed carbon adsorption system is being used by American Cyanamid to reduce refractory organics in effluent. Chemical treatment processes for organic wastes which are described include ozonation for the destruction of organic material, oxidation in the form of aeration, and high-temperature incineration. Applications of membrane processes are described, including reverse osmosis, ultrafiltration, and electrodialysis. Ion exchange is evaluated for closed-loop recycle systems. (Schulz-FIRL)
W78-00006

PROCESS FOR TREATING AN ACIDIC WASTE WATER STREAM,
Societe Anonyme Texaco Belgium N.V., Brussels. (Assignee).
A. Benoit, S. A. R. Dewaele, and A. Verhelst.
United States Patent 4,035,293. Issued July 12, 1977. Official Gazette of the United States Patent Office, Vol. 960, No. 2, p 779, July, 1977. 1 fig.

Descriptors: *Acidic water, *Chemical wastes, *Phosphorus compounds, *Organophosphorus compounds, *Separation techniques, Chemical precipitation, Chemical reactions, *Patents, Hydrogen ion concentration, Industrial wastes, *Waste water treatment.
Identifiers: Phosphonic acids, Phosphoric acids, Mono(beta-hydroxyethyl) alkene thiophosphonate.

A continuous waste water treatment process for acid residues from methanol distillation for the manufacture of mono (beta-hydroxyethyl) alkene thiophosphonate is described. The effluent to be treated should be an aqueous effluent which contains phosphonic acids of general formula CnH2n + 1PO3H2 where n = 12 to 24, and phosphoric acid in a ratio of up to 75:25. The effluent and a slurry of 55-93 weight percent of a reagent of the calcium oxide and calcium hydroxide groups are mixed in a reaction zone. The amount of reagent added to the effluent is proportional to the amount of acid present in the effluent. The mixture is maintained at a temperature of 80-100 C for 1-30 minutes, raising the pH from its initial level of 1.2-3.0 to 8-12. A precipitate, which can be continuously removed from the reactor, and a clear aqueous phase are formed. (Schulz-FIRL)
W78-00007

CARBON ADVANCED WASTE TREATMENT PLANT HANDLES 20 MGD,
Industrial Wastes, Vol 23, No. 4, p 40-41, July/August, 1977.

Descriptors: *Tertiary treatment, *Activated carbon, *Incineration, *Organic wastes, *Chemical wastes, Industrial wastes, Adsorption, Heat treatment, Organic compounds, Sludge disposal, Effluents, *Waste water treatment, New Jersey.

A 22.4 million advanced waste water treatment facility being constructed for the American Cyanimid Company in Bound Brook, New Jersey, is described. The facility will provide tertiary treatment for 20 mgd of effluent from the existing secondary treatment plant, which was constructed in 1958 to treat waste waters resulting from the manufacture of organic chemicals. The plant will contain two multiple hearth furnaces designed by Nichols Engineering and Research Corporation to dispose of the secondary waste-activated sludge and to regenerate carbon used in activated carbon adsorption. Secondary effluent is piped to a system of 10 activated carbon columns, 16 ft in diameter and 48 ft high. Organics are absorbed and effluent is discharged into the river. Sludge from the secondary treatment plant is dewatered and incinerated into ash in a multiple hearth furnace. A Nichols 9 hearth furnace, approximately 26 ft in diameter, is used to thermally regenerate carbon. Spent carbon is dried at 210 F in the first zone of the furnace, treated by pyrolysis at 750 F in the second zone, and regenerated at 1700-1800 F in the presence of steam. After water quenching, the regenerated carbon is hydraulically transported to a carbon column or storage area. A venturi scrubber cleans the exhaust gases before they are discharged to the atmosphere through the furnace exhaust stack. (Schulz-FIRL)
W78-00008

ON-SITE CARBON REGENERATION SYSTEM SOLVES EFFLUENT PROBLEM.
Industrial Wastes, Vol. 23, No. 4, p 29, July/August, 1977. 1 tab.

Descriptors: *Chemical wastes, *Pre-treatment(Water), *Activated carbon, *Organic wastes, Equipment, Adsorption, Industrial wastes, Color, Chemical oxygen demand, Biochemical oxygen demand, Phenols, Effluents, *Waste water treatment, *Canada.
Identifiers: Activated carbon regeneration, Elmira(Ontario Canada), Kilns.

An activated carbon regeneration system is being used to treat aqueous effluents at the Elmira Uniroyal organic chemicals plant in Ontario. Manufactured by C-E Bauer (Canada) , a division of Combustion Engineering Inc in Brantford, Ontario, the unit reactivates 2500 lb/day of spent granular activated carbon which is used to precondition the plant's waste water to reduce color, COD, BOD, and TOC. The carbon regeneration system includes a direct-fired rotary kiln which is 3 ft in diameter and 20 ft long. Spent carbon flows from the bottom of an adsorber to an inclined screw which dewaters the slurry as it travels into the kiln. Moving in a direction countercurrent to the hot gases in the kiln, the carbon is dried, heated, and finally held in a hot zone at 1700 F under a controlled atmosphere for regeneration. After discharge into a water quench tank, the carbon is re-introduced into the adsorption system as a slurry. The C-E Bauer system also includes an afterburner and a wet scrubber for cleaning gases

before discharge into the atmosphere. A comparison of effluent quality at the Elmira Water Pollution Control Plant before and after the institution of carbon treatment at the Uniroyal Plant is presented. (Schulz-FIRL)
W78-00009

RO WATER TREATMENT SYSTEM.
Mechanical Engineering, Vol. 99, No. 8, p 58, August 1977.

Descriptors: *Reverse osmosis, *Membrane processes, *Chemical wastes, *Paints, *Treatment facilities, Industrial wastes, Equipment, Costs, Water reuse, *Waste water treatment.
Identifiers: Japan.

A reverse osmosis waste water treatment system which was designed by Shinko-Pfaudler Ltd has been installed at the Mooka plant of Kobe Steel Ltd in Japan. The system is used to treat rinse water from an electropainting line where an acrylic base finish is applied to aluminum window frames. The system includes 30 B-9 'Permasep' permeators which separate the acrylic paint and accompanying solvents from the rinse water. Additional means of waste disposal are unnecessary, as the system is a closed one and the acrylic finishes and water are reused. Annual costs for finishing 6000 tons of aluminum window frames dropped from $300,000 to $180,000 with the installation of the reverse osmosis system. A net saving of $90,000 is realized after the cost of electricity to operate the system ($6700) and costs to cover permeator and cartridge filter replacement ($23,000) are subtracted. These figures suggest that the unit will pay for itself in cost savings for raw materials, water, and waste disposal in less than 2 years. (Schultz-FIRL)
W78-00010

TREATING WATER FIVE WAYS.
Journal of the institution of Engineers (India), Vol. 26, No. 9, p 28-29, March, 1977.

Descriptors: *Organic wastes, *Pipelines, *Chemical wastes, *Storm water, *Chemical industry, Treatment facilities, Effluents, Sewage treatment, Industrial wastes, *Waste water treatment.
Identifiers: Brunsbuttel(West Germany).

A DM6.5 million waste water treatment facility is being used to treat 1000 cu m of waste water per day from the Bayer chemical complex near Brunsbuttel on the Elbe River in West Germany. The waste water treatment complex has provisions for conventional sewage, water containing organic chemicals, water containing organic salts, cooling water, and storm water. Ditches collect sewage destined for processing at the treatment plant. On-line pre-treatment is used for water contaminated by organic chemicals. Heated cooling water and water contaminated with organic salts are pumped into separate pipelines, monitored, and discharged to the Elbe River via surface pipelines. Storm water is conducted via storm drains to drainage canals at the perimeter of the industrial complex. Construction of the facility involved the emplacement of a 400 m pipeline into the Elbe. (Schulz-FIRL)
W78-00011

CHEMICALS AND ALLIED PRODUCTS, (LITERATURE REVIEW),
Union Carbide Corp. South Charleston, W. Va.
R. F. Nelson, and J. C. Hovious.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1201-1206, June, 1977. 52 ref.

Descriptors: *Chemical wastes, *Oil wastes, *Biological treatment, *Industrial wastes, *Recycling, Textiles, Acids, Phenols, Pesticides, Activated sludge, Activated carbon, Treatment facilities, Pilot plants, *Waste water treatment, Waste disposal, *Bibliographies.

Literature pertaining to the treatment of wastes produced during the manufacture of chemicals and allied products is reviewed. Characteristics of waste water are discussed according to product type, inlcuding TNT, coal gasification, urea, synthetic resins, plastics, polyvinyl chloride, ethyl benzene, dimethyl terephthalate, formaldehyde, and various organic wastes. Biological treatment methods through modifications of the activated sludge process are described. Studies on physical-chemical treatment are described for petrochemical wastes and wastes resulting from the manufacture of synthetic rubber. Various studies on source treatment and resource recovery techniques are presented, with topics including zinc recovery from rayon sludges, cyanide destruction, sodium sulfide removal, phenol removal, pesticide destruction, and dye removal. (Schulz-FIRL)
W78-00012

FATE OF CYANIDE AND RELATED COMPOUNDS IN AEROBIC MICROBIAL SYSTEMS--I. CHEMICAL REACTION WITH SUBSTRATE AND PHYSICAL REMOVAL,
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
S. F. Raef, W. G. Characklis, M. A. Kessick, and C. H. Ward.
Water Research, Vol. 11, No. 6, p 477-483, 1977. 10 fig, 3 tab, 15 ref.

Descriptors: *Cyanide, *Chemical wastes, *Adsorption, *Metabolism, *Chemical reactions, Kinetics, Microorganisms, Biological treatment, Industrial wastes, Carbohydrates, *Waste water treatment, Aerobic bacteria, Aerobic treatment.
Identifiers: Glucose.

Reaction mechanisms of the removal of cyanide during waste water treatment were investigated in laboratory studies using sealed glass ampules with glucose as a substrate and organic buffers. The rate of cyanide removal with respect to time was examined at 30C. Results indicated that the reaction of cyanide with glucose was first order with an optimum pH near 11.0. The biochemical metabolism of glucose/cyanide reaction products was investigated with three sets of growth experiments on the aldonic acid products of glucose-cyanide reaction. The aldonic products were biodegradable in shake flasks and manometric BOD bottles with acclimated and unacclimated seed cultures and a sequential metabolism was suggested by the presence of two plateaus. In adsorption studies with Bacillus magaterium and heterogeneous flocculant bacteria, cyanide was not reduced by contact with non-flocculating cells but was reduced by up to 12% after a one-hour contact period with flocculating cells. In stripping experiments with a microfermenter, 100% of the cyanide was recovered with no biological solids present. An initial decrease in stripping rates was observed when biological solids were present. This was attributed to physical adsorption, metabolism, or possible cyanide reaction with biological polymers. Detoxification with glucose is suggested as a possible method of treating cyanide-containing wastes when aldose carbonhydrates are available as wastes from other industries. (See also W78-00014) (Schulz-FIRL)
W78-00013

FATE OF CYANIDE AND RELATED COMPOUNDS IN AEROBIC MICROBIAL SYSTEMS--II. MICROBIAL DEGRADATION.
Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering.
S. F. Raef, W. G. Characklis, M. A. Kessick, and C. H. Ward.
Water Research, Vol. 11, No. 6, p 485-492, 1977. 10 fig, 3 tab, 18 ref.

Descriptors: *Biodegradation, *Organic compounds, *Activated sludge, *Aerobic treatment, Biological treatment, Chemical wastes, Industrial wastes, Chemical reactions, *Waste water treatment, Microbial degradation.
Identifiers: Cyanide, Cyanide removal.

Microbial degradation was investigated as a mechanism of cyanide removal during activated sludge treatment in addition to adsorption, stripping, and reaction with substrate. Heterogeneous cultures of sewage organisms were acclimated in a 6-liter aerated continuous-flow reactor. Glucose and cyanide were added to starved, acclimated cultures in a microfermenter. Gas washer solutions and reactor solids were analyzed for H(14)CN, (14)CO2, and for (14)C incorporated into cellular material. Analyses indicated that the acclimated heterogeneous cultures could readily metabolize glucose in the presence of cyanide and that as much as 50% of the cyanide was metabolized. The relative order of magnitude of cyanide removal by cyanide-acclimated heterogeneous cultures at neutral pH and aerated conditions was: stripping > metabolism > adsorption > chemical reaction with substrate. (See also W78-00013) (Schulz-FIRL)
W78-00014

PLANNING CHEMICAL MONITORING PROGRAMS FOR INDUSTRIAL FACILITIES AND ELECTRIC POWER PLANTS,
Westinghouse Electric Corp., Pittsburgh, PA. Environmental Systems Dept.
For primary bibliographic entry see Field 5A.
W78-00015

ANAEROBIC DIGESTION OF HIGH STRENGTH INDUSTRIAL WASTEWATERS,
Newcastle-upon-Tyne Univ. (England). Public Health Engineering Div.
G. K. Anderson, and T. Donnelly.
The Public Health Engineer, Vol. 5, No. 3, p 64-71, May, 1977. 5 tab, 28 ref.

Descriptors: *Anaerobic digestion, *Activated sludge, *Filtration, *Organic wastes, *Industrial wastes, Sludge treatment, Design criteria, Pilot plants, Farm wastes, Chemical wastes, *Waste water treatment.
Identifiers: Anaerobic activated sludge, Anaerobic filters.

An anaerobic activated sludge process was developed for the treatment of high-strength industrial organic waste waters. Minimum solids retention time in a digester contact tank and the addition and maintenance of a biological phase are required. Overall process environmental requirements which are discussed include: Anaerobic conditions; temperature; pH; alkalinity and volatile acid concentrations; toxic materials, such as salts, ammonia, and heavy metals, and their control; and nutritional requirements. Basic parameters which are used in anaerobic digester design are discussed, including loading rate, hydraulic retention time, and sludge retention time. The anaerobic activated sludge processing unit includes a continuously-fed, completely-mixed reactor equipped with some form of degassification and settling. Applications of the anaerobic activated sludge process are described. Laboratory studies on the treatment of a high-strength, soluble synthetic sewage at the University of Newcastle-upon-Tyne, England are described. A pilot scale anaerobic contact system was operated under various MLSS concentrations, underflow SS concentrations, and solids retention times. Performance data of the anaerobic contact digester are presented for a wide variety of industrial wastes including slaughterhouse, meat packing, maize starch, distillery, citrus, yeast, milk, acetic acid, dextrose, pig, and chemical wastes. The use of an anaerobic filter, an upflow digester equipped with an inert media for the retention of a biological mass, is described. (Schulz-FIRL)
W78-00016

EFFECTIVE MEASUREMENT OF CHLORINE RESIDUAL,
For primary bibliographic entry see Field 5A.
W78-00017

WASTE WATER PURIFICATION.
International Dyer and Textile Printer, Vol. 158, No. 2, p 89, July, 1977.

Descriptors: *Activated sludge, *Biochemical oxygen demand, *Organic wastes, *Food processing industry, Sludge treatment, Equipment, Industrial wastes, *Waste water treatment.

The Multox process for the reduction of BOD in organic industrial wastes is a multi-stage activated sludge process which was developed by Menzel Abwassertechnik of Stuttgart, Germany. Advantages of the system include: control of fluctuations in pH, concentration, and toxicity; high space loadings; flow equalization; treatment of organic acids without neutralization; short-circuit currents; dissolved oxygen monitoring and input; and lower production of excess sludge. The process is particularly applicable in the food processing industry. An example of BOD reductions by the use of the Multox process in a pickled cabbage factory is presented. (Schulz-FIRL)
W78-00019

RUBBER LININGS ALLEVIATE STICKY POLLUTION PROBLEM.
For primary bibliographic entry see Field 8G.
W78-00020

HANDLING OF WASTE STREAM SLUDGES,
J. Ford.
Process Biochemistry, Vol. 12, No. 5, 16-17, June, 1977. 2 tab, 7 ref.

Descriptors: *Dewatering, *Sludge treatment, *Centrifugation, *Separation techniques, *Food processing industry, Dairy industry, Sewage treatment, Chemical wastes, Industrial wastes, *Waste water treatment.
Identifiers: Brewery wastes, Distillery wastes, Pharmaceutical wastes, Sludge dewatering, Instant coffee mannufacturing.

Waste water treatment and disposal options used in the biochemical industry are described. Sludge characteristics for the wastes, which generally result from simple sedimentation or biological treatment, are described according to source industry. Principal types of mechanical dewatering equipment which are available for use in the treatment of organic wastes include filter press, centrifuge, rotary vacuum filter, and filter belt press. Specific application of centrifugation for industrial sludge dewatering are described. Treatment of the spent wash from grain whiskey distillery operations with a Decanter Centrifuge for protein recovery is described. The operation of a Decanter Centrifuge to remove excess suspended solids for the production of animal feed from effluent produced in the manufacture of instant coffee is also described. Applications of the Decanter Centrifuge to dairy, creamery, and municipal wastes are examined. (Schulz-FIRL)
W78-00021

WASTEWATER TREATMENT IN BREWING AND DISTILLING,
Imperial Chemical Industries Ltd., Hyde (England). Pollution Control Systems.
W. Campbell.
Process Biochemistry, Vol. 12, No. 5, p 6-8, 32, June, 1977. 8 ref.

Descriptors: *Fermentation, *Food processing industry, *Organic loading, *Acidity, *Nutrient requirements, Suspended solids, Industrial wastes, *Waste water treatment, Biological treatment.
Identifiers: *Brewery wastes, *Distillery wastes.

Principles of operation and treatment plant design are described for waste water resulting from brewing and distillation. Biological treatment methods have traditionally been used, since wastes from brewing and distilling are primarily in the form of carbohydrates derived from fermentation. Factors which affect aerobic biological treatment efficiency and design include impurity load, alkalinity or acidity, nutrient concentrations, and solids removal. Operating experiences illustrating the effects of these factors are presented. Poor quality effluents at a brewery waste water treatment plant with multistage high rate biofiltration were attributed to batch discharging and low weekend loading on the biological filters. Similar circumstances are described for two malt distilleries equipped with animal feed recovery plants. Examples of the effects of acidity on plant operation and the use of alkalis to regulate pH are presented. The effects of nitrogen and phosphorus deficiencies on multi-stage treatment units are examined. The need for removal of suspended solids both before and after the biological stage of treatment is discussed. (Schulz-FIRL)
W78-00022

HIGH PURITY PROTEIN RECOVERY,
Viscose Group Ltd., Swansea (Wales).
D. E. Palmer.
Process Biochemistry, Vol. 12, No. 5, p 24-26, 28, June, 1977. 5 fig, 4 tab.

Descriptors: *Proteins, *Amino acids, *Dairy industry, *Membrane processes, *Filtration, Biochemistry, Feeds, Ion exchange, Separation techniques, Food processing industry, Industrial wastes, *Waste water treatment.
Identifiers: Ultrafiltration, Whey recovery, *Protein recovery.

The Vistec protein recovery process was investigated for the isolation of protein from solution by means of ion exchange to recover high purity, undenatured, functional protein from cheese whey. The treatment system includes a holding tank and a filter bottom-stirred tank reactor. The separation process involves separation and isolation of protein using the Vistec ion exchange system, concentration of the proteinaceous eluate by ultrafiltration, and drying with a spray dryer to recover the protein powder. Use of the Vistec system as a primary system where the dilute protein liquors are concentrated by ultrafiltration and spray drying is described. Use of the system for the simple treatment method of spray drying of whole whey is illustrated. An example is presented showing how the Vistec system may be used in conjunction with an existing system, which includes ultrafiltration, to produce a final 30% protein product. Improvement of process efficiency by pre-concentration of the protein-containing effluent with ultrafiltration is discussed. Production costs and chemical and physical properties of the Vistec whey protein isolate are presented. (Schulz-FIRL)
W78-00023

EFFLUENT CONTROL IN FOOD PROCESSING INDUSTRIES,
B. F. Mortensen.
Process Biochemistry, Vol. 12, No. 5, p 19-22, June, 1977. 7 fig.

Descriptors: *Dairy industry, *Food processing industry, *Foreign countries, *Organic wastes, *Biochemical oxygen demand, Treatment facilities, Industrial wastes, *Waste water treatment, Waste disposal.
Identifiers: *Denmark, Slaughterhouse wastes, Brewery wastes, Dairy wastes.

Effluent control in food processing industries and in treatment plants operating in Denmark are described. Danish standards for effluent quality are based on the nature of the receiving waters, including lakes, rivers, fiords, and the open sea. Effluent characteristics of dairy wastes are described. Results of investigations at the Government Research Institute for Dairy Industry are presented. Various methods of biological treatment were evaluated for use in the dairy industry, including the oxidation ditch; high rate trickling filters with stones and corrugated plastic plates or plastic balls as filter media; and alternating double trickling filters. Studies indicated that the oxidation ditch was the most viable method for BOD reduction of dairy wastes, operating well even at 200% BOD overloading or 0.5 kg BOD/d/sq m aerated volume. The treatment facility at the Borup Dairy in Borup, Sealand, is described. Effluent characteristics of slaughterhouse wastes are also described. A testing program conducted by the Danish Meat Research Institute on biological and chemical treatment systems to reduce BOD in slaughterhouse wastes is presented. Operations of several Danish slaughterhouses, including Slaughterhouse Region South, Danish Crown Abattoir in Vojens, and Moghan Sheep and Cattle Slaughterhouse, are described. Waste water treatment and operations at rendering plants are examined. Brewery wastes from the brewing and bottling phases of operation are discussed. Operations of the FAXE Brewery in Fakse are described. (Schulz-FIRL)
W78-00024

FRUIT-, VEGETABLE-, AND GRAIN-PROCESSING WASTES, (LITERATURE REVIEW),
Environmental Associates, Inc., Corvallis, OR.
M. R. Soderquist, and J. L. Graham.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1118-1123, June, 1977. 47 ref.

Descriptors: *Food processing industry, *Recycling, *Canneries, Industrial wastes, Organic wastes, Waste treatment, Membrane processes, Waste disposal, Effluents, Toxicity, Reviews, *Waste water treatment, *Bibliographies.
Identifiers: Fruit processing wastes, Vegetable processing wastes, Grain processing wastes.

Literature pertaining to the processing of fruit-, vegetable-, and grain-processing wastes is reviewed. Federal and state regulation, waste characteristics, technology, disposal methods, and general aspects of treatment are discussed. The use of mathematical models in predicting the performance of a biological treatment system is discussed. Treatment and disposal methods which are presented include spray irrigation, overland flow, membrane treatment, ultrafiltration, and waste recycling. Methods to reduce water consumption, pollution generation, and toxic effects of waste waters from food processing industries are discussed. Various methods of treatment and disposal with applications to particular industries are described, including tomato processing, grape crushing, apple processing, citrus fruit processing, olive oil extraction, and cherry processing. Aspects of treatment and disposal are discussed for various vegetable processing industries, including potato processing, bean processing, sauerkraut wastes, and corn processing. (Schulz-FIRL)
W78-00025

BIOLOGICAL FILTERS, (LITERATURE REVIEW),
S. L. Klemetson.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1001-1005, June, 1977. 28 ref.

Descriptors: *Filtration, *Biological treatment, *Trickling filters, *Mathematical models, *Costs, Biodegradation, Microorganisms, Packed beds, Waste assimilative capacity, Filters, Organic wastes, Chemical reactions, Operation and maintenance, Effluents, Industrial wastes, Municipal wastes, *Waste water treatment.
Identifiers: Rotating biological contactors.

Literature pertaining to the use of biological filters in waste water treatment is reviewed. Mathematical models which have been developed to predict filter performance and to establish optimum process parameters are presented. Some specific objectives which the models were designed to meet include: prediction of the amount of substrate removal by slime subjected to various hydraulic and organic loadings, determination of the diffusion coefficients of oxygen transfer in microbial aggregates, and examination of phosphorus transport in a packed bed reactor. Experimental studies with biological filters using a variety of filter designs, media, and operational parameters to treat municipal and industrial wastes are described. Treatment costs for phosphorus removal by trickling filters, and for the use and construction of regional waste water treatment plants which may employ trickling filters, are discussed. Literature associated with the use of a rotating biological contactor as a type of biological filter is reviewed. (Schulz-FIRL)
W78-00027

MEAT-, FISH-, AND POULTRY-PROCESSING WASTES, (LITERATURE REVIEW),
Battelle Columbus Labs., OH.
J. H. Litchfield.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1113-1118, June, 1977. 49 ref.

Descriptors: *Food processing industry, Canneries, *Fish handling facilities, *Poultry, *Organic wastes, Reviews, Industrial wastes, Recycling, Effluents, Waste water treatment.
Identifiers: Meat processing wastes, Fish processing wastes, Poultry processing wastes.

Literature pertaining to waste treatment and disposal for meat, fish, and poultry processing is reviewed. Aspects related to the treatment, disposal, and resource recovery of meat processing wastes are discussed, including cellulosic ion exchangers, chitosan recovery from shellfish wastes, microbial degradation, fat and protein recovery, dewatering, and waste separation techniques. Waste water treatment and disposal methods are reviewed with respect to fish and shellfish processing, including protein recovery, chitosan recovery, flotation and flocculation processes, and electrolysis. Effluent characteristics for poultry processing wastes are discussed. Sand filtration and granular activated carbon treatment are examined for treatment of chiller water from poultry chilling and scalding operations and from the final composite effluent are presented. Disposal methods of poultry wastes by land application and with anaerobic lagoons are discussed. (Schulz-FIRL)
W78-00028

FERMENTATION INDUSTRY, (LITERATURE REVIEWS),
Purdue Univ., Lafayette, IN.
C. P. L. Grady, Jr., and J. K. Grady.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1123-1127, June, 1977. 44 ref.

Descriptors: *Food processing wastes, *Fermentation, *Yeasts, *Chemical wastes, *Alcohols, *Biological treatment, Industrial wastes, Fertilizers, Organic wastes, *Waste water treatment, Waste disposal.
Identifiers: Brewery wastes, Winery wastes, Pharmaceutical wastes, Distillery wastes, Alcohol production.

A series of articles on waste water treatment methods available to malting, pharmaceutical, and biochemical industries are reviewed. Various subjects related to the production of alcoholic beverages by breweries, distilleries, and wineries are examined, including waste water characteristics, biodegradation, biological treatment, chemical oxygen demand, and recovery and reuse of organic wastes. Topics related to Brazil's commercial alcohol industry, which produces ethanol from molasses obtained during cane sugar refining, are discussed, including color removal, waste composition, and land application as a means of waste disposal. Aspects of pharmaceuticals and biochemicals production which are discussed include operating experiences, COD removal, biological treatment, the use of pharmaceutical wastes for fertilizers, federal guidelines and effluent standards, and waste treatment processes. Results of a laboratory investigation to determine the technical feasibility of treating yeast plant waste water in a two-stage activated sludge system are discussed. (Schulz-FIRL)
W78-00029

REMOVAL OF COLOR FROM EFFLUENTS OF ANODIZING PLANTS,
Sandoz Ltd., Basel (Switzerland).
H. Grossmann.
Products Finishing, Vol. 41, No. 11, p 50-54, August, 1977.

Descriptors: *Dyes, *Dye concentrations, *Organic compounds, *Aluminum, *Color, Aluminum alloys, Separation techniques, Environmental effects, Color, Industrial wastes, *Waste water treatment.
Identifiers: Anodizing wastes.

Since some of the aluminum treated in anodizing plants is dyed by immersion in baths which contain organic dyes, anodizing plants must provide means of color removal before effluent can be discharged. Additional problems are posed because large volumes of highly concentrated dye liquors must be used, while relatively small amounts of dye are actually taken up by the aluminum. Toxicities and the effect of aluminum dyes on aquatic organisms and receiving waters are described. Since dyes are present in solution and are formulated to be resistant to biodegradation, removal in purification, plants is usually accomplished by adsorption or precipitation processes. Although aluminum dyes are retained in anion exchangers, they pass through cation exchangers. Dissolved dyes can be adsorbed or precipitated as hydroxides in a neutralization tank. Dye characteristics and the typical composition of used dye bath are discussed. Disadvantages to the use of chemical decomposition for decolorization are presented by the high concentrations of heavy metals which remain in the dye baths after dyes are removed. Concentration and separation of dyestuffs is hindered by the need for additional sludge and solid waste disposal facilities. Electrolytic oxidation, although efficient for decolorization, requires high initial investments and energy expenditure. (Schulz-FIRL)
W78-00030

POLLUTION-CONTROL PROCESS FOR HEAVY METALS IN PLATING RINSE WATERS.
Products Finishing, Vol. 41, No. 11, p 92-93, August, 1977. 1 tab.

Descriptors: *Heavy metals, *Industrial wastes, *Oxidation, *Equipment, Zinc, Copper, Lead, Chromium, Separation techniques, Effluents, *Waste water treatment.
Identifiers: Electroplating wastes, Metal wastes.

A Patented process for treating metal-containing plating rinse waters, the Ni1-Metal Chemical Oxidation Reduction Process, has been produced by Automatic Medical Systems, Inc. of Minneapolis, Minnesota. The batch chemical destruct process has been used to remove copper, chromium, nickel, zinc, cyanide, cadmium, lead, tin, and silver from plating rinse waters. Results from a testing program with NI1-Metal Pollution Control Process are presented. Main features of the system include efficient reduction in metals concentrations with a range of tank sizes, minimum capital outlay, ease of operation, relatively short reaction time, and lower sludge volumes than for the usual hydroxide sludges. (Schulz-FIRL)
W78-00031

METAL RECOVERY MAKES GOOD SENSE,
Corning Glass Works, NY.
S. Bhatia, and R. Jump.
Environmental Science and Technology, Vol. 11, No. 8, p 752-755, August, 1977. 1 fig, 1 tab, 5 ref.

Descriptors: *Metals, *Separation techniques, *Industrial water, *Distillation, *Long-tube vertical distillation, Condensation, Industrial wastes, Chemical wastes, *Waste water treatment.
Identifiers: Climbing-film evaporators, Electroplating wastes, *Metals recovery.

Various aspects of resource recovery in the electroplating, metal, and plastics finishing industries are discussed. Since rinse water from plating operations may contain as much metal as is used in the process, the climbing film evaporator (CFE) is discussed as a recent development in metals recovery technology. Plating rinse water is vaporized by low-pressure steam and the concentrate is driven up into a vapor-liquid separator. The recovered solution is drained into a storage tank when its concentration has reached a predetermined level set by a concentration sensor controller. The distilled water can be reused in the rinsing process. Advantages in the use of the climbing film evaporator include reduced water use, lower costs for plating chemicals, and reduced labor costs in preparing plating solutions. Applications of the CFE system by General Plating in Detroit, Michigan; Ford Motor Company in Saline, Michigan; and Hudson Bay Diecastings Ltd in Bramalea, Ontario, are described. (Schulz-FIRL)
W78-00032

NORWEGIAN STEELWORKS INSTALLS LARGE MAGNADISC WASTE WATER CLEANING SYSTEM.
ASEA Journal, Vol. 50, No. 2, p 46, 1977.

Descriptors: *Steel, *Filters, *Flocculation, *Filtration, *Industrial wastes, *Treatment facilities, Water pollution control, Metals, Equipment, Separation techniques, *Waste water treatment.
Identifiers: Oslo(Norway).

Waste water from the blooming and wire rod mills at the Elkem-Spigerverket A/S steelworks in Oslo, Norway, will be treated by a MAGNADISC filter plant. A rotating magnetic disc filter which consists of an array of 45 thin, contra-rotating, circular discs is the major component of the system. Suspended matter and oil are first removed from the rolling mill waste water in a coarse settling tank. The remaining magnetic and non-magnetic particles are bound together with a flocculant additive. The MAGNADISC filters remove the sludge, leaving a residual solids concentration of about 30 g per cubic meter. The filtering system, which removes between 15 and 20 tons of mill scale per day from rolling mill waste water, has been installed at Elkem-Spigerverket to reduce the discharge of pollutants flowing into the Aker River. (Schulz-FIRL)
W78-00033

PEAT MOSS FILTER.
Water and Waste Treatment, Vol. 20, No. 6, p 52, 54, June, 1977.

Descriptors: *Filters, *Filtration, *Heavy metals, *Absorption, *Peat, Organic soils, Soil chemical properties, Separation techniques, Metals, Industrial wastes, Porous media, Chemical wastes, *Waste water treatment.
Identifiers: *Peat moss filters.

The use of peat moss to purify waste water containing heavy metals is being investigated at the

University of Sherbrooke in Canada. Preliminary studies have indicated that peat moss may have the ability to absorb metals such as copper, zinc, and mercury and that metals uptake is related to the acid content of the water. A pilot plant with a capacity of about 20,000 gallons of waste water per day was used to test the use of peat in the treatment of electroplating industry waste water which contained cyanide, cadmium, chromium, copper, nickel, and zinc. The plant included a peat moss filter, a device for spraying waste effluents, and a system for peat disposal. Filter construction involves grinding the peat moss and mixing it with water to form a 1% peat moss slurry. The slurry is pumped to an adjustable-speed moving screen belt to provide a one-inch-thick filter bed. Eight pipes suspended above the filter bed are used to spray chemically treated waste water over the bed. After saturation with heavy metals, the peat can be incinerated or used for landfill. (Schulz-FIRL)
W78-00034

BALANCED CARBONATE/BICARBONATE TREATMENT FOR PRECIPITATION OF TOXIC METAL WASTES,
Illinois Inst. of Tech., Chicago.
J. Patterson, and N. R. Barber.
Industrial Finishing, Vol. 53, No. 8, p 51-53, August, 1977. 1 fig.

Descriptors: *Carbonates, *Bicarbonates, *Hydrogen ion concentration, *Metals, *Chemical precipitation, Chemical reactions, Calcium carbonate, Industrial wastes, *Waste water treatment.
Identifiers: Metals precipitation, Hydrogen ion concentration control, Carbonate treatment.

Applications and advantages in the use of balanced carbonate/bicarbonate treatment for precipitation of toxic metal wastes are discussed. Advantages of the use of sodium bicarbonate include precipitation of a metal while holding the pH within a narrow range at nearly optimum levels, neutralization of excess acidity, and lower dispensing and sludge handling costs than for lime. Advantages of the use of sodium hydroxide to precipitate metals include ease of handling and application, precise pH control, and low sludge production. Although calcium carbonate is sometimes used in primary treatment, its slow dissolution results in better performance during batch processing than in a continuous system. The mixture of sodium bicarbonate with another suitable carbonate is suggested to enhance metals removal. With the addition of another carbonate, the pH is raised from 8.3 to 9, causing the precipitation of many more metals. Advantages of the bicarbonate/carbonate mixture include the steady system pH, in spite of varying levels of pH and metal in the effluent, and the precipitation of carbonate salts within a narrow pH range. Bicarbonate treatment is suggested as most cost-effective for industrial waste water treatment plants that treat 200,000 to 500,000 gallons of waste water per day. (Schulz-FIRL)
W78-00035

TINY DROPLETS CLEAN UP IN BIG SEPARATION JOBS.
Chemical Week, Vol. 121, No. 11, p 32, September, 1977.

Descriptors: *Membrane processes, *Separation techniques, *Metals, *Ammonium compounds, *Solvent extractions, Oil, Mining, Organic wastes, Industrial wastes, *Waste water treatment.
Identifiers: Liquid membranes.

Liquid membranes as complex emulsion systems have been developed at the Exxon Research Center in Linden, New Jersey, for use in kidney dialysis and for the removal of toxic ions from industrial waste water. The emulsion system is composed of an aqueous phase that is surrounded by an oil phase and stabilized by surfactants. A liquid membrane system which was developed by the Takuma Corporation in Osaka, Japan, under the direction of Exxon is also described. The Takuma system was adapted for removing toxic heavy metals and ammonia from municipal and industrial waste water. An ion trapping agent is dissolved in water and encapsulated by an oil phase which is composed of a surfactant dissolved in an 'isoparaffinic' solvent. Special ion carriers in the oil phase transport inorganic ions from the oil membrane into the aqueous phase. The system is capable of completing ion extraction and stripping in a single step and has been used in laboratory experiments to remove metal ion. Use of the liquid membranes for the extraction of metals from ores is currently being investigated. (Schulz-FIRL)
W78-00036

REMOVAL OF TOXIC METAL IONS FROM METAL-FINISHING WASTEWATER BY SOLVENT EXTRACTION,
Texas Southern Univ., Houston. Dept. of Chemistry.
C. W. McDonald, and R. S. Bajwa.
Separation Science, Vol. 12, No. 4, p 435-445, 1977. 3 tab, 13 ref.

Descriptors: *Solvent extractions, *Separation techniques, *Metals, *Nitrogen compounds, Chemical reactions, Zinc, Cadmium, Copper, Chromium, Sodium compounds, Heavy metals, Industrial wastes, *Waste water treatment.
Identifiers: Amines, Metal-finishing wastes.

Solvent extraction procedures using high molecular weight amines were investigated for the removal of chromium, cadmium, and zinc from metal-finishing waste water. The experiments investigated the extraction abilities of Primene JM-T, Primene 81-R, Amberlite AL-1, Alamine 336, and Aliquat 336-S with synthetic solutions of cadmium, chromium, copper, nickel, and zinc, and with metal-finishing waste water obtained from the Dixie Metal Finishing Plant in Houston, Texas. With a 25% Alamine 336-xylene solution as the extractant, chromium, cadmium, and zinc can be extracted selectively or simultaneously with a 100-to-1 aqueous phase:organic phase ratio. Stripping experiments with sulfuric acid, ethylenediamine, EDTA, and sodium hydroxide indicated that sodium hydroxide was the most efficient stripping agent, with removal of more than 99.5% of the chromium, cadmium, and zinc from the organic phase with 4 M NaOH in single stripping operation. An evaluation of reagent life and regeneration indicated that a regenerated Alamine 336-xylene solution could be reused for as many as 15 cycles without loss of extraction efficiency. The reaction mechanisms by which metals are extracted from metal finishing waste water are described. (Schulz-FIRL)
W78-00037

CHROMIC ACID DECATIONISER.
Water and Waste Treatment, Vol. 20, No. 7, p 47, July, 1977.

Descriptors: *Separation techniques, *Metals, *Ion exchange, *Cation exchange, Acids, Industrial wastes, Acidic water, Chemical wastes, Liquid wastes, *Waste water treatment.
Identifiers: *Chromic acid decationizer.

The Canadian Eco-Tec Decationizer is suggested for the removal of cationic metallic contaminants such as trivalent chrome, nickel, zinc, copper, iron, and aluminum from chromic acid-based solutions used in electroplating, anodizing, chrome plating, and etching. Treatment of the solutions can eliminate costs and hazards associated with disposal, as well as improve operations and possibly allow for reuse of the solutions. The Eco-Tec Decationizer uses the patented Reciprocating Flow Ion Exchange process and other design and equipment innovations, and may provide a viable alternative to the usually costly and complicated means of contaminant removal from chromic acid solutions. (Schulz-FIRL)
W78-00038

NEW TECHNOLOGY FOR BOILER FEED AT MOBIL,
J. B. Leather.
Effluent and Water Treatment Journal, Vol. 17, No. 6, p 279-282, 285, June, 1977. 5 fig, 2 tab.

Descriptors: *Oily water, *Oil wastes, *Demineralization, *Ion exchange, *Separation techniques, Conductivity, Silica, Cation exchange, Anion adsorption, *Boiler feed water, Filters, Filtration, Treatment facilities, Boilers, Equipment, *Waste water treatment.
Identifiers: Coryton(Essex United Kingdom).

Expansions of the waste water treatment facilities at the Mobil oil Company Refinery at Coryton, Essex, England, are described. Initial plans for the facilities included cation, degassing, strong base anion and mixed bed stages to produce an effluent which was low in silica and conductivity. The demineralization plant includes three cation and three strong base anion exchange units which were arranged for counter-current regeneration, and an atmospheric degasser. The plant is designed to treat a total maximum flow rate of 544 tons/hr. In the counter-current regeneration technique waste water passes through the ion exchange resin in a downward direction while regenerant passes in an upward direction. Requirements of the system include the use of cation-free water for regenerant chemical dilution and maintenance of the resin bed in a completely compact, undisturbed state. The regenerant collector contains a header and lateral system at the top of the resin bed. Further details on regenerant production, storage, and transfer are presented. Coalescing filters and candle-type pre-coat filters are used to produce a suitable refinery condensate for feeding to the boilers. Mechanical, electrical, and civil engineering work for the Coryton facility is being done by Degremont Laing Ltd. (Schulz-FIRL)
W78-00039

ACTIVATED CARBON IMPROVES EFFLUENT QUALITY IN REFINERY SLUDGE PROCESS,
Amoco Oil Co., Texas City, TX.
C. G. Grieves, M. K. Stenstrom, J. D. Walk, and J. F. Grutsch.
Industrial Wastes, Vol. 23, No. 4, p 30-35, July/August, 1977. 6 fig, 10 tab, 8 ref.

Descriptors: *Chemical wastes, *Activated sludge, *Activated carbon, *Oil wastes, *Nitrification, Aeration, Pilot plants, Industrial wastes, Sludge treatment, Chemical oxygen demand, Phenols, Particle size, *Waste water treatment.

The effects of the addition of powdered activated carbon to the aeration section of an activated sludge process for refinery waste water treatment were investigated with pilot plant experiments conducted in three phases at the Amoco Texas City refinery. The experiments used modified activated sludge reactors in which sludge from the sludge blanket flowed by gravity back into the aeration zone. The first two phases of the program investigated enhancement of treatment by the addition of high doses of carbon (100 and 200 mg/liter) for the removal of soluble organic carbon, soluble COD, NH3-N, and phenolics. A newly-developed high surface area carbon was used in the third phase of the study. Results indicated that the addition of activated carbon to the activated sludge process significantly improved effluent characteristics. A comparison in effectiveness of the types of carbon used in the studies indicated that performance was better and less carbon was required when a higher surface area carbon was used. The high surface area carbon developed for the program was twice as effective as the best commercially available carbon tested.

Prefiltration and operation at a high sludge age (60 days) also improved pilot plant effluent quality. (Schulz-FIRL)
W78-00040

MEETING BPT STANDARDS FOR REFINERY WASTEWATER TREATMENT.
Engineering-Science, Inc., Pasadena, CA.
Industrial Wastes, Vol. 23, No. 4, p 20-25, July/August, 1977. 5 fig, 5 tab, 5 ref.

Descriptors: *Oil wastes, *Chemical wastes, *Oily water, *Separation techniques, *Federal Water Pollution Control Act, Filtration, Biological treatment, Hydrogen ion concentration, Water quality standards, Liquid wastes, *Waste water treatment.
Identifiers: Petrochemical wastes, Stripping, pH control, API separators, Tilted plate separators.

Best practicable treatment for petroleum refineries and petrochemical plants has been defined by the EPA as biological treatment combined with post-filtration. Such treatment is required of all existing industrial dischargers by July 1977. Methods of primary treatment which are applicable to petroleum industries include API separators, tilted plate separators, filtration, pH control, and stripping processes. Intermediate processes include dissolved air flotation, coagulation-precipitation, and equalization. Secondary/tertiary treatment processes include activated sludge, chemical oxidation, and filtration. The characterization of treatment needs according to pollutant sources, such as normal process operations, utility operations, sanitary sewage, contaminated storm runoff, ballast water blowdown, and miscellaneous discharges, is suggested. Typical applications and advantages are discussed for primary treatment processes for oily wastes. (Schulz-FIRL)
W78-00041

CHEMICAL RECOVERY SYSTEM CHECKS POLLUTION.
Modern Power and Engineering, Vol. 71, No. 6, p 32-34, June, 1977. 1 fig.

Descriptors: *Incineration, *Carbonates, *Pulp wastes, *Oxidation, *Dewatering, *Drying, Pulp and paper industry, Industrial wastes, Treatment facilities, Chemical wastes, Waste disposal, *Waste water treatment.
Identifiers: Fluidized bed reactors, Sodium carbonate recovery.

The Papier Cascades (Cabano) Inc. pulp and paper mill in Cabano, Quebec, has begun using a $2 million chemical recovery system to treat spent liquor from the plant's daily production of 200 tons of corrugating medium. The Copeland system contains a fluidized bed reacotr for the combustion of spent liquor to oxidize organic pulping residue and recover sodium carbonate and sodium salts. Spent liquor which has been concentrated in a direct contact venturi-type evaporative scrubber is injected into the upper freeboard zone of the 22-ft diameter fluidized bed reactor. Water is evaporated from the concentrate by gases at a temperature of about 1200F. Sodium hydroxide in the dried liquor solids is converted into sodium carbonate to form a pelletized bed material. Withdrawal of the granular bed product through a nozzle in the side of the reactor is controlled by a variable speed rotary valve. The sodium carbonate is recycled through the pulp mill. The direct contact venturi scrubber/evaporator cools and cleans hot exhaust gases from the reactor while evaporating liquid from the weakly concentrated liquor. The system is automatically controlled through a central control room. (Schulz-FIRL)
W78-00042

GREAT LAKES PAPER LAUNCHES THUNDER BAY PULP MILL.
Paper, Vol. 188, No. 1, p 18-20, July, 1977.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Chemical wastes, *Biochemical oxygen demand, *Treatment facilities, Bleaching wastes, Industrial wastes, Water pollution control, *Waste water treatment, *Canada, Lake Ontario.
Identifiers: Thunder Bay(Ontario Canada).

Operations of a closed cycle, bleached softwood kraft market pulp mill in Thunder Bay, Ontario, Canada, are described. The Rapson-Reeve closed cycle process was designed for the Great Lakes Paper Company under a $1.2 million contract from Environment Canada's Demonstration and Design of Pollution Abatement Technology Program. The new bleached kraft pulp mill which is designed to handle 3,000 cords of wood per day includes a Kamyr continuous digester with a capacity of 800 t/day and 3.5 hours of in-digester washing, a two-stage diffuser washer, a five-stage bleach plant with countercurrent washing in both bleach plant and brownstock washing, and extensive cleaning of both brownstock and bleached pulp with 1,054 Noss cleaners. The closed cycle process involves transport of the effluent from the bleach plant into the pulping operations for reuse and subsequent chemicals recovery. The Rapson-Reeve process is designed to totally remove BOD by chemical rather than biological processes. Color and toxicity are also reduced in the process. Information on the design and operation of the continuous digester, the bleach plant, countercurrent washing, and the pulp machine is presented. Goslin-Birmingham salt liquor evaporators filter out sodium chloride in the recausticizing system. A spill system which consists of underground collection tanks for acids, alkalis, and fiber prevents accidental discharge from the mill. (Schulz-FIRL)
W78-00043

DEWATERING PAPER MILL SLUDGE.
Water Services, Vol. 81, No. 976, p 344, June, 1977.

Descriptors: *Filters, *Dewatering, *Pulp wastes, *Pulp and paper industry, *Clarification, *Separation techniques, Equipment, Filtration, Industrial wastes, *Waste water equipment.

British Tissues Ltd is using two string discharge rotary-drum vacuum filters manufactured by Stockdale Engineering Ltd of Cheshire, England, to dewater paper mill effluent. The mill uses approximately 1.5 million gallons of water daily, which is ultimately discharged along with paper fiber and clay. Screening is used to recover much of the fiber and the residue is passed on to an effluent treatment plant. Small particles are settled in a clariflocculator to which polyelectrolytes are added. The Stockdale filters are used to dewater the resulting thickened clarifier underflow. The Stockdale units produce a filter cake with a solids content of approximately 20%. The stainless steel Stockdale filters are equipped with a string discharge for the relatively thin, sticky filter cakes. The filtration areas of the two filters used by British Tissues Ltd are 5.85 and 13.27 sq m. (Schulz-FIRL)
W78-00044

MISSISSIPPI PAPER MILL SETS EXAMPLE.
Water and Wastes Engineering, Vol. 14, No. 7, p 29, July, 1977.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Aeration, *Settling basins, Oxygenation, Biochemical oxygen demand, Treatment facilities, *Waste water treatment, Mississippi.
Identifiers: Moss Point(MS).

Effluent treatment at the International Paper Company's Moss Point paper mill in Jackson County, Mississippi, is described. The secondary waste water treatment facility for processing 28 mgd was approved for development in 1971 and engineering services were provided by Michael Baker, Jr., Inc. Relocation of a portion of the Escatawpa River by dredge construction of a new channel and closure of the natural channel with a sand core dike was required in construction of the facility. A 60-acre, aerated waste water stabilization basin constructed of dredge-filled earthen dikes retains the average waste water flow of 28 mgd from the paper mill's primary clarifier for 8 days. An oxygen transfer of 2.17 lbs per horsepower-hour is supplied by 22 floating mechanical aerators. Nitrogen is added to the waste at a rate of 2 lbs per 100 lbs of BOD to satisfy nutrient requirements and promote the growth of microorganisms. (Schulz-FIRL)
W78-00045

RAYONIER'S $76-MILLION POLLUTION CONTROL PROJECT FOR SULFITE PULPING STARTS UP IN FLORIDA.
Paper Trade Journal, Vol 161, No 9, p 23, May, 1977.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Treatment facilities, *Industrial wastes, Incineration, Water pollution control, Clarification, Energy, Costs, *Waste water treatment, Florida.
Identifiers: Fernandina Beach(FL).

New facilities at the ITT Rayonier sulfite pulp mill in Fernandina Beach, Florida, will be used to treat cooking process wastes which previously had been discharged into the ocean directly or via the Amelia River. Wastes from the processing of southern pine, a highly resinous wood, at the Fernandina facility required special processes other than conventional ones used in handling kraft mill wastes. The $76 million pollution abatement program includes the recovery of heat and processing chemicals for re-use. Liquid wastes from primary cooking operations are concentrated by evaporation and sent to a recovery furnace and boiler for incineration. A spray mist scrubber is used to remove potential air pollutants from gases produced in the burning process and to recover processing chemicals. Usable bleaching wastes are burned at the company's kraft pulp mills in Jesup, Georgia. After a 210-ft diameter clarifier removes grit and unusable wood fibers from the mill waste water, the solids are incinerated or transported to a landfill. Clarified effluent is retained in a 33-acre aeration lagoon before discharge through a diffuser into the Amelia River. (Schulz-FIRL)
W78-00046

NITRIFICATION DESIGN APPROACH FOR HIGH STRENGTH AMMONIA WASTEWATERS,
Associated Water and Air Resources Engineers, Inc., Nashville, TN.
C. E. Adams, Jr., and W. W. Eckenfelder, Jr.
Journal Water Pollution Control Federation, Vol 49, No 3, Part 1, p 413-421, March, 1977. 7 fig, 11 ref.

Descriptors: *Nitrification, *Ammonia, *Mathematical models, *Oxygen requirements, *Design criteria, Oil wastes, Pulp wastes, Phenols, Organic wastes, Chemical wastes, Oil industry, Pulp and paper industry, Industrial wastes, *Waste water treatment.

The use of nitrification for ammonia removal from high-strength waste waters was investigated, and design coefficients needed for estimating detention times and oxygen requirements for nitrification with the activated sludge process were generated. Basic concepts and mechanisms associated with the biological conversion of ammonia to nitrate were discussed. Proposed design models to correlate detention time and oxygen requirements to the amount of nitrification desired included: a model which described the oxidation of ammonia in terms of ammonia concentration, detention time, and overall nitrification rate coefficient; and an oxygen utilization model which related total oxygen required to BOD removed,

amount of oxygen used for synthesis, and oxygen required for endogenous activities. The validity of the models was tested in laboratory and pilot studies with activated sludge systems using three types of industrial wastes, including pulp and paper waste water, refinery waste water, and phenolic waste water. The studies indicated that the models were applicable to both a single-stage and a two-stage nitrification process and that high sludge ages were required for nitrifying high concentrations of ammonia. Design considerations on oxygen requirements, limitations of biological nitrification, and modification to the activated sludge process are discussed. (Schulz-FIRL)
W78-00047

ALTERNATIVES FOR BIOLOGICAL WASTE TREATMENT OF DYE WASTEWATERS,
Tennessee Univ., Knoxville. Dept. of Environmental Engineering.
D. W. Weeter, and A. G. Hodgson.
American Dyestuff Reporter, Vol 66, No 8, p 32, 34, 36, 38, 61, August, 1977. 2 fig, 9 tab, 6 ref.

Descriptors: *Dyes, Color, *Biodegradation, *Activated sludge, *Adsorption, *Chemical wastes, Oxygen requirements, Waste assimilative capacity, Textiles, Industrial wastes, Suspended solids, *Waste water treatment.
Identifiers: *Color removal.

Alternative methods of treatment of dye waste waters from textile mills are reviewed. Laboratory studies were used to investigate the degradability of six dyes as measured by oxygen uptake, with specific emphasis on color reduction as the main goal of treatment. The absorptive capacities of acclimated and non-acclimated sludges for the six dyes were examined. Studies indicated that oxygen uptake by each of the dyes was limited, and no effective removal of color or change in hue was observed over a 25-day incubation period at 20C. Slight nitrogenous oxygen uptake was indicated, but there was no significant change between the carbonaceous and the total oxygen uptake. In the second phase of the study, possible color removal and organic loading by adding mixed liquor suspended solids to the dyes was investigated. A floc which exhibited poor settling characteristics was produced when acclimated mixed liquor suspended solids were added to the dye solution. Chemical oxygen demand and measured color were higher for the treated dye solutions than for untreated solutions. In the third phase of the study, color reduction by the addition of non-acclimated mixed liquor suspended solids to dye solutions was investigated. Results were similar to those obtained for acclimated solids. The degree of color reduction with the addition of MLSS ranged from 25 to 40% and varied with type of dye. The degree of color reduction was not significantly affected by the length of contact time. (Schulz-FIRL)
W78-00048

SLUDGE DEWATERING IN TEXTILE PLANTS,
Kendall Co., Griswoldville, MA.
C. Cole, S. Corr, and J. Albert.
American Dyestuff Reporter, Vol 66, No 8, p 30-31, 61, August, 1977. 4 fig, 2 tab, 6 ref.

Descriptors: *Dewatering, *Bleaching wastes, *Textiles, *Sludge treatment, *Centrifugation, Separation techniques, Filtration, Suspended solids, Polymers, Treatment facilities, Pilot plants, Industrial wastes, *Waste water treatment, Massachusetts.
Identifiers: Griswoldville(MA).

Weston and Sampson Engineers of Boston, Massachusetts, were contracted to develop a program for waste activated sludge dewatering at the Kendall Company textile bleaching plant in Griswoldville, Massachusetts. The 1 million gallons of waste water generated at the plant each day are low in suspended solids and commonly contain BOD in the range of 500-600 mg/liter. A three-day modified extended aeration activated sludge process reduces the BOD of screened waste water by 95%. Gravity settling is used to clarify mixed liquor to a waste activated sludge solids content of 0.5-0.7%. A mechanical sludge dewatering system was installed to reduce odor problems associated with sludge holding lagoons. Vacuum filtration, centrifugation, and pressure filtration were evaluated as means of sludge dewatering. Laboratory tests at Ingersoll-Rand in Nashua, New Hampshire, indicated that a countercurrent flotation separator (CFS) in combination with a slow-speed Kruger centrifuge was the best means for dewatering the difficult sludge. Microsize bubbles which rise countercurrent to the raw sludge entering the CFS combine with flocculated particles to form a sludge blanket at the top of the unit. Studies on polymer dosages indicated that a dosage of approximately 11.5 lb per dry ton of solids resulted in the greatest solids recovery. The sludge dewatering system, which includes a dual polymer system, a sludge holding tank, sludge pumps, and a compressed air distribution system, is designed to thicken and dewater 1300 lb of sludge daily over a 31-hour week of operation. (Schulz-FIRL)
W78-00049

PROSPECTS FOR WATER RE-USE,
Shirley Inst., Manchester (England). Finishing Div.
G. J. Parish.
American Dyestuff Reporter, Vol 66, No 8, p 27, 29, 52, August, 1977. 1 tab.

Descriptors: *Textiles, *Water reuse, *Water utilization, *Impaired water use, Industrial wastes, Costs, Sewage treatment, Tertiary treatment, *Waste water treatment.

Various aspects of the reuse of waste water for industrial purposes are discussed. Multiple usage of water is suggested to reduce total water intake, save water costs, provide a water source where supplies of raw water are limited, and reduce the total amount of effluent to be discharged. The degree of ability to reuse water within a given industry depends on the nature of the industry, process waste water characteristics, and process water quality requirements. Aspects of waste water treatment systems to be considered include adaptability, versatility, resilience, cost, energy, ease of operation, and current plant size. Waste water treatment systems are evaluated with respect to producing an effluent for reuse in the textile industry. Treatment methods which are examined include conventional biological treatment, flocculation, activated carbon, ion exchange, pretreatment, direct catalytic oxidation, reverse osmosis, and multi-stage evaporation. (Schulz-FIRL)
W78-00050

WASTE WATER TREATMENT AND WATER RECYCLING.
International Dyer and Textile Printer, Vol 157, No 10, p 478. May 13, 1977.

Descriptors: *Water reuse, *Vapor compression distillation, *Heat transfer, *Textiles, *Recirculated water, Reclamation, Energy, Industrial wastes, Industrial water, *Waste water treatment.

The IBK waste water treatment and water recycling method, designed by IBK Koeppl of West Germany, has been used by textile manufacturers in response to increasing costs of water and waste water treatment. Based on the principle of regenerating vaporization, the process treats effluent and recovers process substances. Steam produced during vaporization can also be used in heat-consuming equipment used in textile finishing. The high-quality distilled effuent can be used immediately in the power or water supply cycles. Vaporization removes all dyestuffs, turbidity, mechanical impurities, salts, and alkalis. Additional treatment with activated carbon can qualify the regenerated water for other industrial uses. The remaining concentrate can be treated in a combustion chamber to burn off the hydrocarbons and separate out the dried salts. Heat recovery by the IBK recycling system lowers total energy costs for textile waste water treatment. Automatic controls for effluent input and for physical variables are included in the IBK system. (Schulz-FIRL)
W78-00051

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) and Associates, Media, PA.
R. S. Talbot.
Journal Water Pollution Control Federation, Vol 49, No 6, p 1161-1163, June, 1977. 13 ref.

Descriptors: *Textiles, *Industrial wastes, *Activated carbon, *Dyes, *Chemical wastes, Activated sludge, Chemical oxygen demand, Suspended solids, Filtration, Color, Water utilization, *Waste water treatment, *Bibliographies, *Reviews.

Literature pertaining to the treatment of wastes resulting from the manufacture of textiles is reviewed. Treatment processes discussed include ultrafiltration, biological filtration, activated sludge, flocculation, chemical treatment, activated carbon, and sludge dewatering. Studies on the removal of grease, suspended solids, and chemical oxygen demand from wool scouring liquors are described. Methods of water conservation during textile dyeing are presented. Treatment of combined municipal and industrial wastes with activated sludge processes is discussed. Chemical treatment of textile dye and finishing wastes with lime, alum, or activated carbon treatment is examined. Pollutants found in waste water resulting from the manufacture of tufted textiles for rugs and carpets are described. (Schulz-FIRL)
W78-00052

PROBLEMS IN PUBLIC SEWAGE TREATMENT PLANTS CAUSED BY SIZING BATHS AND POSSIBILITIES FOR SOLVING THEM (SCHWIERIGKEITEN IN OEFFENTLICHEN KLAERANLAGEN DURCH SCHLICHTEREIABWAESSER UND MOEGLICHKEITEN ZU IHRER BEHEBUNG),
HABIS TEXTIL A.G., Flawil (Switzerland).
R. Tanner.
Textilveredelung, Vol 12, No 6, p 241-243. 4 fig.

Descriptors: *Textiles, *Organic wastes, *Municipal wastes, *Industrial wastes, Sludge treatment, Retention, Biological treatment, *Waste water treatment.
Identifiers: Textile sizing wastes, Combined wastes.

Sizing bath effluents with high organic matter and organic carbon content caused disturbances in the operation of a municipal biological waste water treatment plant providing for a transit time of 4-4.5 hr for the waste water. The sizing effluents from the textile finishing plant, up to 800 liters/day, increased the sludge index and the discharge of finely dispersed sludge and coagulated matter. The sizing effluents contained native starch, modified starch derivatives, carboxymethylcellulose, polyacrylates, digesting agents for starch, fats, and waxes. For all these compounds, which are difficult to degrade, the transit time of 4-4.5 hrs was too short. The problem was solved by replacing the sizing bath collection tank by a discharge pipeline to prevent fermentation, by increasing the storage life of the sizing baths, and by the reuse of used baths. These measures resulted in a 28% drop in the sizing bath discharge. (Takacs-FIRL)
W78-00053

WATER RECYCLING-NO WASTE WATER TO SEWAGE TREATMENT PLANTS (RECYCLING

FUER WASSER - KEIN ABWASSER AN KLAERANLAGEN).
Das technische Umweltmagazin, No 5, p 43-44, 1977. 3 fig.

Descriptors: *Textiles, *Water reuse, *Distillation, *Separation techniques, *Recycling, Evaporation, Treatment facilities, Costs, Salts, Energy, Industrial wastes, *Waste water treatment.

A new recycling system developed by Ingenieurburo Koppl, Tubingen, West Germany, for the treatment and recycling of waste waters generated in textile finishing operations by regenerative evaporation is described. Evaporation is done under elevated pressure, and the distillate is of highest purity. The extra cost of evaporation is minimal, because the heat necessary for the technological process is used. The residue is concentrated to 50% and incinerated to obtain dry salts as a residue. (Takacs-FIRL)
W78-00054

ZINC RECOVERY FROM RAYON PLANT SLUDGE,
Avtex Fibers, Inc., Front Royal, VA.
L. B. Bowen, J. H. Mallinson, and J. H. Cosgrove.
Chemical Engineering Progress, Vol 73, No 5, p 50-54, May, 1977. 2 fig, 2 tab.

Descriptors: Zinc, *Textiles, *Fabrics, *Sludge treatment, *Chemical reactions, Iron, Acids, Neutralization, Construction materials, Costs, Operation and maintenance, Industrial wastes, *Waste water treatment, Recycling.
Identifiers: *Zincc recovery, Rayon manufacturing wastes.

A process for recovering zinc hydroxide and other solids from rayon plant sludge is being used at Avtex Fibers, Incorporated, in Front Royal, Virginia. Twenty-three possible recovery methods have been investigated during the 27 years of operation, including 15 general methods: crystallization; drying, roasting, and calcining; drying and smelting; electrolysis of zinc from zinc sulfate solution; ion exchange; H2S precipitation; sodium hydroxide extraction; two-stage precipitation using lime and NaOH, Na2CO3, or Na2S; flash drying; concentrating sludge with centrifuges; electrodialysis; solution mining; flotation; solvent extraction; and harvesting dry zinc sludge. The seven step process incorporated in the new treatment facilities involves mining, heat treatment to convert amorphous sludge to a filterable crystalline material, pressure filtration, acid digestion, pressure filtration for purifying the zinc sulfate product, and an iron removal step. Problems associated with construction materials are described. Chemical and utility consumption quantities required per pound of zinc recovered are given. Startup problems encountered with sludge mining and composition, filter press operation, and filter press cloth design are descibed. (Schulz-FIRL)
W78-00055

NEW PLANT FILTERS 400 GAL/MIN. OF MINE WATER.
Filtration and Separation, Vol 14, No 4, p 414, July/August, 1977. 1 fig.

Descriptors: *Coal mine wastes, *Iron compounds, *Flocculation, *Dewatering, *Mine drainage, Mine wastes, Filters, Filtration, Aeration, Recirculated water, Industrial wastes, *Waste water treatment.

The continuously operating, nearly automatic mine water treatment plant at the Silverdale Colliery at Newcastle-under-Lyme near Stoke-on-Trent in England is described. Designed by coal preparation engineers of the National Coal Board in conjunction with Simon Hartley of Stoke-on-Trent, the plant was commissioned to reduce the iron content of 2600 cu m/day of mine water from 200 ppm to less than 2 ppm. After aeration of the waste water, lime in the form of a slurry is mixed with the waste water in a reaction tank. Polyelectrolyte is manually dosed to the turbid water in two NCB deep-cone thickening tanks. Settled sludge is periodically released by gravity into a sludge collection tank and clear effluent flows into wiers at the top of the NCB tanks. A sludge cake with a final water content of 35% and a solids composition of 65% CaO and 16% Fe2O3 is produced by a 110 sq ft Stockdale Engineering Ltd rotary-drum, belt-discharge vacuum filter with cloth washing and air blow discharge facilities. The clear treated effluent is used to wash mine surfaces, and the remainder is diluted with iron-free water from the mine shaft. The large slurry holding tank allows flow balancing and system shutdown during periods of low flow. (Schulz-FIRL)
W78-00056

UNIQUE AUTOMATIC WATER-TREATMENT PLANT AT SILVERDALE COLLIERY.
The Mining Engineer, Vol 136, No 194, p 569-570, July, 1977. 1 fig.

Descriptors: *Coal mine wastes, *Iron compounds, *Water treatment, *Flocculation, *Dewatering, Lime, Iron oxides, Filters, Aeration, Mine drainage, Mine wastes, Recirculated water, Acid mine water, Industrial wastes, *Waste water treatment.

An automatic, continuously-operating water treatment plant at the Silverdale coal mine at Newcastle-under-Lyme near Stoke-on-Trent in England is described. The system is designed to reduce the iron content of 2600 cu m/day of ochreous mine water. The waste water is aerated and a slurry of 100 ppm lime is added to the waste water in a reaction tank. Polyelectrolyte is added to the turbid water in two NCB deep-cone thickening tanks equipped with weirs for clear water overflow. Settled sludge is periodically released by gravity into a sludge collection tank. A 110 sq ft Stockdale Ltd rotary-drum, belt-discharge vacuum filter with cloth washing and air blow discharge facilities dewaters the sludge to a final water content of 35%, producing a dry filter cake with a solids composition of 65% CaO and 16% Fe2O3. A portion of the clear effluent is used to wash the mine surfaces and the remainder is mixed with iron-free water from the mine shaft. Advantages to the use of the system include its nearly automatic operation and small space requirements relative to conventional oxidation lagoons used in the treatment of mine waters. (Schulz-FIRL)
W78-00057

NCB WATER TREATMENT PLANT NEEDS NO LAGOONS.
Coal Age, Vol 82, No 7, p 21, July, 1977.

Descriptors: *Iron, *Mine drainage, *Acid mine water, *Lime, *Treatment facilities, Coal mines, Coal mine wastes, Liquid wastes, Sludge treatment, Dewatering, Filtration, Flocculation, Industrial wastes, *Waste water treatment.

An automatic water treatment plant is being used at the Silverdale coal mine in England to treat 400 gpm of iron-containing mine waters. The automatic treatment plant produces a filter cake with a water content of 35% and eliminates the need for conventional settling lagoons. Mine water is pumped from a 250,000 gal holding tank with a capacity sufficient to hold 10 hr of flow to a reactor tank equipped with a Simcar aerator. A lime slurry is pumped into the reactor tank at a rate of 100 lb/min while the aerator supplies oxygen at a rate of 9.5 kg/hr. The turbid waste water is then mixed with a polyelectrolyte flocculant in two NCB deep-cone thickening tanks in which the iron content is reduced to 3 ppm. Clear effluent which overflows to a holding tank is routed back to the mine, and sludge is periodically drawn from the tanks through a butterfly valve. The thickened sludge which has a water content of approximately 60% is further dewatered with a rotary belt vacuum filter to a final water concentration of about 35%. Effluent which is not reused in mine operations is diluted with other iron-free water from Silverdale shafts. The large capacity of the holding tank allows the plant to treat waste water on an intermittent basis. (Schulz-FIRL)
W78-00058

STUDY EXAMINES WASTE DISPOSAL AT PITTSBURGH PLANTS,
Westinghouse Research Labs., Pittsburgh, PA.
For primary bibliographic entry see Field 5E.
W78-00060

PRETREATMENT STRATEGIES FOR INDUSTRIAL WASTE CONTROL PROPOSED BY EPA,
For primary bibliographic entry see Field 5G.
W78-00061

GUIDE TO WASTEWATER TREATMENT: BIOLOGICAL-SYSTEM DEVELOPMENTS,
Engineering-Science, Inc., Austin, TX.
D. L. Ford, and L. F. Tischler.
Chemical Engineering, Vol 84, No 17, p 131-135, August, 1977. 2 fig, 13 ref.

Descriptors: *Biological treatment, *Industrial wastes, *Activated sludge, *Trickling filters, *Biodegradation, Equalizing reservoirs, Organic loading, Dilution, Solvent extractions, Suspended solids, Design criteria, Nitrification, Filtration, *Waste water treatment.

High-rate biological treatment systems such as activated sludge, trickling filters, and rotating discs are reviewed for use in municipal and industrial waste water treatment. Various aspects of suspended-growth systems such as the completely-mixed activated sludge process are discussed, including contact stabilization, solids removal, and effluent polishing. Fixed-growth systems such as the conventional trickling filter and the rotating biological filter are described and compared with suspended-growth systems. Flow equalization and auxiliary basins in industrial waste water treatment are suggested to offset problems associated with hydraulic- and organic-load variations to biological systems. Pretreatment with hydrolysis is suggested to enhance biodegradability. Pre-dilution of influent streams having high organic concentrations by streams having low organic concentrations is suggested to improve overall performance of a biological system. Steam or solvent stripping of industrial waste streams is recommended to reduce high-organic loads, minimize loading variations, and reduce inhibition of biological processes by particularly toxic wastes. Increasing the amount of biological solids in the aeration basin of suspended growth systems by increasing the sludge-recycle ratio and/or reducing sludge wastage is reported to prevent biological upset. Various processes used in the removal of secondary solids are discussed. Design and operational variables which can affect process performance are discussed, including sludge age, temperature, sludge bulking, nitrification, and activated carbon treatment. (Schulz-FIRL)
W78-00062

ELETROMAGNETIC PISTON PUMP.
For primary bibliographic entry see Field 8C.
W78-00063

COOLING-WATER CALCULATIONS,
Air Products and Chemicals, Inc., Allentown, PA.
For primary bibliographic entry see Field 5B.
W78-00064

OILY WASTE TREATMENT SYSTEM.
Professional Engineer, Vol 47, No 8, p 47, August, 1977.

Descriptors: *Separation techniques, *Suspended solids, *Industrial wastes, *Clarification, Equipment, Aeration, Coagulation, Colloids, *Waste water treatment, *Oil wastes.

The Favair dissolved air flotation system treatment process was designed by the Permutit Company for the separation of suspended solids and colloidal materials from industrial wastes such as food processing, pulp and paper processing, latex manufacturing, biological and oily wastes. Air at 50 psi is added to the waste liquid in a retention tank which may have received prior treatment with polyelectrolytes for coagulation. When the air-saturated liquid is released to atmospheric pressure in the flotation tank, the dissolved air comes out of solution and forms microscopic bubbles. Suspended particles adhere to the surface of the rising bubbles and are carried to the surface. They are then removed by scrapers, leaving clarified water at the bottom of the tank. (Schulz-FIRL)
W78-00066

AGRICULTURAL USE OF SEWAGE SLUDGE: PROBLEMS OF INDUSTRIAL EFFLUENTS (LANDWIRTSCHAFTLICHE VERWERTUNG VON KLAERSCHLAMM: PROBLEME DURCH INDUSTRIEABWAESSER),
Eidgenoessische Forschungsanstalt fuer Agrikulturchemie und Umwelthygiene, Bern (Switzerland).
For primary bibliographic entry see Field 5E.
W78-00067

NEED FOR NEW AND BETTER MEMBRANES,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
For primary bibliographic entry see Field 3A.
W78-00069

PHOSPHATE REMOVAL BY SANDS AND SOILS,
New York State Dept. of Environmental Conservation, Albany. Research Unit.
T. J. Tofflemire, and M. Chen.
Ground Water, Vol 15, No 5, p 377-387, September-October 1977. 6 fig, 13 tab, 31 ref.

Descriptors: *Unsaturated flow, *Laboratory tests, *Waste water disposal, *Recharge, Filtration, *Phosphates, Soil characteristics, Infiltration, Soil profiles, Soils, Sands, Waste disposal, Water quality, Filters, Soil filters, Adsorption, Analytical techniques.
Identifiers: Isotherm test, *Phosphate removal.

Phosphate retention by soils is especially important for tile fields and rapid infiltration systems near lakes where eutrophication is a problem. The use and application of the phosphate adsorption isotherm test to estimate a soil's phosphate removal ability was discussed. It was found that in New York State, the till soils had a greater phosphate retention ability than the outwash soils. Within the tills and within the outwashes, the more acid soils had a greater phosphate retention than the more basic or calcareous soils. The B horizon of many of the soils had a high phosphate capacity. However, this is often neglected in rapid infiltration systems because the waste water is discharged below the B horizon. The phosphate removal in column studies and field studies in rapid infiltration systems was found to be greater than predicted by the rapid isotherm test. Intermittent sand filters with 2 ft sand and underdrains were found to have a limited ability to remove phosphate. A substantial portion of slowly fixed phosphate is non-leachable by rain water. Methods to predict and design for phosphate retention by sands and soils were described. (Humphreys-ISWS)
W78-00092

CHARACTERISTICS OF WASTE WATERS FROM PACKINGHOUSES,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-00100

DISSOLVED AIR FLOTATION OF POULTRY PROCESSING WASTE,
Maine Dept. of Environmental Protection, Augusta.
S. W. Reed, and F. E. Woodard.
Journal Water Pollution Control Federation, January 1976, Vol. 48, No. 1, p. 107-120. 13 fig, 18 ref, 4 tab.

Descriptors: *Food processing industry, *Flotation, *Suspended solids, *Hydrogen ion concentration, *Polyelectrolytes, *Waste water treatment, Poultry.
Identifiers: *Poultry processing wastes, *Dissolved air flotation, Dissolved organic carbon.

Optimum chemical doses and time of chemical addition are determined for suspended solids removal using dissolved air flotation of chilled water from a poultry processing plant. An optimum pH and aluminum sulfate dose exists, but no direct relationship is found between suspended solids concentration and the optimum aluminum sulfate dose. Optimum air:solids ration and rise rate of particles being floated are also investigated. (EPA, Corvallis)
W78-00101

REDUCING WASTE LOADS FROM POULTRY PROCESSING PLANTS,
Texas Agricultural Extension Service, College Station.
P. B. Mellor, and F. A. Gardner.
December 10, 1976. 4 p, 2 tab, 1 ref.

Descriptors: *Biochemical oxygen demand, *Cost comparisons, *Food processing industry, *Screens, Industrial wastes, Local governments, Municipal wastes, Sampling, Pretreatment(Water), *Waste water treatment, Texas.
Identifiers: *In-plant waste control, *Poultry processing wastes.

Since EPA regulations require municipalities to charge users for pollutant concentrations higher than those of normal households, most poultry plants in Texas are or will be interested in lowering organic concentrations in their wastewater. This report is directed to the area of in-plant control and alterations to decrease organics in a plant's wastewater. A study showed that effluent from the Neches River Conservation District demonstration poultry plant decreased in levels of BOD from 880 mg/l to 680 mg/l adn of TSS from 1050 mg/l to 270 mg/l when rotary screens for feathers and offal were moved from the post-pump position to the prior-to-pumping sumps below the floor level. The monthly municipal surcharge reduction rates due to this change are given for concentrations of BOD and TSS. Methods of dry handling and separate treatment of high organicly loaded wastewater in the plant are discussed. (Prodehl-EPA, Corvallis)
W78-00103

SCREW PRESS DEWATERING SOLVES COSTLY WASTE DISPOSAL PROBLEM,
Cross Bros. Meat Packers, Inc., Philadelphia, PA.
R. Fitzgerald, and K. J. Kovacs.
National Provisioner, Vol 175, No 20, p 12 - 14, November 13, 1976.

Descriptors: *Waste water treatment, *Food processing industry, *Dewatering, *Heat treatment, *Hydraulic design, Livestock, Biochemical oxygen demand, Treatment, Costs, Design, Effects, Disposal.
Identifiers: *Meat packing wastes, *Paunch manure disposal, *Dessication, Slaughterhouse.

A paunch manure waste handling and disposal problem was eliminated by means of a dewatering process utilizing a screw press. Cross Brothers Meat Packers, Inc. slaughters from 550 to 600 cattle per day, each animal containing 40 to 50 lbs. of paunch manure containing 82% water and extremely high BOD. Landfilling disposal, treatment with the plant's primary clarifier, and dewatering by cooking were found unacceptable. The satisfactory existing treatment and disposal process for the paunch manure consists of (1) a partially dewatering vibrating screen (moisture reduced to 70%) (2) conveyor to a perforated walled hopper, (3) the dissicator screw press (moisture reduced to 40 - 45%), and (4) a batch cooker where blood is also added (moisture reduced to 8%). Research is being done on the possibility of using the remaining by-product as an animal feed. Since the use of this dewatering system, municipal waste disposal surcharge costs have been reduced by several thousand dollars per quarter. (Prodehl - EPA, Corvallis).
W78-00105

COMPOSTING PAUNCH MANURE,
King and Co. Indianapolis, IN.
For primary bibliographic entry see Field 5E.
W78-00106

THE MEAT PACKING PLANT WASTE DISPOSAL PROBLEM,
Michigan Engineering Experiment Station, East Lansing.
E. F. Eldridge.
Bulletin 105, December 1946. 50 p., 16 fig, 4 tab, 21 ref.

Descriptors: *Industrial wastes, *Food processing industry, *Waste water treatment, *Treatment facilities, *Activated sludge, *Flotation, Anaerobic digestion, Biological treatment, Water pollution treatment, Biochemical oxygen demand, Oil wastes, Pretreatment(Water), Screens, Sedimentation, Septic tanks, Waste identification, Design criteria, Chlorination.
Identifiers: *Meat packing wastes, Grease recovery, Primary treatment, Secondary treatment, In-plant waste control.

General methods of waste disposal for meat packing plants (including slaughter-houses) are discussed for both the small and large plant. The chief organic matter dealt with include blood, manure, hair, dirt and grease washed from the floor and equipment. Standards for emitting effluent to streams and to a city treatment plant are discussed. Advice on procedure of selecting a treatment method is given and categorized into 3 groups: those (1) containing salable materials, (2) which can be discharged directly, and (3) which must be treated. Two treatment processes are advised and discussed for the small plant: biological filtration and superchlorination preceded by elementary primary treatment, and effective grease removal. Methods of primary and secondary treatment for large plants are discussed; some design criteria for the different units and processes are included. (Prodehl EPA, Corvallis)
W78-00107

WASTEWATERS DISCHARGED FROM AN ABATTOIR,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5B.
W78-00108

DESIGN OF A GREASE RECOVERY PLANT FOR A MEAT PACKER,
Arizona Univ., Tucson.
A. H. Beard Jr.

In: Proceedings of the Fourth Industrial Waste Conference, Layfayette, Indiana, Engineering Extension Series No 68, p 129, Sept 21-22, 1948.

Descriptors: *Flotation, *Oil wastes, *Sedimentation, Waste identification, Design data, Food processing industry, *Treatment facilities, *Waste water treatment, Biochemical oxygen demand, Suspended solids.
Identifiers: *Meat packing wastes, Grease recovery, In-plant waste control.

The harmful effect of grease on receiving water courses and sewage-treatment plants has been an incentive to bring about maximum grease recovery from liquid wastes. Several variable factors which are inherent in the packing plant waste discharge are discussed and statistics on the published data from the United States Health Service and other sources on the combined waste volume from 16 different packing plants are given. The degree of varience of composition of wastes from different packing plants is also shown by tabulated average values of lbs. BOD, lbs, suspended solids, and lbs. of grease per 1,000 lbs. of animals killed from three different sources. Statistics are also given on amounts and origin of raw and processed fat from a typical large packing plant. Methods of preliminary and actual design for grease reclamation using flotation and sedimentation processes are discussed. The principal factors necessary for a thorough survey are listed. A detailed design example of a grease recovery plant for a typical mixed kill packing plant using a two-stage recovery system is given, including initial and operating costs. (Prodehl - EPA, Corvallis)
W78-00109

TREATMENT OF MEAT PACKING WASTES,
Sioux Falls Municipal Treatment Plant, SD.
L. Bradney, W. Nelson, and R. E. Bragstad.
Sewage and Industrial Wastes, Vol 22, No. 6, p. 807 - 816, June 1950, 6 figs, 4 tab, 9 ref.

Descriptors: *Trickling filters, *Sludge digestion, *Nitrogen, Design data, Activated sludge, Biochemical oxygen demand, Flow rates, Industrial wastes, Food processing industry, Oil wastes, Waste identification, *Waste water treatment.
Identifiers: *Meat packing wastes, *Grease, In-plant waste control.

Methods of treatment for meat packing wastes are discussed with reference to waste discharge data collected from the John Morrel and Co. meat packing plant is Sioux Falls, South Dakota. Of the losses sustained by the packing houses, those of grease and organic nitrogen appear to be the most objectionable if these wastes are discharged to sewers for further treatment by a sewage treatment plant. The excessive effects and standard methods of plant control of each are discussed. Methods used and problems confronted in pretreatment, primary settling, secondary treatment, and digestion by the city's treatment plant are reported. Because of excessive loads on the secondary treatment (using both activated sludge and trickling filters) performance was improved for the standard filter by (1) installing primary filters of the backwash type ahead of the standard filters, (2) replacing dosing siphons and fixed nozzles with rotary distriubtors, and (3) recirculating at a rate of 5.0 m.g.d. The rising of sludge in the final sedimentation tanks was a problem at this plant. Methods used to combat this problem are described. (Prodehl - EPA, Corvallis)
W78-00110

THE CHARACTERISTICS OF WASTES FROM CHICKEN PACKING PLANTS,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-00111

WASTES FROM POULTRY DRESSING ESTABLISHMENTS,
Public Health Service, Kansas City, MO.
For primary bibliographic entry see Field 5B.
W78-00112

THE DESIGN AND OPERATIONS OF A WASTE TREATMENT PLANT FOR A SMALL PACKING PLANT,
Burns and McDonnell, Kansas City, MO.
A. H. Wymore.
In: Proceedings of the 6th Industrial Waste Conference, Purdue University, Lafayette, Indiana, Engineering Extension, Series No. 76, p. 413-421, February 1951, 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Food processing industry, Trickling filters, *Sedimentation, *Flotation, *Oil pollution, Biochemical oxygen demand, Industrial wastes, Nitrates, Nitrites, Water analysis, Treatment facilities, Design data, Digestion, Heat, Costs, Missouri.
Identifiers: *Meat packing wastes, *Grease pollution, *Slaughterhouses.

A new treatment plant was placed in operation by the Reitz Meat Products Company in June, 1948 to replace a system of small septic tanks. The wastes include those typical of a plant doing both slaughtering and meat processing. A high degree of conservation in the plant is practiced; an exception being loss of grease which is troublesome in the trickling filter. The waste discharge cycles around an eight-hour working day. The sewage treatment plant is designed for 2:1 recirculation in each of the two stages of filtration, and the primary and secondary clarifiers and trickling filter are of combined 'Duo' - unit types. The digester is part of the clarifier in a chlorigester design where heated water is added from the main plant boilers. Conventional sludge drying beds are provided. Complete design data are given along with methods of plant operations. Analyses of sampled effluent including S.S., BOD., COD, total organic nitrogen, nitrates, and nitrites are tabulated. Problems still existing are water coloration by red dye and obstruction of equipment by grease, otherwise the effluent appears to be satisfactory. Cost of the sewage plant was about $50,000. (Prodehl - EPA, Corvallis)
W78-00113

TWO INDUSTRIAL WASTE PROBLEMS AT NEW HAVEN, CONN.,
Hartford Sewage Treatment Plant, CT.
For primary bibliographic entry see Field 5A.
W78-00114

POULTRY DRESSING WASTE,
Indiana State Board of Health Indianapolis.
P. E. Miller.
In: Proceedings of the 6th Industrial Waste Conference, February 21 - 23, 1951, Purdue University, Layfayette, Indiana, Engineering Extension Series No. 76, p. 176-180, 6 fig, 1 ref.

Descriptors: *Waste identification, *Food processing industry, *Septic tanks, *Lagoons, Biochemical oxygen demand, Water analysis, Pollutant identification, Waste water treatment, Treatment facilities.
Identifiers: *Poultry processing wastes, Slaughterhouse wastes.

A plant designed to dress about 5,000 chickens per day has liquid wastes from poultry dressings containing varying amounts of blood, feathers, fleshings, washings from evisceration, digested and undigested food, manure, and dirt. All wastes go to floor draines, through sewers to two parallel 225 gallon screen pits provided with 1/4 inch mesh vertical screens, to a 14,430 gallon septic tank, and onto a 300,000 gallon lagoon draining by seepage into an underlying gravel stratum. Ammonium nitrate on the water surface has been used to control odors. A single day's analysis of a 9-hour composite sample is reported and shows a 5-day BOD of 385 ppm, SS 248 ppm, VSS 232 ppm, total solids 993 ppm, volatile total solids 447 ppm, pH 7.3, and average waste flow 49 gpm. Reduction in BOD is given for the septic tank and lagooning processes. Load factors per 1,000 lb. live weight and population equivalents are given. (Prodehl - EPA, Corvallis)
W78-00115

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
For primary bibliographic entry see Field 5E.
W78-00119

WASTEWATER RESEARCH EXPANDS,
For primary bibliographic entry see Field 5E.
W78-00122

MEAT PACKINGHOUSE WASTEWATER: CHARACTERIZATION BY SOURCE,
Texas Univ. at El Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00166

CHEMICAL TREATMENT OF MEATPACKING PLANT WASTEWATER FROM UNIT OPERATIONS,
Texas Univ. at El Paso. Dept. of Civil Engineering.
C. O. Payan.
Master Thesis, May 1975. 79 p, 7 fig, 39 tab, 23 ref.

Descriptors: *Chemical precipitation, *Coagulation, *Flocculation, *Food processing industry, Water analysis, Chemical reactions, Chlorides, Data collections, Suspended solids, Nitrogen, Water sampling, Texas, *Waste water treatment.
Identifiers: *Meatpacking wastes, *Ferric chloride, *Polyelectrolytes, Blood, Manure, Offal, Carbon removal, Nitrogen removal, Aluminum sulfate.

Since it is of significant economic advantage to reclaim blood and other scraps, the use of chemicals to treat these products has been introduced. The purpose of this study is to investigate and determine the optimum chemical dosage for treatment of the various wastes produced in the meatpacking process. A literature review on current methods and uses of chemical coagulation and precipitation using lime, aluminum sulfate, sodium silicate, ferrous and ferric salts, chlorine and organic polymers is presented. The chemical reactions involved in chemical treatment are presented. Results of studies and field investigations using polymers in combination with alum or ferric chloride are discussed. A study was conducted on chemical treatment of blood, manure, and stomach washing wastes from the Peyton Meatpacking Company, El Paso, Texas. The chemicals were ferric chloride and sodium carbonate buffer, and a polymer (Nalco 676). The results of tests conducted, varying the concentration of the chemicals and order of addition, are tabulated indicating the various natures of flocculation and amount of kjeldahl nitrogen and total solids reduction. Conclusions include: (1) carbon removal increases with increase in ferric chloride dosage, and (2) the addition of a polymer (Nalco 676) greatly enhances the precipitation process for all wastes tested. (Prodehl-EPA, Corvallis)
W78-00167

STATISTICAL EVALUATION OF PACKINGHOUSE WASTE DATA,
Environmental Health Center, Oak Ridge, TN.
For primary bibliographic entry see Field 5A.
W78-00169

NEW DEVELOPMENTS IN PACKINGHOUSE WASTE TREATMENT,
Minnesota Univ., Minneapolis. Dept. of Sanitary Engineering.
G. J. Schroepfer.
In: Proceedings of the 8th Industrial Waste Conference, Purdue University, Lafayette, Indiana, Engr. Ext. Ser. No. 83, May 1953, p. 518-539, 9 fig, 11 tab.

Descriptors: *Anaerobic digestion, *Biological treatment, *Food processing industry, Biochemical oxygen demand, Cost analysis, *Waste water treatment, Data collections, Industrial wastes.
Identifiers: *Meat packing wastes, Anaerobic contact process.

Described are recent developments in a new method of treating packinghouse wastes involving anaerobic decomposition instead of the conventional aerobic processes. In March, 1952, the Committee on Meat Packing Plant Waste Disposal of the American Meat Institute requested evaluation of data on a pilot plant anaerobic process in Austin, Minnesota. The paper resulting from the analysis is made up of three general parts: (1) a discussion of the preliminary tests with a evaluation of results; (2) a summary of certain special investigations preparatory to the actual research tests; (3) the presentation of data on the research test program presently underway. Results of the data on the anaerobic contact process over a three-year period include: (1) removal of at least 95 percent of the BOD and suspended solids accomplished at loadings as high as .20 lbs. BOD per cu. ft. of digestion tank per day, with 13-hour detention periods on raw waste flow; (2) tow explanations for the large loadings are high process temperatures and high solids concentration in this system. (Prodehl - EPA, Corvallis)
W78-00170

ALTERNATIVES TO END-OF-PIPE TREATMENT,
CH2M/Hill, Corvallis, OR.
R. E. Pailthorp.
Civil Engineering - ASCE, February 1977, p. 49 - 52, 2 fig.

Descriptors: *Regulation, *Recycling, *Water reuse, *Food processing industry, *Recycling, *Federal water pollution control act, Waste treatment, *Waste water treatment, Grants, Pollution abatement, Cost analysis, Economic feasibility.
Identifiers: *Meat packing wastes, Food processing wastes, Protein recovery.

End-of-pipe treatment must be replaced by innovative, in-process changes if industrial plants are to creatively meet the upcoming 1983 EPA pollution control requirements. By-products recovery, production, and utilization are alternatives needing research, development, and financial backing. Discussed are: (1) existing and potential systems for by-product recovery, (2) the concept of an industrial complex created totally for complete waste product utilization and by-product production, and (3) a practical approach to optimizing end-of-pipe treatment versus in-process changes. Examples of by-product utilization are protein recovery, solids recovery for cattle feed, and waste-product conversion to secondary products. (Prodehl -EPA, Corvallis)
W78-00172

LEATHER TANNERY WASTE MANAGEMENT THROUGH PROCESS CHANGE, REUSE AND PRETREATMENT,
Pfister and Vogel Tanning Co., Milwaukee, WI.
J. M. Constantin, and G. B. Stockman.
Environmental Protection Agency, Report No. 600/2-77-034, January 1977, 172 p.

Descriptors: *Tannery wastes, *Chromium, *Sulfides, *Oil wastes, Waste identification, Chemical reactions, Design data, Waste water treatment.
Identifiers: *Leather industry, Chromium recycle, Sulfide reduction, Oil and grease separation, Waste characterization and loading.

Reduction of tannery waste, i.e., trivalent chromium, sulfide and oil and grease components has been accomplished by process change. Protein recovery and hydroclonic separation of solids was possible in tannery processing in reducing waste loading. All waste load reduction was accomplished without loss of leather quality. Waste characterization through material balance was accomplished. Chemical reactions and engineering design factors provide guidance for other plant scale operation. (EPA-Corvallis)
W78-00173

THE ANAEROBIC CONTACT PROCESS AS APPLIED TO PACKINGHOUSE WASTES,
Minnesota Univ., Minneapolis. Dept. of Sanitary Engineering.
G. J. Schroepfer, W. J. Fullen, A. S. Johnson, N. R. Ziemke, and J. J. Anderson.
Sewage and Industrial Wastes, Vol. 27, No. 4, April, 1955, p. 460-487, 6 tab, 15 fig, (presented at 27th Annual Meeting, Federation of Sewage and Industrial Waste Assns.; Cincinnati, Ohio; Oct 11-14, 1954).

Descriptors: *Anaerobic digestion, *Laboratory tests, *Food processing industry, *Waste water treatment, Analysis, Biochemical oxygen demand, Additives, Costs, Sedimentation, Trickling filter, Sampling.
Identifiers: *Meat packing wastes, Evacuation tank.

Pilot plant investigation of the anaerobic treatment of packing plant wastes was underway at the Geo. Hormel and Co. plant at Austin, Minnesota for a 4-year period from 1950 to 1954. A program of analysis and research tests were promoted by the American Meat Institute from 1952 to 1954, and description and results of these tests are presented. The pilot plant is described. The four periods of investigations from which data are reported are: (1) early tests from July 1950 to September 1952, during which separation was generally unsatisfactory. (2) Preliminary tests from October to December 1952, where a new separation process employed evacuation followed by gravity settling. (3) The 1953 research test program in which fly ash was employed. (4) The 1953-54 research test program conducted without benefit of additives to determine the effects of: (a) loading and detention of efficiency, (b) the degree of vacuum on processing efficiency and costs, (c) digestion temperatures, and (d) degree of mixing on efficiency. A process was developed which is capable of accomplishing removals in 5-day BOD of 95% and SS of 90% at loadings up to 0.20 lb. of BOD per cubic foot of digester volume per day. (Prodehl - EPA, Corvallis)
W78-00175

DIRECT COMPARISON IN PHYSIOCHEMICAL TREATMENT OF PACKINGHOUSE WASTEWATER BETWEEN DISSOLVED AIR AND ELECTROFLOTATION,
Swift and Co., Oak Brook, IL. Research and Development Center.
E. R. Ramirez, D. L. Johnson, and O. A. Clemens.
Presented at 31st Annual Purdue Industrial Waste Conference, May 4-6, 1976, West Lafayette, Indiana. 29 p, 4 fig, 10 ref.

Descriptors: *Air entrainment, *Flotation, *Food processing industry, Basins, Coagulation, Electrical equipment, Industrial wastes, Oil wastes, Pretreatment(Water), Suspended solids, *Waste water treatment, Water analysis.
Identifiers: *Meat packing wastes, *Rendering wastes, *Dissolved air flotation, *Electro flotation, Primary treatment, Electrocoagulation-electroflotation.

Wastewater generated (.9 - 1.5 MGD) at the Swift Company beef slaughterhouse plant in Grand Island, Nebraska, was divided into two parallel treatment basins using a split water mechanism to feed each basin. Evaluation and comparisons of dissolved air flotation vs (1) electroflotation and (2) electrocoagulation with electroflotation processes on wastewater were performed. The evaluation program was further divided into Phase I, including evaluating wastewater treatment without the dehairing operation; and Phase II, with the dehairing operation. Effluent composite samples were taken on a continuous basis. Conclusions include (1) little difference was found between the performance of dissolved air flotation (20% recycle) and electroflotation in conjunction with metal coagulants in primary treatment of Phase I wastewater (2) neither dissolved air flotation nor electroflotation alone is a satisfactory primary treatment for Phase II wastewaters; electrocoagulation-electroflotation primary treatment is needed for satisfactory effluent to municipal treatment plants (3) electrolytic processes are especially effective in removing ammonia-nitrogen values from wastewater. (Prodehl - EPA, Corvallis)
W78-00177

THE PURIFICATION OF THE EFFLUENT WATER IN THE MEAT AND FISH INDUSTRY,
Provincial Chemical Lab. of Cremona (Italy).
P. Baldacci, A. Canuti, and G. Coppiardi.
Report TR-467-74, (1974), 21 p. Translation from Industrie Alimentari, Vol. II, No. 2, p 51-58, 1972. 28 ref.

Descriptors: *Data collections, *Food processing industry, *Patents, *Waste water treatment, Activated sludge, Aerobic treatment, Anaerobic digestion, Analysis, Biochemical oxygen demand, Organic wastes.
Identifiers: *Meat packing wastes, *Poultry processing wastes.

The studies of twenty-eight authors are briefly presented on the problems of pollution caused by the meat and fish industry and methods of control. Methods of treatment, recovery and utilization of effluents, and patents on specific processes are discussed. The activated sludge treatment is generally employed to purify this type of effluent; particularly in high density areas, with respect to both people and animals. (Prodehl - EPA, Corvallis)
W78-00178

ECONOMIC ANALYSIS OF SPRAY IRRIGATION OF POULTRY PROCESSING WASTEWATER VS. UPGRADING OF WASTEWATER TREATMENT FACILITIES,
Mogul Corp., Chagrin Falls, OH.
R. L. Cooper.
Presented at the Seventh Engineering Foundation Conference, February 14, 1977. 24 p. 3 fig, 4 tab.

Descriptors: *Aerated lagoons, *Economic feasibility, *Waste water treatment, *Waste disposal, Biochemical oxygen demand, Flotation, Food processing industry, Sprinkler irrigation, Filtration, Land use, Nitrogen oil wastes, Ponds, Cost comparisons.
Identifiers: *Poultry processing wastes, Discharge requirements, Waste loads, Chemical addition.

A poultry processing plant needs to improve its waste treatment system to meet North Carolina discharge limitations. The maximum day limitation was equivalent to BOD5, TSS, TKN and Oil and Grease of 16.5, 18.3, 4.6 and 12.8 mg/l, respectively. The plant processed 38,500 chickens daily and had an average discharge of 0.15 mgd. Two methods of upgrading the treatment system were economically evaluated. The present system included a rotary screen, a grease trap with skimmer, an aerated lagoon and a stabilization lagoon. The first alternate for upgrading was in air

flotation, with chemical addition prior to the aerated lagoon, clarifier following the aerated lagoon and a sand filter and chlorination following the stabilization lagoon. The second alternate included the air flotation system and a spray irrigation percolation system following the stabilization lagoon. Each of the systems was considered capable of satisfying the effluent limitations. The first alternate would have had a lower capital investment but cost over 25% more than spray irrigation over a 10-year period. (Witherow - EPA, Corvallis)
W78-00179

POULTRY PROCESSOR MEETS CHALLENGE OF INCREASED WASTE LOAD,
Gold Kist, Inc., Atlanta, GA.
For primary bibliographic entry see Field 5A.
W78-00180

ANAEROBIC DIGESTION OF PACKING PLANT WASTES,
Hormel (George A.) and Co., Austin, MN.
W. J. Fullen.
Sewage and Industrial Wastes, Vol 25, No 5, p 576 - 585, May 1953. 4 fig, 9 tab.

Descriptors: *Sedimentation, *Anaerobic digestion, *Waste water treatment, Biochemical oxygen demand, Food processing industry, Nitrogen, Water analysis.
Identifiers: *Meat packing wastes, Clarification.

Laboratory investigation of anaerobic treatment for packinghouse wastes was performed by George A. Hiormel and Co. Pilot plant study was started July, 1950. The pilot plant consist of the holding tank, digester, degassing chamber, and rectangular clarifier. Operational changes are discussed for successive time periods. Samples of the raw feed and final effluent, analyzed daily by 'standard methods', are tabulated for the successive time periods, along with the pilot plant loadings and efficiencies. Returned sludge from the clarifier to digester amounts to 60% of the total influent flow, and suspended solids 1.6%. The cost of vacuum for the degassing chamber calculated at 160,000 KW/hr. annually $0.01 per KW/hr is $1,600. Vacuum treatment allows sludge to settle rapidly and remain down for 1 to 3 hours. Savings of 35 to 50% in construction costs and 15 to 25% in 1 to 3 hours. Savings of 35 to 50% in construction costs and 15 to 25% in operation have been predicted, as compared with the aerobic method of sedimentation and filtration with comparable BOD removals (Prodehl EPA, Corvallis).
W78-00181

OPERATING AND ECONOMIC FACTORS INVOLVED IN THE STUDY OF A PACKING WASTE PROBLEM,
Illinois Univ. at Urbana-Champaign. Dept. of Bacteriology.
H. O. Halvorson.
Sewage and Industrial Wastes, Vol 25, No 2, p. 170-176, February, 1953. 5 fig, 1 ref.

Descriptors: *Biochemical oxygen demand, *Cost analysis, *Waste identification, Industrial wastes, Food processing industry, *Waste water treatment, Water analysis, Iowa.
Identifiers: *Meat packing wastes, In-plant waste control, Water use.

A waste treatment study involving most efficient operating plant processes and economic was made at the Morrell Packing Plant at Ottumwa, Iowa. The plant slaughters hogs, cattle, and sheep with a plant capacity of about 2,000,000 lbs. of live animal slaughtered per day. The first step in these studies was to provide facilities for continuous measurement of flow and the collection of daily samples of effluent waste. A frequency distribution was made of pounds BOD per 1,000 lbs. live weight. By making some broad generalizations, it was possible to calculate the cost of waste treatment per million gallons of water vs strength of waste. A cost nomograph was constructed in which net costs of evaporation of waste waters were included as a proportion of the waste strength. From such cost analysis this plant decided that any waste having a BOD in excess of 14,000 ppm should be sent to the evaporators; wastes weaker than that should be treated as sewage. (Prodehl - EPA, Corvallis)
W78-00182

STERLING POULTRY PIONEERS PLANT WATER RECLAMATION,
Sterling Poultry Processing Corp., Oakland, MD.
D. Timmons.
Broiler Business, Vol 27, No 5, May 1976, p. 22 - 30, 9 photos, 1 schematic.

Descriptors: *Food processing industry, *Oxidation lagoons, *Recycling, *Waste water treatment, *Water analysis, Grants, Poultry, Standards, Sampling.
Identifiers: *Poultry processing wastes, In-plant waste control.

Methods used by Sterling Poultry Processing Corp. to treat their plant sewage to meet state requirements are initially discussed. Methods of in-plant water recycling and reuse are discussed. The corporation was given a grant from the EPA and the Maryland State Health Agency to do waste water recycling experimental work. University students collect samples from the regular fresh chilling process water and from a chiller using 100 percent recycled waste water, and perform complete chemical and microbiological analysis. The sampling technique is described. Problems encountered and methods of redesign caused by increasing Federal water standards are discussed. A detailed schematic of the plants waste water treatment system incorporated with its reclaming facilities is shown, including points and connections for the water sampling studies. (Prodehl - EPA, Corvallis)
W78-00183

OUTLINE OF TANNING WASTE TREATMENT STRATEGY IN JAPAN,
Public Works Research Inst., Tokyo (Japan).
T. Annaka, and K. Sakai.
September, 1976. 28 p, 27 fig, 9 tab, 4 ref.

Descriptors: *Tannery wastes, *Activated sludge, *Chemical precipitation, *Sedimentation, *Standards, State governments, Trickling filters, *Waste water treatment, Aerated lagoons.
Identifiers: Joint pretreatment facilities, *Japan.

The effluent standards for tanning waste in Japan are presented and discussed. Included is the national effluent standard under the Water Pollution Control Act (1971), the temporary effluent standard for tannery waste for transitional period 1971 - 1981, and the District effluent standards for tannery wastes. The tanning waste treatment program in one district is presented and explained. The methods outlined for this program are: (1) a 20% solids removal sedimentation tank in each factory, (2) effluents from each sedimentation tank collected in nine joint pretreatment facilities, where 70% suspended solids removal occurs by chemical clarification or plain sedimentation, (3) effluent from joint facilities accepted by public sewers and treated with domestic sewage by activated sludge process. Procedures and results of some experimental methods used to improve the tannery waste treatment for this program are illustrated, the wastes being chromium and vegetable tanning wastes, and domestic sewage, combined. Included in these studies are: (1) pre-mixing to improve settleability in the sedimentation processes, (2) addition of sulfuric acid as a coagulant in chemical clarification, and (3) biological treatment by (a) activated sludge process (using air and pure oxygen), (b) trickling filter process, and (c) aerated lagoon process. (Prodehl-EPA, Corvallis)
W78-00184

TOTAL SYMBIOTIC POLLUTIONLESS SYSTEMS FOR EFFICIENCY MANAGING WATER, EFFLUENTS, SOLID ORGANIC WASTES, AND ODORS IN FOOD PROCESSING AND SIMILAR INDUSTRIES,
Manitoba Univ., Winnipeg. Dept. of Food Science.
R. A. Gallop, A. W. Hydamaka, P. W. Stephen, and R. K. Rastogi.
Paper presented at AI Ch E - EPA, Third National Conference on Complete Watereuse, Cincinnati, June 27 - 30, 1976. 27 p, 9 fig, 20 ref.

Descriptors: *Food processing industry, *Recycling, *Water reuse, Activated carbon, Cost analysis, Design criteria, Industrial wastes, Planning, Poultry, Canneries, *Waste water treatment, Odor, Organic wastes.
Identifiers: *Poultry processing wastes, Total systems design, Symbiotic design.

The goals and objectives of the research, development and demonstration program begun by EPA and the Food Processing Industry are surveyed. The Total Systems Approach is described as the means of meeting the legislative goal of zero discharge. Process change, by-product recovery, water recycling, and treatment are part of the total systems approach. The Total Systems Approach is discussed in general terms with several specific examples. The technical and economic advantages of this approach are enumerated. (Witherow-EPA, Corvallis)
W78-00185

CHICK HATCHERY WASTES DISPOSAL,
Buchart-Horn, Lewisburg, PA.
For primary bibliographic entry see Field 5E.
W78-00186

SLUDGE HANDLING AND DISPOSAL: A SPECIAL REPORT,
Nalco Chemical Co., Oak Brook, IL.
For primary bibliographic entry see Field 5E.
W78-00187

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR III.
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, CA.
For primary bibliographic entry see Field 5G.
W78-00260

AREAWIDE WASTE TREATMENT AND EROSION CONTROL PLANNING,
For primary bibliographic entry see Field 5G.
W78-00265

TREATMENT OF AQUEOUS WASTE,
Pullman Inc., Chicago, IL. (Assignee).
J. E. Wallace.
U.S. Patent No. 4,026,791, 6 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 2118, May 31, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water quality control, Industrial wastes, *Chemical wastes, *Phenols, Aromatic compounds, Separation techniques, Solvent extraction.

In the process of producing phenol from cumene, aqueous waste streas result which are contaminated with organic materials, particularly phenol, which are made innocuous to the environment only with substantial difficulty. A process is described to reduce the biological oxygen demand of these aqueous wastes, particularly the phenol content, by a liquid extraction step whereby a highly aromatic fraction of a organic waste stream in the phenol process is used as the solvent. The process includes provision for simultaneous preparation and recovery of the solvent as well as recovery of the phenol. (Sinha - OEIS)

W78-00270

FILTER SYSTEM AND METHOD OF FILTERING ANIMAL PROCESSING WASTES,
Kalbfleisch (Herbert L.), Sooke (British Columbia). (Assignee).
G. O. Orth, Jr.
U.S. Patent No. 4,026,792, 4 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 2118, May 31, 1977.

Descriptors: *Patents, *Waste water treatment, *Oily wastes, *Oil pollution, Industrial wastes, Food processing industry, Filtration, Fibrous beds, Cellulose, Separation techniques.
Identifiers: Hydrophobic fiber filters, Hydrophilic fiber filters.

Alternate hydrophilic and hydrophobic fiber filters are used to remove particulate matter and oil from aqueous animal processing wastes, such as those from cannery operations, poultry processing plants and packing plants. The fiber used to make the filters is preferably a low-lignin content, cellulosic fiber that is digestible by ruminating animals. The adsorbed oil in the hydrophobic filter may be removed and the filter reused. The hydrophilic fiber filter containing particulate matter may be dewatered and converted to animal feed or fertilizer. (Sinha - OEIS)
W78-00271

PROCESS FOR RESOLVING OIL-IN-WATER EMULSIONS BY THE USE OF A CATIONIC POLYMER AND THE WATER SOLUBLE SALT OF AN AMPHOTERIC METAL,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
F. A. Mauceri.
U.S. Patent No 4,026,794, 5 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 958, no 5, p 2119, May 31, 1977.

Descriptors: *Patents, *Oil pollution, *Oily wastes, *Waste water treatment, *Water pollution treatment, Industrial wastes, Emulsions, Separation techniques, Flocculation, Neutralization, Polymers.
Identifiers: Metal working industry.

An object of this invention is to provide a method for the resolution of oil-in-water emulsions and the recovery of oil from industrial plant effluents. The method is by treating the oily waste water with a composition comprising: a water soluble salt of an amphoteric metal; a water soluble cationic terpolymer, the terpolymer containing prior to polymerization: diallyl dimethyl ammonium chloride, N-vinyl-2-pyrrolidone, and acrylamide, the terpolymer having a molecular weight range of from 5,000 to 300,000; and water. When this composition is added to the oily waste water the negatively charged water particles will neutralize and from an easily recoverable floc containing the oil. (Sinha-OEIS)
W78-00273

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No 4,026,796, 9 p, 11 ref; Official Gazette of the United States Patent Office, Vol 958, no 5, p 2119, May 31, 1977.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, *Industrial wastes, Color, Absorption, Cellulose, Pulp and paper industry, Tannery wastes, Bleaching wastes, Dyes, Separation techniques.
Identifiers: Decolorization.

A complete or at least very extensive purification, including decolorization, of industrial effluents can be achieved if these are brought into contact with absorbents which consist of cellulose pretreated with precipitants. The process is suitable for the removal of anionic dyestuffs, optical brighteners, dyeing suxiliaries and washing agents, and for the elimination of residues of tanning agent. The cellulose to be used as the carrier material in the purification consists of bleached or unbleached spruce sulphite cellulose, Kraft cellulose or waste sheets from printing. Suitable precipitants are compounds which are adsorptively bound by the cellulose and which at the same time exert a precipitating or retaining action on the residual substances. In this respect, water-soluble basic aminoplasts such as formaldehyde-dicyanidiamide condensation products have proved suitable. (Sinha-OEIS)
W78-00274

BUFFERING AGENTS,
Aerojet-General Corp., El Monte, CA. (Assignee).
For primary bibliographic entry see Field 3A.
W78-00281

FROTH FLOTATION WITH SEWAGE TREATMENT PLANT WATER EFFLUENT,
Inspiration Consolidated Copper Co., Morristown, NJ. (Assignee).
G. F. Fountain, J. Veloz, E. A. Bilson, and J. A. Cronin.
U.S. Patent No. 4,028,235, 4 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 301, June 7, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Froth flotation, Mining, Water reuse, Water utilization.
Identifiers: Polyglycerols.

This invention provides a conditioned sewage treatment plant water effluent which can comprise up to 100% of the aqueous phase of an ore flotation pulp without having any adverse effects on the flotation. The method comprises using sewage treatment plant water effluent condition prior to use with at least about 3 parts per million of a polyglycerol. Such effluent is used in the froth flotation of copper sulfide ores. (Sinha-OEIS)
W78-00282

RECOVERY OF MERCURY,
Ontario Research Foundation, Sheridan Park. (Assignee).
D. W. Townsend, and H. D. Woods.
U.S. Patent No. 4,028,236, 3 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 301, June 7, 1977.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Water pollution treatment, Water quality control, *Mercury, Iron, Reduction(Chemical).
Identifiers: Tin, Metal recovery, Chlorine producing plant.

With this invention the concentration of mercury in metallic and soluble ionic form in aqueous media, from various sources such as the liquid effluent from a sodium hydroxide-and chlorine-producing plant in which flowing mercury cathods are used in the electrolysis of sodium chloride solutions, may be decreased and in many cases substantially eliminated. The aqueous medium containing the mercury is contacted with tin-coated iron having exposed tin-iron interfaces in contact with the medium. The metallic mercury 'wets' the tin surface and is accumulated on it and the iron causes the mercury ions to be reduced to the metal which is then collected on the tin surface. The mercury may be recovered from the tin surface in any desired manner, typically by vacuum distillation. (Sinha-OEIS)
W78-00283

METHOD AND APPARATUS FOR TREATMENT OF FLUORINE-CONTAINING WASTE WATERS,
Hatachi Ltd., Tokyo (Japan). Assignee).
S. Nishimura, T. Sawa, K. Otani, and S. Kikkawa.
U.S. Patent No. 4,028,237, 9 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 959, no. 1 p 301, June 7, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Chemical wastes, *Fluorines, Chemical reactions, Water pollution sources, Separation techniques.

The object of this invention is to provide a method for treating fluorine-containing waste waters and also waste water which contains not only fluorine but also phosphate. Aluminum ions added to fluorine-containing waste water to convert fluorine values to hardly soluble complexes, phosphoric acid or phosphate and calcium compound are added to form fluoride apatite with the residual fluorine in the waste water, and these complexes and apatite are removed from the waste water. Waste water containing phosphate in addition to fluorine in divided into concentrated waste water and dilute waste water according to the fluorine concentration, calcium compound is added to the concentrated waste water to form calcium fluoride, aluminum ions are added to the dilute waste water to convert fluorine values to hardly soluble complexes both the waste waters are mixed, calcium ions are added to the mixture to form fluoride apatite, and the so formed complex and apatite are removed from the mixed waste water. (Sinha-OEIS)
W78-00284

TREATMENT OF MUNICIPAL WASTE SLUDGES,
Dart Industries, Inc., Los Angeles, CA. (Assignee).
J. L. Allan.
U.S. Patent No. 4,028,238, 4 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 301-302, June 7, 1977.

Descriptors: *Patents, *Sewage treatment, *Sludge treatment, *Sludge disposal, Water pollution source, Chemical reactions, Flocculation, Neutralization, Waste treatment.
Identifiers: Sludge dewatering.

The municipal waste sludge of this invention is typically one that has been treated in a bio-lagoon and subsequently allowed to settle in a settling tank. However, it is within the scope of this invention to treat various other dilute waste sludges containing suspended material of high organic content and which would provide health hazards to the environment if disposed of without treatment. The sludge is made alkaline by the addition of a suitable alkali, e.g., lime. Alum (aluminum ammonium sulfate) is added to the alkalized sludge in conventional amounts and a gelatinous precipitate of aluminum hydroxide is formed. If needed, the pH of the sludge at this point is adjusted to a value of at least 9, preferably between 10 and 11. In order to agglomerate the suspended particles in the sludge, a flocculting agent is also added to the mixture. At this point the treated sludge will settle, and if desired, the supernatant clear liquid phase can be withdrawn and after neutralization to a pH in the range of about 6 to about 9 discharged without any pollution problems. (Sinha-OEIS)
W78-00285

METHOD OF THERMAL DISINFECTION OF SEWAGE AND PLANT REALIZING SAME,
V. A. Kokurin, I. A. Bakulov, and V. M. Kotlyarov.
U.S. Patent No. 4,028,242, 8 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 302, June 7, 1977.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Water pollution treatment, *Disinfection, Water purification, Environmental sanitation, Thermal properties, Microorganisms, Sewage bacteria, Temperature.

Sewage is heated to a temperature above 100C in two steps. In the first step, sewage is heated to a temperature not greater than 100C and then conducted into the nozzle of a jet apparatus into which heat-carrier steam is also injected so that the sewage is heated to a temperature greater than 100C, which constitutes the second step of heating. The heated sewage is maintained in a continuous flow while being discharged from the jet apparatus, the pressure in the continuous flow corresponding to the steam saturation temperature. The invention can be employed for disinfecting sewage from pathogenic microorganisms and disease germs as well as for freeing sewage from harmful chemicals which on exposure to high temperatures decompose to form simple non-toxic substances. It may also find applicaton in veterinary and medical microbiology, in the production of biological preparations for agricultural and medical purposes, as well as in the processing of animal husbandry products. (Sinha-OEIS)
W78-00287

ARRANGEMENT FOR CONVERSION OF FOREIGN MATTER CONTAINED IN WATER,
Rheintechnik Weiland and Kaspar KG, Neunkirchen (West Germany). (Assignee).
T. Stahler.
U.S. Patent No. 4,028,245, 11 p, 9 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 303-304, June 7, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Water purification, Settling basins, *Biological treatment, *Aeration, Water reuse, Equipment.

A conversion tank is provided with an intake for the water to be treated and a drain for the treated water. There are hollow bodies which have several rotating perforations in the wall and are on one side completely emerged from the water and on the other side are completely immersed in the water. These bodies are pipes and are filled with matter which is insoluble in water and has a large surface accessible to air and water. The pipes are parallel to each other and parallel to the water surface. The rotating pipes on the emergent side carry along a large quantity of water which runs back to the conversion tank through the perforations during the travel of the pipes above the water level. At the same time they are enriched with air. A large part of this air is carried to the immersion side by the pipes underneath the water level where it is forced out of the pipes by the water. It rises in the water leading to further aeration of the water. Whenever the water which is aerated comes into contact with the biological breeding ground which forms on the material, it converts the harmful materials, particularly the fecal matter, into harmless matter. The water leaving the conversion tank after separating solid and floating matter can be used again. (Sinha-OEIS)
W78-00288

SEWAGE SETTLING TANK,
Sybron Corp., Rochester, NY. (Assignee).
R. F. McGivern.
U.S. Patent No. 4,028,249, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 305, June 7, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Settling basins, Sludge disposal, Settling velocity, Equipment, *Settling basins.
Identifiers: *Settling tanks.

The invention provides a multi-level tank which decreases the settling distance and therefore the settling time and which utilizes a floating siphon system that provides an efficient means for removing the settled materials from each tank layer. The settling tank contains vertically spaced decks which divide the tank into horizontal layers or settling zones. The decks are arranged so as to leave an unobstructed vertical channel extending substantially the full length of the settling tank. An inlet for liquid to be treated and an outlet for treated liquid communicates with each of the tank layers at opposite ends. A carriage floating on the liquid moves from one end of the tank to the other and siphons carried by the carriage have a depending leg extending down the vertical channel to one of the decks and a horizontal header extending across the deck for purposes of removing the sludge which has settled on to the deck. (Sinha-OEIS)
W78-00289

METHOD OF SEPARATING IONIZED SUBSTANCES FROM AN AQUEOUS SOLUTION,
Kernforschungsanlage Juelich G.m.b.H. (West Germany). (Assignee).
U. Zimmermann.
U.S. Patent No. 4,024,054, 8 p, 5 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 1192, May 17, 1977.

Descriptors: *Patents, *Separation techniques, *Water pollution treatment, *Heavy metals, Water quality control, Osmosis, Transfer, Sea water, *Waste water treatment, Bubbles.

Ionized substances such as heavy metal ions are separated from a mixture dissolved in aqueous solution such as sea water, lake water, waste water and the like by means of complex formers adapted to react and enter into a combination with the substances to be separated. The method is characterized by adding to the aqueous solution bubbles formed by cells of living organisms the content of which has an osmolarity differing within limitation from osmolarity of the aqueous solution. The complex formers are added to a solution the osmolarity of which is lower than the cell content of the cells. Due to the osmosis through the cell skin acting as diaphragm, the state of equilibrium between the solution in the interior of the cells and the solution containing the complex formers, the cell content practically corresponds to the solution containing the complex formers. The osmolarity of the solution containing the complex formers is increased by adding osmotically active substances selected from the group consisting of calcium ions, potassium ions, sodium ions. Subsequently the bubbles formed by the exchange of the cell content of the cells and containing the complex formers are separated from the solution containing the complex. Then the separated bubbles are introduced into the aqueous solution until the substance to be separated has moved into the interior of the bubbles and then the cells are separated from the aqueous solution. (Sinha - OEIS)
W78-00295

WASTE WATER SAMPLING SYSTEM,
For primary bibliographic entry see Field 5A.
W78-00301

PROCESS FOR REMOVING MONOHYDRIC AND POLYHYDRIC PHENOLS FROM WASTE WATER,
Metallgesellschaft A. G., Frankfurt am Main (West Germany). (Assignee).
H. M. Stonner, and P. Wiesner.
U.S. Patent No. 4,025,423, 5 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1657, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Chemical wastes, *Water pollution treatment, Organic compounds, Chemical reactions, *Phenols, Hydrogen sulfide, Ammonia, Separation techniques, Distillation, *Chemical wastes.
Identifiers: Coal gasification or degasification.

Monohydric and polyhydric phenols are removed from waste water together with hydrogen sulfide, free and combined ammonia, by extraction and distillation. The waste water is formed during the degasification or gasification of coal and is subsequently subjected to biological purification. The steps of the process are as follows: Removing a major portion of the monohydric phenol, part of the polyhydric phenol and any free fatty acids present in the waste water by extraction with a small amount of a non-saponifying organic solvent; separating the phenols from the extract by distillation; removing a major portion of the polyhydric phenols, the remaining monohydric phenols and any free acids by a single or repeated extraction with a large amount of the same organic solvent; transforming the phenols in the extract to their salts by treatment with an aqueous alkaline solution, washing the salts out and separating the mixture into an organic phase and an aqueous phase, recycling the solvent-containing organic phase; recovering the free phenols using surplus carbon dioxide; and separating the free phenols by decanting and/or extraction with the organic solvent. (Sinha - OEIS)
W78-00303

APPARATUS AND METHOD USING ACTIVATED CARBON TO PURIFY LIQUID WASTES,
Eastman Kodak Co., Rochester, NY. (Assignee).
R. J. Anderson, and R. B. Leon.
U.S. Patent No. 4,025,426, 10 p, 5 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1658, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Water purification, *Activated carbon, Adsorption, Separation techniques, Liquid wastes.

An apparatus and method utilizing activated carbon to remove impurities from liquids comprises an adsorption column containing stacked carbon containers. Each of the containers holds an activated carbon bed, has an opening above the level of the bed to permit introduction of oxygen, steam or other gas, and has means for permitting passage of liquid from the container. Liquid to be purified enters the top of the column, flows through the carbon beds and out of the column. A control module monitors the effectiveness of the column and generates signals to control the reactivation of the carbon by heating the carbon containers and passing steam into the individual containers. Provision is made for using hydrostatic pressures to increase the rate of flow of liquids through the apparatus. Oxygen, another oxidizing gas or a gaseous mixture promotes aerobic growth to destroy impurities adsorbed by the carbon thus extending the useful life of the column. (Sinha - OEIS)
W78-00304

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 4,025,428, 9 p, 12 ref; Official Gazette of the United States Patent Office, Vol 958, no 4, p 1659, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water purification, Organic wastes, Color, Pulp and paper industry, Tannery wastes, Dyes.
Identifiers: *Decolorization, Formaldehyde.

It has been found that a complete or very extensive purification, including decolorization of industrial effluents is achieved if these are brought into contact with absorbents which consist of cellulose pretreated with precipitants. The process is suitable for the removal of anionic dyestuffs, opti-

cal brighteners, dyeing auxiliaries and washing agents, and for the elimination of residues of tanning agent. Three process are suitable for this purpose: the water is stirred with the pretreated cellulose material and then separated; the pretreated cellulose material is kept in suspended state by the counter-current flow of the water; and a filtration process where the water is passed through pre-treated cellulose filter material. The filtration process is preferable. The cellulose to be used as the carrier material consists of bleached or unbleached spruce sulphite cellulose, Kraft cellulose or waste sheets from printing. The cellulose can be in the form of granules, filter paper or paper pulp. Suitable precipitants are water soluble basic aminoplasts such as formaldehyde-dicyandiamide condensation products. (Sinha-OEIS)
W78-00305

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENT,
CIBA-GEIGY Corp., Ardsley, NY. (Assignee).
H. Neuschutz.
U.S. Patent No. 4,025,429, 8 p, 2 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 958, no 4, p 1659, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Water quality control, Organic wastes, Separation techniques, Flocculation, Chemical reactions, Color, Pulp and paper industry, Tannery wastes, Dyes.
Identifiers: Decolorization, Formaldehyde.

A process is disclosed for the purification of effluent which results in the textile, paper and leather industries and in the manufacture of dyestuffs, and which contains water-soluble, anionic dyestuffs or optical brighteners. The process for the effective decolorization of residual liquors, comprises the addition of a water-soluble formaldehyde condensation product to the effluent and the subsequent removal of the occurring flocculate from the effluent. Especially suitable water-soluble formaldehyde condensation products are condensation products from dicyandiamide or dicyandiamidine, optionally urea, formaldehyde and, optionally, an alkylenepolyamine having 2 to 8 carbon atoms. (Sinha-OEIS)
W78-00306

REMOVAL OF METAL IONS FROM WASTE WATER,
Amax, Inc., New York. (Assignee).
R. F. Pagel.
U.S. Patent No. 4,025,430, 6 p, 2 fig, 2 tab, 6 ref; Official Gazette of the United State Patent Office, Vol 958, no 4, p 1659, May 24, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, Water pollution sources, Water pollution treatment, *Zinc, Chemical reactions, Separation techniques, Hydrogen ion concentration, *Chemical precipitation, Ions.
Identifiers: Hydrometallurgy.

The invention is directed to a method for removing metal ion impurities from industrial waste water and is particularly applicable to the treatment of aqueous effluents obtained in the hydrometallurgy of zinc. The method comprises the sequential steps of neutralizing the waste water with slaked lime to a final pH of at least about 8.5 to precipitate hydroxides of metals which form residual quantities of metal ions other than Mg, Ca, Na and K, capable of being removed from the solution by the addition of a soluble silicate solution, separating the effluent from the hydroxide precipitate, adding to the effluent a soluble silicate solution in an amount at least sufficient to remove the residual metals ions from the solution, and then separating the silicate-treated effluent from the precipitate. (Sinha-OEIS)
W78-00307

INTRODUCTION TO WASTEWATER TREATMENT PROCESSES,
Laval Univ., Quebec.
R. S. Ramalho.
Academic Press (New York, San Francisco, London). 1977. 409 p.

Descriptors: *Waste water treatment, *Municipal wastes, *Industrial wastes, *Waste treatment, Wastes, *Water pollution treatment, Aeration, *Sewage treatment, Sedimentation, Flotation, Neutralization, Activated sludge, Oxidation lagoons, Trickling filters, Anaerobic digestion, *Sludge treatment, Dewatering, Filtration, Centrifugation, Digestion, *Tertiary treatment, Suspended solids, Carbon, Adsorption, Ion exchange, Reverse osmosis, Electrodialysis, Chlorination, Ozone, Nutrient removal, Ecology, Economics, Engineering, Water pollution control, *Water reuse.

The 8 chapters of this textbook deal with the characterization (BOD, etc.) of domestic and industrial waste waters; the theory and practice of effluent aeration (oxygen transfer kinetics, air diffusion, turbine and surface aerators, etc.); pretreatment and primary treatments (screening, sedimentation, flotation, neutralization); activated sludge and other aerobic secondary treatments (extended aeration or total oxidation, aerated lagoons, stabilization ponds, trickling filters); anaerobic treatment; sludge processing (thickening, dewatering, pressure and vacuum filtration, centrifugation, digestion, etc.) and disposal; tertiary treatments (suspended solids removal, carbon adsorption, ion-exchange, reverse osmosis, electrodialysis, chlorination, ozonization, nutrient removal, etc.); and the general ecological, economic, and engineering aspects of water pollution abatement and water reuse. A subject index is appended, and student problems and further reading references are given after each chapter. (Brown-IPC)
W78-00360

CONTINUOUSLY OPERATING SAND FILTER (KONTINUIERLICH ARBEITENDER SANDFILTER),
P. J. Metzger.
Allgemeine Papier-Rundschau, No. 16, p 409-410, 412, April 20, 1977. 4 fig, 3 tab.

Descriptors: *Filters, *Sands, *Waste water treatment, Industrial water, Cleaning, Equipment, Water pollution control, Water pollution treatment, Filtration.
Identifiers: *Sand filters.

A description is given of a continuous sand filter of use in waste water purification which is characterized by an improved sand bed recirculation system with intensive cleaning of each sand grain. The recirculation system is designed to result in a conical top surface of the filter bed with coarse grains concentrated at this surface. (Speckhard-IPC)
W78-00361

SANITARY-HYGIENIC EVALUATION OF THE EXTRACTION METHOD OF WATER REGENERATION FROM ATMOSPHERIC MOISTURE, (IN RUSSIAN),
Yu. E. Sinyak, L. A. Kuznetsova, M. I. Shikina, A. G. Fil'chakov, and V. V. Krasnoshchekov.
Kosm Biol Med. 6(3), p 22-24, 1972.

Descriptors: *Waste water treatment, *Moisture, Acids, *Separation techniques, Organic acids, Water purification, *Activated carbon, Public health, Potable water.
Identifiers: Phosphonic-acid, Atmospheric moisture.

Tri-N-Octylamine (TOA), di-n-nonyl-amine and di-Z-ethylhexylphosphonic acid (DI-2) were used as extracting agents to purify water obtained from air moisture. The purified water is designated for human use in closed ecological systems such as spaceships. Water with TOA and DI-2 was toxic for water fleas and frog heart. Purification of the water using activated C removed toxic contaminants and met sanitary-hygienic requirements.—Copyright 1975, Biological Abstracts, Inc.
W78-00362

TREATMENT AND USE OF WASTE EFFLUENT STREAMS,
Lummus Co., New York.
R. T. Whitehead, B. J. Luberoff, and M. C. Sze.
Canadian Patent No. 1,009,566. May 3, 1977. 18 p, 15 claims, 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Water reuse, *Patents, *Chemical precipitation, *Heat exchangers, *Cooling towers, Water pollution treatment, Waste treatment, Industrial wastes, Water pollution sources, Wastes, Pulp and paper industry, Effluents, *Water purification.

A process is provided for purification of an aqueous waste stream containing suspended or dissolved chemical matter, such as a waste stream from a thickener in a pulp or paper mill. The process comprises subjecting the waste stream to a cooling tower operation in which at least a portion of the water contained in the stream is vaporized and at least a portion of the chemical content is precipitated, separating and recovering the precipitated chemical content, passing the remaining aqueous stream in indirect heat exchange with at least one process stream, and returning the heat-exchanged aqueous stream to the cooling tower. (Lynch-IPC)
W78-00364

PRODUCTION OF FOOD YEAST FROM SPENT SULFITE LIQUOR,
Boise Cascade Paper Group, Salem, OR.
R. F. Anderson.
Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1976, Preprints, p 9-13B. 2 fig, 5 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Yeasts, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Oregon, Water pollution control, Sulfite liquors, Byproducts, Foods, *Fermentation, Carbohydrates.
Identifiers: *Spent sulfite liquors, Sulfite pulp mills, Candida utilis, Sugars.

The production of food yeast from sugars contained in sulfite mill waste waters by Boise Cascade Corp., Salem, Oregon, is described. Candida utilis is grown in two fermenters using Waldhof aeration systems. The yeast product is rendered inactive by pasteurization and spray dried. The dried yeast powder is sold to the food-processing industry where it is used as an ingredient in yeast hydrolyzates and seasoning mixes for food products. (Witt-IPC)
W78-00365

BIOLOGICAL TREATMENT OF SPENT LIQUOR FROM HIGH-YIELD BISULFITE PULPING OPERATION. PART I,
Consolidated-Bathurst, Ltd., Montreal (Quebec).
K. Goel, R. Paquin, Y. M. Mehta, and Y. Lemay.
Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1976, Preprints, p 101-107A. 8 fig, 6 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, *Biological treatment, *Biochemical oxygen demand, Nutrients, Capital costs, Operating

costs, Pilot plants, Water pollution control, Sludge, Sulfite liquors, *Biodegradation.
Identifiers: Spent sulfite liquors, Sulfite pulp mills.

Biodegradation of spent liquor from high-yield bisulfite pulping was investigated to determine the feasibility of using the activated sludge process for BOD reduction. Process variables such as liquor concentration, detention time, BOD loading, and amounts of nutrients were studied. A two-stage system was selected because of superior BOD removal efficiency and sludge settling characteristics. A 1000 gal/da pilot plant was designed and run successfully for 9 months. Results showed that approximately 90% of the BOD could be eliminated. Capital and operating costs of $5,000,000 and $500,000/yr, respectively, were estimated for a mill producing 250 tons/day of high-yield bisulfite pulp. (See also W78-00367) (Witt-IPC)
W78-00366

BIOLOGICAL TREATMENT OF SPENT LIQUOR FROM HIGH-YIELD BISULFITE PULPING OPERATION. PART II,
Consolidated-Bathurst Ltd., Montreal (Quebec).
K. Goel, R. Paquin, Y. M. Mehta, and Y. Lemay.
Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1976, Preprints, p 109-114A. 9 fig, 6 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Sulfite liquors, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, *Biological treatment, Biochemical oxygen demand, Sludge, Flotation, *Separation techniques, Foaming, Sludge disposal, Water pollution control.
Identifiers: Spent sulfite liquors, Sulfite pulp mills.

In any activated sludge biological treatment system, separation of the mixed liquor into a concentrated stream of biological solids and clarified effluent is essential. The design of the activated waste treatment plant, therefore, should not be limited to consideration of the biological aspects of the process but also give due attention to solid-liquid separation. A laboratory study was made of the factors influencing the rate of solid/liquid separation. The results of the 'batch flux' method of analysis for designing a full-scale sedimentation clarifier are presented. The study also includes the trials performed using a continuous-flow pilot flotation unit for solid/liquid separation of the mixed liquor and for thickening and disposal of excess biological sludge. Analysis of the data show that an aeration tank loading of 225 lb of 5-day BOD/1000 cu ft/day (mixed liquor suspended solids approximately 5000 ppm) and 200% sludge recycle, the limiting clarifier solids loading would be about 35 lb/day/sq ft. Dissolved air flotation was impractical for solid/liquid separation of the mixed liquor because of excessive foaming. The studies also showed that the sludge can be digested together with wood chips during high-yield bisulfite pulping without any significant effect on pulp quality and BOD of the spent sulfite liquor. (See also W78-00366) (Witt-IPC)
W78-00367

TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W78-00369

A PROMISING NEW PROCESS FOR REMOVING HEAVY METALS FROM WASTEWATER,
J. E. Hanway, Jr., R. G. Mumford, and D. G. Barth.
Civil Engineering, Vol 46, p 78-79, October, 1976.

Descriptors: *Heavy metals, *Waste water(Pollution), *Waste water treatment, Zinc, Lead, Copper, Iron, Water pollution sources, Cellulose, *Recycling, Water pollution control, Metals, *Chemical precipitation.
Identifiers: *Cellulose xanthate.

A dosage of 90 mg of cellulose xanthate/liter of waste water reduced the concentration of lead and zinc to 30 micrograms/liter or less and reduced the concentration of copper and iron to an acceptable level. It is suggested that the process may be adaptable to a closed-cycle operation with recycle, recovery, and reuse of reagents and products. (Buchanan-IPC)
W78-00370

OPTIMIZATION OF WATER MANAGEMENT IN THE PRODUCTION OF WOOD FIBERBOARD USING THE WET PROCESS (K RACIONALIZACII VODNEHO HOSPODARSTVA VO VYROBE DREVOVLAKNITYCH DOSAK MOKRYM SPOSOBOM),
Research and Development Inst. of Wood and Timber, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 3E.
W78-00371

DETERMINATION OF FREE SULFUR DIOXIDE IN SPENT SULFITE LIQUOR AND PAPER MILL EFFLUENTS USING A SELECTIVE ELECTRODE (DETERMINAZIONE DI ANIDRIDE SOLFOROSA LIBERA NEL LISCIVO SOLFITICO ESAUSTO ED IN ACQUE DI SCARICO DE CARTIERA MEDIANTE ELETTRODO SELETTIVO),
Istituto di Fisica dell'Atmosfera, Bologna (Italy).
For primary bibliographic entry see Field 5A.
W78-00373

REVERSE OSMOSIS AND ULTRAFILTRATION APPLIED TO THE PULP INDUSTRY (OSMOSE INVERSE ET ULTRAFILTRATION APPLIQUEES A L'INDUSTRIE DES PATES),
U. Haagensen.
Papier, Carton et Cellulose, Vol 26, No 4, p 46-52, April, 1977. 14 fig, 1 illus, 1 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Reverse osmosis, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Boiler feed water, Bleaching wastes, Economics, Energy, Membrane processes, Separation techniques, *Pulp wastes, Proteins, Biological treatment.
Identifiers: *Ultrafiltration, Spent sulfite liquors, Black liquors, Condensates, Fiberboard mills, Semichemical pulp mills, Paper mills.

Following an introduction to the general principles of effluent treatment by membrane filtration, the use of reverse osmosis and ultrafiltration in the concentration and/or purification of spent sulfite liquors, evaporator condensates, black liquor, boiler feedwater, and effluents from fiberboard mills, semichemical pulp mills, bleach plants, barking operations, and paper mills is examined. The energy consumption and economy of each of the processes is also considered. The combination of the two processes in effluent recovery as well as in the production of proteins and in biological treatment of effluents is discussed. (Speckhard-IPC)
W78-00377

CHARACTERIZING EFFLUENT VARIABILITY FROM PAPER INDUSTRY WASTEWATER TREATMENT PROCESSES EMPLOYING BIOLOGICAL OXIDATION,
Tufts Univ., Medford, MA.
For primary bibliographic entry see Field 5B.
W78-00378

EFFECT OF CONSTRUCTIONAL AND OPERATIONAL FACTORS ON THE EFFICIENCY OF SLUDGE DEWATERING IN SEDIMENTATION CENTRIFUGES (WPLYW CZYNNIKOW KONSTRUKCYJNYCH I EKSPLOATACYJNYCH NA EFEKTYWNOSC ODWADNIANIA OSADOW W WIROWKACH SEDYMENTACYJNYCH),
Technical Univ., Lodz (Poland). Inst. of Papermaking and Paper Machinery.
P. Stanislawczyk.
Przeglad Papierniczy, Vol 33, No 3, p 99-103, March, 1977. 8 fig, 9 ref, 2 tab.

Descriptors: *Sluge treatment, *Centrifugation, *Dewatering, Construction, Operation and maintenance, *Waste treatment, Water pollution treatment, Water pollution sources, Suspended solids, Pulp wastes, Efficiencies, Pulp and paper industry, *Waste water treatment, Water pollution treatment, Industrial wastes, Treatment facilities, Equipment.
Identifiers: *Sedimentation centifuges.

The principle and construction of sedimentation centrifuges, and the effect of process variables on the quantitative and qualitative separation of suspended solids are discussed. The variables considered are the flow rate of the suspension, angular velocity of the centrifuge cylinder, width of the centrifuged suspension ring, concentration of the suspension entering the centrifuge, centrifuge cylinder shape, ash content in the suspension, and the addition of flocculants. It is pointed out that there is a certain optimum combination of process variables depending on the properties of the suspension being centrifuged, which can be established only experimentally. Examples are given of applications of centrifuges to the thickening and dewatering of pulp and paper industry effluents, and the efficiency of the process is indicated. (Stapinski-IPC)
W78-00379

UDDEHOLM-KAMYR BLEACH PLANT WITH CLOSED WATER SYSTEM (BIELARNIA TYPU UDDEHOLM-KAMYR O ZAMKNIETYM OBIEGU),
Uddeholm A.B., Skoghall (Sweden).
K. A. Andersson.
Przeglad Papierniczy, Vol. 33, No. 3, p 103-106, March, 1977. 6 fig, 1 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Adsorption, *Resins, Water pollution treatment, Water pollution sources, Pulp and paper industry, Color, Biochemical oxygen demand, Capital costs, Operating costs, Costs, Foreign countries, Europe, Chlorine, Effluents.
Identifiers: Kraft mills, Sweden, Closed systems.

A description is given of a system for the purification of bleaching effluents with an adsorption resin, designed for closed-cycle bleach plants. Results obtained in the purification of effluent from the first-stage alkali extraction and the overall bleaching effluent are presented, including the reduction of color and BOD and the chlorine balance. Investment and operating costs are estimated for a purification system for a closed-cycle bleach plant producing 500 tons/day of bleached kraft pulp. An Uddeholm-Kamyr bleach plant coupled with an effluent purification system will be constructed in Skoghall, Sweden. The plant will have a capacity of 250 tons/day. (Stapinski-IPC)
W78-00380

CONTINENTAL (GROUP INC.)'S APPROACH FOR REDUCED PAPER MILL WATER CONSUMPTION AND ITS EFFECT ON ENERGY USE,
Continental Group, Inc., Hodge, LA.
For primary bibliographic entry see Field 3E.
W78-00381

NEW MILL DESIGN -- A PRESENT DAY APPROACH TO REDUCED WATER USAGE,
Wheelabrator-Frye Inc., Birmingham, AL.
For primary bibliographic entry see Field 3E.

W78-00382

WHITE WATER INVENTORYING,
J. B. Jackson.
Southern Pulp and Paper Manufacturer, Vol. 40, No. 6, p 37-38, June, 1977. 3 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Effluents, Industrial wastes, Wastes, Industrial water, Water pollution sources, South Carolina, Monitoring, Water conservation, Dissolved solids.
Identifiers: *White water(Paper machines), Paper mills, Corrugating medium(Fluting paper).

A method of controlling the process waters at Sonoco Products Co.'s corrugating medium mill at Hartsville, South Carolina, is described. This approach consists of a monitoring system that totalizes the water in all pulp stock and water chests in the paper mill. This allows production personnel to discharge a minimum constant amount of process water (white water) as effluent and, at the same time, minimize fresh water usage. This approach has reduced the fiber loss by 68%, specific effluent flow (gallons/ton) by 35-46%, and the dissolved solids discharged to effluent by 48-53% in the 400 ton/day mill. (Witt-IPC)
W78-00383

CONTROL OF BOD LOAD ON ACTIVATED SLUDGE IN AERATION TANKS (OPERATIVNOE REGULIROVANIE NAGRUZKI NA IL V AEROTENKAKH),
Nauchnyi Planovii Otdel Bumazhnoi Promyshlennosti, USSR.
M. A. Evilevich, L. K. Korovin, and I. M. Kas'yanik.
Bumazhnaya Promyshlennost', No. 3, p 27-28, March, 1977. 3 fig.

Descriptors: *Activated sludge, *Biochemical oxygen demand, *Aerated lagoons, *Waste water treatment, Wastes, Waste treatment, Water pollution treatment, Sedimentation, Biological treatment, Capital costs, Water purification, Water pollution control, Pulp waste.

Experiments have shown that deviation of the 5-day BOD load from the optimum value results in worsening of activated sludge sedimentation and in disruption of the biological purification process. The BOD load in an aeration tank without an activated sludge regenerator is determined by the effluent flow rate and BOD, activated sludge concentration, and equipment volume. The first two parameters depend on local purification conditions and cannot be controlled. Adjustment of the equipment volume requires considerable investment and cannot be used for current process control. Thus, the only controllable parameter is activated sludge concentration. A reduction of this concentration to below 2 g/liter can affect the stability of the process, and an increase to over 3 g/liter has a detrimental effect on the operation of secondary sedimentation tanks. Consequently, maintenance of suitable BOD requires, as a rule, a lowering of the tank output. On the other hand, an activated sludge regenerator can solve the control problem. The actual 5-day BOD load on the activated sludge can be calculated in this case from the aforementioned parameters and from the regeneration and the recirculation coefficients. The latter, within the 0.4-1.0 range, has no effect on the purification efficiency, but its small variations can be used to control the load within a wide range. Experimental curves are presented showing the effect of the recirculation coefficient on the BOD load at regeneration coefficients of 0.25, 0.50, and 0.75. (Stapinski-IPC)
W78-00388

WE SHARE OUR EXPERIENCE (IN BOARD MILL EFFLUENT TREATMENT) (DELIMSYA OPYTOM),
Stupinskaya Kartonnaya Fabrika, Stupino (USSR).
L. B. Fedotovskii.
Bumazhnaya Promyshlennost', No. 4, p 22-23, April, 1977.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Filters, Sands, Sedimentation, Suspended solids, Hydrogen ion concentration, Gravels, Quartz, Biochemical oxygen demand, Water reuse, Sludge, Dewatering, Water purification.
Identifiers: Board mills, Soviet Union(USSR), Aluminum sulfate, Polyacrylamide.

The Stupino board mill (USSR) manufactures imitation chromo board from waste paper, chemical pulp, and groundwood. The production of multicolor printed carton blanks began in 1974, and in the same year an extensive mechanical effluent purification system was put into operation. The effluents from the board mill and auxiliary plants (up to 65,950 cu m/day) first pass through sand traps and then to radial sedimentation tanks, where sedimentation of suspended solids is intensified by the addition of aluminum sulfate in an amount sufficient to give a pH of 5.5-6.5. The clarified effluents then undergo a second purification stage in contact clarifiers filled with gravel and layers of quartz sand of different granular composition. The purified effluents have a pH of 6.8-7.3, a suspended solids content of 2-10 mg/liter, and a 5-day BOD of 8 g/liter, i.e., have properties conforming to sanitary standards. About 70% of the purified effluents are recycled to the mill as a replacement for fresh process water. The dewatering of sludge from the radial sedimentation tanks is done in vacuum filters using polyacrylamide as an additive. (Stapinski-IPC)
W78-00389

STUDY OF FILTRATION PROPERTIES OF WASTE WATERS (ISSLEDOVANIYA FIL'TRATSIONNYKH SVOISTV STOCHNYKH VOD),
G. P. Kuchin, E. M. Bakaeva, L. A. Makarova, and S. A. Kister.
Bumazhnaya Promyshlennost', No. 4, p 23-24, April, 1977. 2 fig.

Descriptors: *Pulp wastes, *Filtration, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, *Waste water treatment.
Identifiers: *White water(Paper machine), Filter paper, Parchment paper, Magazine paper, Cotton pulp, Sulfite pulp.

The filterability properties of white water from the manufacture of filter paper (100% cotton pulp), parchment base paper (100% bleached sulfite pulp), and magazine paper (100% bleached sulfite pulp containing starch, kaolin, and size) were studied in a laboratory equipment modeling the Waco filter as a function of the initial concentration of the suspension (180-2400 mg/liter). The filterability of white water from cotton pulp was nearly 100% and was independent of the suspension concentration. In the case of white water from pulp containing a filler and other additives, a high filtration effect (65-70%) was obtained at a concentration of 600-700 mg/liter. At higher concentrations the filtration effect was higher by 5-10%, but the filtration rate was much lower. The use of a sublayer increased the filtration effect to 95%, but did not increase the filtration rate. Thus, to avoid low filter efficiency, the suspension concentration should be maintained at not more than 700 mg/liter. (Stapinski-IPC)
W78-00390

PROCESS FOR CLARIFYING (PAPER-)COATING PLANT EFFLUENTS--A CONTRIBUTION TO THE IMPROVEMENT OF ENVIRONMENTAL PROTECTION (VERFAHREN ZUR KLAERUNG VON STREICHEREIAB-WAESSERN -- BEITRAG ZUR VERBESSERUNG DES UMWELTSCHUTZES),
Feinpapierfabrik Koenigstein VEB (East Germany).
U. Huettenrauch.
Zellstoff und Papier, Vol. 26, No. 5, p 150-152, May, 1977. 1 fig, 3 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Coagulation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Proteins, Water purification, Chemical precipitation, Effluents.
Identifiers: Paper mills, Photographic paper.

A method is described for the clarification of paper mill effluents, and especially paper-coating plant effluents from the manufacture of photographic base paper. The method is particularly suited to treating effluents containing collagen-type proteins and is based on clarification via colloid chemical reactions. It has the advantage that existing clarification plants can be used to remove the coagulated solids. Results are reportedly good as regards recovery of materials and pollution control. (Speckhard-IPC)
W78-00391

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
For primary bibliographic entry see Field 5C.
W78-00413

APPLICATION OF A NEW NONLINEAR PROGRAMMING CODE WITH DECOMPOSITION TO THE REGIONAL WASTEWATER-COLLECTION AND TREATMENT-LOCATION PROBLEM,
West Virginia Univ., Morgantown. Computer Center.
For primary bibliographic entry see Field 5G.
W78-00448

PROTECTION OF VIRUSES DURING DISINFECTION BY ADSORPTION TO PARTICULATE MATTER,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00450

APPLICATION OF REVERSE OSMOSIS AND ULTRAFILTRATION TO THE PURIFICATION OF PULP AND PAPER INDUSTRY EFFLUENTS. (2) (ZASTOSOWANIE ODWROCONEJ OSMOZY I ULTRAFILTRACJI DO OCZYSZCZANIA SCIEKOW Z PRZEMYSLU CELULOZOWO-PAPIERNICZEGO),
Instytut Inzenierii Ochrony Srodowiska Politechniki Slaskiej (Poland).
M. Bodzek, and O. Kominek.
Przeglad Papierniczy, Vol. 33, No. 3, p 82-86, March, 1977. 8 fig, 13 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Membrane processes, Cellulose, Inorganic compounds, Lignins, Color, Effluents.
Identifiers: *Ultrafiltration, Cellulose acetate, Sugars.

The feasibility of purifying pulp and paper mill effluents by reverse osmosis and ultrafiltration has been demonstrated by experimental work, includ-

ing the preparation of cellulose acetate membranes and their characterization and evaluation for the purification of mill effluents. Also described is the laboratory apparatus in which the membranes were tested to determine the effects of pressure, solution concentration, and the temperature of thermal treatment of the membranes on the rate of filtration and the degree of separation. Solutions of sodium and calcium chlorides, sodium and magnesium sulfates, sodium sulfite, sodium acetate, and sucrose were used in membrane tests. Results showed that reverse osmosis membranes are suitable for the removal of inorganic compounds and reducing sugars from effluents within the concentration range 1-10 g/liter and a pressure of up to 40 atmospheres (gage). The ultrafiltration membranes can be used for removal of colored lignin products. These findings need to be confirmed in industrial tests with actual effluents and lignin compounds. (stapinski-IPC)
W78-00453

USE OF CHITOSAN FOR THE REDUCTION AND RECOVERY OF SOLIDS IN POULTRY PROCESSING WASTE EFFLUENTS,
Georgia Univ., Experiment. Dept. of Food Science; and Georgia Experiment Station, Experiment.
W. A. Bough, A. L. Shewfelt, and W. L. Salter.
Poultry Science, Vol 54, p 992 - 1000, 9 tab, 19 ref. 1975.

Descriptors: *Chemical precipitation, *Coagulation, *Food processing industry, *Poultry, *Recycling, *Water reuse, Chemical oxygen demand, Cost analysis, Flotation, Flocculation, Laboratory test, Suspended solids, *Waste water treatment, Water analysis.
Identifiers: *Poultry processing wastes, *Chitosan.

Treatment of poultry processing wastes with chitosan as a coagulating agent reduced suspended solids in the composite effluents by 74 -94%. The combined effects of chitosan and dissolved air flotation (DAF) reduced suspended solids and COD in the chiller effluent by 82% and 62%, respectively, and in the scalder effluent by 77% and 46%. The dry coagulated solids from the chiller effluent contained 35.0% crude protein and 49.1% fat by DAF and 54.0% crude protein and 29.4% by coagulation and gravity settling. The yields of dry coagulated solids from the chiller, scalder, and composite effluents were 2.7, 1.5, and 2.8 lb/1000 gal. Corresponding requirements for chitosan, estimated to cost $1/lb., were 0.04, 0.05, and 0.25 lb./1000 gal. The value of coagulated by-products as animal feed supplements, the reduction in total waste load, and the possibility of recycling clarified chiller and scalder effluents commend coagulation pretreatment and by-product recovery. Since chitosan is derived from shrimp and crab solid wastes, the coagulated solids could feasibly be rendered with other poultry by-products into feed supplements if official approval for use is obtained. (Prodehl - EPA, Corvallis)
W78-00457

INDUSTRIAL WASTE PROCESS DESIGN,
Manhattan Coll., Bronx, NY. Dept. of Civil Engineering.
W. W. Eckenfelder, Jr., and D. J. O'Connor.
Proceedings American Society of Civil Engineers, February 15-19, 1954, Sanitary Engineering Division, Vol 80, No 411, p. 411-1 to 411-25. 13 fig, 5 tab, 26 ref.

Descriptors: *Aerobic treatment, *Chemical precipitation, *Sedimentation, Water analysis, Activated sludge, Anaerobic conditions, Biochemical oxygen demand, Chemical oxygen demand, Coagulation, Design data, Food processing industry, Trickling filters, Suspended solids, *Waste water treatment.
Identifiers: *Meatpacking wastes.

Procedures for data collection and analysis from the industrial waste survey are presented. Laboratory procedures, including pilot plant functions are discussed. The theory and application of sedimentation, activated sludges (with application to tirckling filters), and chemical treatment are discussed, and applications given to specific waste problems and studies from cannery, pulp and paper, packinghouse, dairy and paint wastes. Design criteria are presented in the form of a process material and flow balance. Statistical methods applied to analysis and design criteria are discussed. (Prodehl - EPA, Corvallis)
W78-00459

CONSERVATION OF WATER IN FOOD PROCESSING BY USE OF LOW VOLUME HIGH PRESSURE SPRAYS,
North Carolina State Univ. at Raleigh. Dept. of Food Science.
For primary bibliographic entry see Field 3E.
W78-00460

FULL-SCALE MODIFIED DIGESTION OF MEAT PACKING WASTES,
Wilson and Co., Inc., Chicago, IL. Research and Technical Dept.
A. J. Steffen.
Sewage and Industrial Wastes, Vol 27, No 12, p 1364-1368, Dec 1955, 2 fig, 1 tab, 2 ref. Presented at 1955 annual meeting Central States Sewage and Industrial Wastes Assn., Rochester, Minn, June 22 - 24, 1955.

Descriptors: *Anaerobic digestion, *Food processing industry, *Treatment facilities, Cost comparisons, Design data, Sludge digestion, *Waste water treatment, Minnesota.
Identifiers: *Meat packing wastes, Degassification.

The first full-scale modified digestion facility to treat meat processing wastes will be constructed at Wilson and Co., Albert Lea, Minn. The design is based on the studies conducted on a pilot-scale plant at Austin, Minn. by Geo. A. Hormel and Co. with the cooperation of the American Meat Institute. Evaluation of the process for full-scale development revealed that an anaerobic digestion plant can be built for two-thirds the cost of a conventional two-stage trickling filter plant, however, operating costs are slightly higher due to power requirements in mixing and degassification. The hydraulic profile and unit loadings on which the design is based are presented. One hundred percent flow equalizations and maintenance of 95F in the digesters is proposed. Open turbine digester mixing will be installed in the first stage plant. Degassifiers will consist of two vertical steel tanks, each 11 feet in diameter and 9 feet deep where the effluent is pulled under 20 inch vacuum. The design provides for aerobic treatment by a single-pass high-rate trickling filter followed by final clarifiers and chlorination. (Prodehl - EPA, Corvallis)
W78-00461

AN INVESTIGATION INTO THE DISPOSAL OF BLOOD BY ANAEROBIC DIGESTION,
Kent Sewage Treatment Plant, OH.
K. B. Singleton.
Sewage and Industrial Wastes, Vol 29, No 10, p 1174-1176, October, 1957, 2 tab. Presented at the 1957 Annual Meeting, Ohio Sewage and Industrial Wastes Treatment Conference, Dayton, Ohio, June 19 - 21, 1957.

Descriptors: *Anaerobic digestion, *Food processing industry, *Laboratory tests, Biochemical oxygen demand, Carbon dioxide, Sulfides, *Waste water treatment, Ohio.
Identifiers: *Meat packing wastes, *Blood.

Since the sewage treatment plant at Kent, Ohio had only one primary digester, an investigation was made on the anaerobic digestion of blood coming from a nearby slaughterhouse. Two pyrex jugs of 20,000 ml capacity approximated closely the actual conditions in the plant primary digester. During a 24-day period a total of 14,400 ml. of fresh solids was added to each pilot digester. In addition, 715 ml of raw blood was added to pilot digester No. 1. Pilot digester No. 2 served as a control. From the study, it appears that addition blood to an anaerobic digester should be approached with extreme caution. The high percentage of carbon dioxide should be approached with extreme caution. The high percentage of carbon dioxide and hydrogen sulfide content in the evolved gas, the great BOD, the extensive scum and foam conditions, the indescribable odor, and the increased digestion time necessary to reduce the volatile matter in the sludge are all factors that indicate unsatisfactory digestion of whole blood.)(Prodehl-UEPA, Corvallis)
W78-00462

PACKINGHOUSE WASTE TRICKLING FILTER EFFICIENCY FOLLOWING AIR FLOTATION,
Morrell (John) and Co., Ottumwa, IA. Chemical and Research Labs.
K. A. Hirlinger, and C. E. Gross.
Sewage and Industrial Wastes, Vol 29, No 2, p 165-169, February 1957, 4 fig, 2 tab, and ref. Presented at the 1956 annual meeting, Iowa Sewage and Industrial Wastes Assn.; Clear Lake, Iowa; Sept 12 - 14, 1956.

Descriptors: *Flotation, *Food processing industry, *Trickling filters, Biochemical oxygen demand, Design data, Nitrogen, Oil wastes, Sampling, Water analysis, *Waste water treatment, Iowa.
Identifiers: *Meatpacking wastes, Grease.

The objective of this study was to determine the efficiency of a trickling filter in reducing the 5-day BOD of packinghouse waste which had previously been subjected to treatment by air flotation. A 14-foot diameter filter was designed and constructed to obtain data which would be of practical value in determining the size of fullscale units in possible future planning. The filter was designed in accordance with the formula advocated by Eldridge for high-rate trickling filters. Startup and operation, and problems encountered, are discussed. Methods of sampling are presented and results of effluent analysis are tabulated for BOD, COD, nitrogen, and grease. The average reductions in BOD, oxygen consumed, grease, and nitrogen accomplished by all unit employed in this test compare favorably with the reductions given for more conventional combinations of secondary treatment units. (Prodehl-EPA, Corvallis)
W78-00463

COMBINED TREATMENT OF POULTRY AND DOMESTIC WASTES,
Roberts and Co. Associates, Atlanta, GA.
J. M. Roberts.
Sewage and Industrial Wastes, Vol 30, No 9, p 1186-1189, September 1958. Presented at Industrial Waste Conference, Georgia Institute of Technology, Atlanta, GA; April 11, 1958, 1 tab.

Descriptors: *Poultry, *Operating costs, *Municipal wastes, *Waste water treatment, Food processing industry, Screens, Sedimentation, Biological treatment, Sampling, Water analysis, Georgia.
Identifiers: *Poultry processing wastes, Offal, Feathers.

In spite of the apparent profitable means of waste disposal to local rendering plants, a large percentage of poultry waste material finds its way into the sewers. From samples collected, the water used per bird averaged 5.32 gal. in the government inspected plants and only 2.17 ga. in the other plants. The BOD contributed per bird averaged 0.03 lb. By accepting 0.17 lb. BOD per person per day as a

normal sewage contribution, then each six birds processed equals one person. On the basis of 3.26 gal. of water per bird, composition of the waste to be expected from a processing plant per 100 birds is about as follows (in lb. 1,000 birds): 26.6 total solids, 15.3 suspended solids, 9.4 settleable solids, 1.3 grease, and 30.0 BOD5. During the first year of operation of a combined treatment plant grit averaged 10.38 cfd and feathers averaged 20.2 cfd. Screen stations being installed at plant sites consist of 2 types, vibrating or rotary. Operational problems due to feathers, pumping and digestion are discussed. Treatment costs are included. (Prodehl-EPA, Corvallis)
W78-00464

OPERATION OF FULL-SCALE ANAEROBIC CONTACT TREATMENT PLANT FOR MEAT-PACKING WASTES,
Wilson and Co., Inc., Albert Lea, MN. Albert Lea Waste Treatment Plant.
A. J. Steffen, and M. Bedker.
In: Proceedings 16th Industrial Waste Conference, Purdue Univ., Lafayette, Indiana, Engr. Ext. Ser. No 109, May 1961, p 423-437, 13 fig, 2 tab, 7 ref.

Descriptors: *Anaerobic digestion, *Food processing industry, *Oxidation lagoons, Anaerobic conditions, Biochemical oxygen demand, Data collections, Effluent, Feasibility studies, Heat treatment, Sedimentation, Sludge digestion, Suspended solids, Wastewater treatment, Waste identification, Minnesota.
Identifiers: *Meat packing wastes, *Anaerobic contact treatment, *Degassification.

Since December 1959, all of the waste from the Wilson and Company Meat Packing Plant at Albert Lea, Minnesota has been treated by the anaerobic contact process. The design of this treatment plant, the first of its kind, was based upon pilot scale studies conducted initially by Hormel and Company, and later by the American Meat Institute at Austin, Minnesota, and by Wilson and Co. and Albert Lea. The process takes advantage of the fact that anaerobic organisms thrive best on warm (90 to 95F temperature), high organ solids wastes. The treatment plant flow diagram is shown and discussed, the main units being an equalizer, 2 degassifiers, and anaerobic digesters in parallel, 2 sludge separators in series, and 2 oxidation lagoons in series. The anaerobic contact process is similar to the activated sludge process. The effluent is well within the tolerance of 30 ppm BOD and suspended solids, established by the Minnesota Water Pollution Control Commission, and compares favorably with results obtained in aerobic waste treatment process. Complete operating data is tabulated and graphs presented of relative parameters for the digesters and polishing lagoons. (Prodehl-EPA, Corvallis)
W78-00465

POLLUTION ABATEMENT OF POULTRY PROCESSING AND BY-PRODUCTS WASTES,
Rockingham Poultry Marketing Cooperative Inc., Broadway, VA.
E. A. Budd, and S. C. Crawford.
In: Proceedings 16th Industrial Waste Conference, Purdue Univ., Lafayette, Indiana, Engr. Ext. Ser. No 109, May 1961, p 64-66.

Descriptors: *Centrifugation, *Food processing industry, *Water reuse, Biochemical oxygen demand, Cost analysis, Dewatering, Laboratory tests, Oil wastes, Standards, Water analysis, *Waste water treatment.
Identifiers: *Poultry processing wastes.

The Rockingham Poultry Marketing Cooperative have four processing plants that are producing 120,000 chickens and turkeys a day; a 20 million lb. per year dog food plant, and a chicken products canning plant. Water from the operations flow in almost a closed cycle because of centrifugal solids and fatty wastes separation by use of a Sharpes P-200 Super-D-Canter and a Sharpes DG-2 Autojector. Sludge is disposed of manually, and the previously installed sedimentation and lagoon treatment system is only used to collect the sludge prior to disposal. An approximate materials balance of the systems indicates that at a wastes input of 3200 gph about 400 lbs/hr. of solids are removed and 125 lbs./hr. of fat recovered. It is expected that future operation of this system will exceed the criteria set by the Virginia State Water Control Board of 80-85% BOD and suspended solids removal. Operating costs are discussed. (Prodehl-EPA, Corvallis)
W78-00466

OXIDATION POND STUDIES ON EVISCERATION WASTES FROM POULTRY ESTABLISHMENTS,
Delaware State Water Pollution Commission, Dover.
J. S. Anderson, and A. J. Kaplovsky.
In: Proceedings 16th Industrial Waste Conference, Purdue Univ., Lafayette, Indiana, Engr. Ext. Ser. No. 109, May 1961, 9 fig, 1 tab, 14 ref.

Descriptors: *Oxidation lagoons, *Food processing industry, *Lagoons, *Poultry, *Odor, Biochemical oxygen demand, Feasibility studies, Design criteria, Nitrates, Nitrites, Ponds, Stabilization, *Waste water treatment, Delaware.
Identifiers: *Poultry processing wastes, Blood, Viscera.

Presented is an interim report of data collected to date by the Water Pollution Commission, State of Delaware, in its effort to study, primarily, the effectiveness of oxidation ponds to treat a comparatively heavy loading of highly nutrient wastes from a poultry processing plant. Removal of an existing odor problem, and establishing criteria for a more economical design applicable to existing conditions within Delaware were the main purposes of the investigation. Space limitations at the particular installation studies necessitated accepting a design loading far exceeding the conventional surface loadings of 20 to 100 lbs. BOD per acre per day; that being a highly colored blood-type waste at surface loadings as high as 250 lbs. BOD per acre per day. The oxidation ponds consist of a 3.71 acre lagoon and a 4.02 acre lagoon, operated in parallel. A flow diagram of the poultry plant waterborne wastes and graphical data of influent and effluent characteristics vs. time are presented. The average hydraulic loading for both ponds was 1,314,000 gal. per day. Detention time was 2.89 days at 18 inches depth, and 3.85 days at 24 inches depth. Conclusions of the investigation show that total surface loadings of approximately 214 lbs. BOD/acre/day from poultry processing plants, appear feasible in high rate oxidation ponds with potential BOD reductions from 70 to 96%, and effective odor control with less loading during darkness periods. (Prodehl-EPA, Corvallis)
W78-00467

POND TREATMENT OF MEAT PACKING PLANT WASTES,
Swift and Co., Chicago, IL. Operating Div.
F. W. Sollo.
In: Proceedings 15th Industrial Waste Conference, Purdue Univ., Engr. Ext. Ser. No. 106, p 386-391, May 1960. 2 tab, 3 fig, 3 ref.

Descriptors: *Anaerobic digestion, *Food processing industry, *Lagoons, *Oxidation lagoons, *Ponds, Biochemical oxygen demand, Laboratory tests, *Waste water treatment, Water analysis.
Identifiers: *Meat processing industry.

A two-stage system of ponds has been applied to the treatment of meat packing plant wastes. On a pilot scale test an 8,000 gal., five foot deep anaerobic pond produced an average BOD reduction of 78.6% with an influent BOD of 1,680 ppm, pond temperature of 72F, and detention period of 4.4 days. On the same test a 0.53 acre, three feet deep oxidation pond produced a 90% BOD reduction with an influent BOD of 1,450 ppm, detention period of 50 days, and a BOD loading of 243 lbs. per acre per day. The anaerobic pond did not produce a stable effluent but was far more efficient in BOD reduction per unit area. It also appeared that the oxidation pond could handle loadings higher than generally used and produce a stable effluent. Operating data is tabulated for the test ponds in series. A full scale treatment pond system was constructed in 1955. The anaerobic pond is 192 feet X 320 feet at the surface and has a 14 foot water depth. The oxidation pond has a total surface area of 19.2 acres and 3 foot water depth. BOD values for the first four years of operation are tabulated. Advantages are low investment cost, simplicity of operation, and production of effluent that is stable without dilution. (Prodehl-EPA, Corvallis)
W78-00468

PACKINGHOUSE WASTE PROCESSING, APPLIED IMPROVEMENT OF CONVENTIONAL METHODS,
Rath Packing Co., Waterloo, IA.
K. M. Garrison, and R. J. Geppert.
In: Proceedings 15th Industrial Waste Conference, Purdue Univ., Engr. Ser. No 106, May 1960, p 207-218. 6 fig, 7 tab.

Descriptors: *Coagulation, *Costs, *Flotation, *Air entrainment, *Classification, *Filtration, *Centrifugation, Biochemical oxygen demand, Food processing industry, Oil wastes, Recycling, Sedimentation, Suspended solids, *Waste water treatment.
Identifiers: *Meat packing wastes, Grease removal.

A study was made of various types of waste handling equipment in an effort to recover valuable materials and reduce the strength and volume of packinghouse wastes. The processes studied included air-flotation, liquid-solid cyclone classification, vacuum-drum filtration, and centrifugation. It was found that each process could be applied for reducing the biological load and solids content of packinghouse wastes. However, for the plant under study, the high capital investment and operating costs or low rates of material recovery precluded their application. The most effective methods for reducing valuable material losses were determined by a thorough study of each plant waste process. Modification of the methods of handling hasher wash waters and interceptor bottom sludge resulted in increased grease and tankage recovery as well as reduced hydraulic and biological load of the plant sewage. The use of plastic as a filter media in a biological filter tower resulted in BOD removals of 70% at very high rates of filter loading. (Prodehl-EPA, Corvallis)
W78-00469

DEVELOPMENT OF THE ANAEROBIC CONTACT PROCESS. II. ANCILLARY INVESTIGATIONS AND SPECIFIC EXPERIMENTS,
Minnesota Univ., Minneapolis. Dept. of Sanitary Engineering.
G. J. Schroepfer, and N. R. Ziemke.
Sewage and Industrial Wastes, Vol 31, No 6, June 1959. 13 fig, 3 tab, 1 ref.

Descriptors: *Anaerobic digestion, *Flotation, *Sedimentation, *Adsorption, *Stabilization, *Centrifugation, Biochemical oxygen demand, Activated sludge, Food processing industry, Heat, Laboratory tests, Organic loading, Sludge treatment, Wastewater treatment, Minnesota.
Identifiers: *Meat packing wastes, *Anaerobic contact.

This is the second of a two-part paper summarizing the results of three years of research on the application of the anaerobic contact process in the treatment of various types of industrial wastes and

municipal sewage. Synthetic milk wastes and meat packing wastes were the main wastes tested. (Part I included data from pilot-plant investigations and an economic analysis and was published by the same Journal, Vol. 31. No. 2, p 164, February 1959.) Part II reports on ancillary investigations and special experiments, summarizes the study, and offers the conclusions. Included in these investigations were: (1) A series of experiments run on a batch basis to determine the adsorption and stabilization characteristics of anaerobic sludge and, (2) pilot plant studies to evaluate the factors influencing separation and concentration of active sludges including gravity separation, air flotation, centrifuging, and wicketing. (Prodehl-EPA, Corvallis)
W78-00470

STABILIZATION PONDS FOR MEAT PACKING WASTES,
Wilson and Co., Inc., Chicago, IL.
A. J. Steffen.
Journal Water Pollution Control Federation, Vol 35, No 4, p 440-444, April 1963. 3 fig, 1 tab, 7 ref.

Descriptors: *Aerobic treatment, *Anaerobic digestion, *Lagoons, *Ponds, *Stabilization, Biochemical oxygen demand, Food processing industry, Organic wastes, Temperature, Wastewater treatment.
Identifiers: *Meat packing wastes, Aerobic lagoons, Anaerobic lagoons.

The development and uses of stabilization ponds in the meat packing industry are discussed, the main uses being as tertiary treatment following conventional aerobic systems or an aerobic contact system; as secondary treatment, either two stage anaerobic - aerobic systems or single-stage aerobic basins; or as complete treatment following conventional grease recovery. Examples of stabilization lagoons operated under these various conditions at different plants are discussed, and operating data and BOD efficiencies are tabulated. Conclusions derived from experience in the use of stabilization basins for treatment of meat packing wastes include: (1) complete treatment can be accomplished by anaerobic basins 8 to 17 feet deep loaded at 0.011 to 0.015 lb. BOD/day/cu. ft. followed by conventional aerobic lagoons loaded at 50 to 280 lb. BOD/day/acre, or (2) by aerobic lagoons limited to lower BOD loadings in the range of 50 lb/day/acre; (3) secondary treatment permitting loading in excess of 200 lb./day/acre with 90 percent removal can be accomplished following equalization and clarification; and (4) tertiary treatment utilizing aerobic lagoons will successfully treat an anaerobic effluent of 130 BOD mg/l at an average loading of 410 lb./day/acre and yield an aerobic effluent of less than 30 mg/l BOD. (Prodehl-EPA, Corvallis)
W78-00471

ANAEROBIC AND AEROBIC PONDS FOR PACKINGHOUSE WASTE TREATMENT IN LOUISIANA,
Louisiana State Board of Health, New Orleans. Div. of Public Health Engineering.
J. F. Coerver.
Proceedings 19th Industrial Waste Conference, Purdue Univ., Ext. Ser. 117, p 200-209, May 1964. 3 fig, 5 tab.

Descriptors: *Aerobic treatment, *Anaerobic digestion, *Lagoons, *Ponds, *Stabilization, Biochemical oxygen demand, Food processing industry, Odor, Organic loading, Sedimentation, *Waste water treatment, *Louisiana.
Identifiers: *Meat packing wastes, Anaerobic lagoons, Aerobic lagoons.

The results of treating packinghouse wastes in a pond system at Houma, Louisiana, and comparatively designed installations at Slidell and Gonzales, Louisiana, indicate that packinghouse wastes, including blood and paunch manure, can be successfully treated in low cost ponds without significant nuisance or health hazard. These pond systems, and other similar installations recently placed in operation in the State of Louisiana, consist of three ponds in series - an anaerobic pond, a 'transitional' pond, and an aerobic pond. The first such pond installation in the state, at Autin Packing Company in Houma, has been removing 98.1 percent of the BOD applied to the pond system. Most of the BOD is removed in the anaerobic pond where 879 lbs./acre/day have been removed in a pond only two feet deep with an applied loading of 950 lbs./acre. It has been demonstrated that equivalent BOD removals/acre-ft of volume in the anaerobic pond could be achieved in deeper ponds. Consistantly good results obtained at mature pond installations at Gonzales and Slidell bear this out. To date, these pond systems have given very satisfactory results. They are by far the least expensive treatment units to build and operate, are reliable, and are nuisance free except for slight odors at initial operation. (Prodehl-EPA, Corvallis)
W78-00473

FUNDAMENTAL PRINCIPLES OF SEWAGE CHLORINATION,
Public Health Service, Cincinnati, OH. Div. of Water Supply and Pollution Control.
C. E. Rhines.
In: Proceedings 20th Industrial Waste Conference, Purdue Univ., Eng. Ext. Ser. No 118, p 673-678, May 1965. 3 tab, 3 ref.

Descriptors: *Chlorination, *Disinfection, *Nitrites, Biological treatment, Food processing industry, Laboratory tests, Nitrates, Oxidation, *Sewage treatment, *Waste water treatment.

Sewage usually contains many substances that limit the activity of chlorine, and chlorine treatment has been found to be of little or no benefit in many treatment plant operations. The Microbiology Section, Basic and Applied Sciences Branch, Division of Water Supply and Pollution Control, initiated a study to learn the means of achieving reliable disinfection. Experiments were conducted to determine the main factors affecting chlorination. Conclusions include: (1) amino acids completely stop the disinfection process whereas ammonia merely slows the process; (2) the chlorine demand of domestic sewage was commonly reduced by a factor of three after 5 to 20 hrs. of slow aeration; (3) chlorination of septic sewage requires excessive chlorine; and (4) the major hindrances to reliable sewage chlorination are nitrate compounds, parasites in dumped sewage, and oxidation of reducing substances. Tests bear out the fact that superficial bio-oxidation, as commonly practiced, is worthless before chlorination and often causes serious interference through intermediate oxidation products, notably, nitrite nitrogen. (Prodehl-EPA, Corvallis)
W78-00474

POLYELECTROLYTES IN INDUSTRIAL WASTE TREATMENT,
Dow Chemical U.S.A., Midland, MI.
R. B. Schaffer.
In: Proceedings 18th Industrial Waste Conference, Purdue Univ., Engr. Ext. Ser. No. 115, p 447-459, May 1963. 8 fig, 4 tab.

Descriptors: *Coagulation, *Flocculation, *Food processing industry, *Sedimentation, Anaerobic digestion, Aerobic treatment, Biochemical oxygen demand, Laboratory tests, Sludge digestion, *Waste water treatment.
Identifiers: *Meat packing wastes, *Polyelectrolytes.

Factors such as pH, ionic charge, temperature, solids concentration and many others make it virtually impossible for one particular chemical to apply in each instance in solids-liquid separation. Because of these variations, the PURIFLOC flocculants were developed by the Dow Chemical Company for use as synthetic organic polyelectrolytes in waste treatment processes. Case studies of various industries using this product are presented and data tabulated showing definite improvements over their conventional methods. Laboratory and pilot studies using polymers for the operational improvement of an anaerobic contact process used by Wilson and Company in Albert Lea, Minnesota, were encouraging enough to warrant a full-scale trial. Data is presented for varying dosages of polymer and digester loadings. In every instance, the percentage of BOD removed and settling rates increased in the sludge separators after addition of the polymer. (Prodehl-EPA, Corvallis)
W78-00475

INDUSTRIAL WASTE STABILIZATION PONDS IN CANADA,
Ontario Water Resources Commission, Toronto.
F. A. Voege, and D. R. Stanley.
Journal Water Pollution Control Federation, Vol 35, No 8, August 1963, p 1019-1023.

Descriptors: *Food processing industry, *Lagoons, *Ponds, *Stabilization, Biochemical oxygen demand, Industrial wastes, *Waste water treatment, *Canada.
Identifiers: *Meat packing wastes, *Poultry processing wastes, *Rendering wastes.

A survey was conducted of the application of stabilization ponds for the treatment of industrial wastes in Canada. The meat packing, poultry processing and rendering industries are included. Meat packing plants and slaughterhouses with low volume discharges are using smaller areas than the Ontario Water Resources Commission design criteria of 20lb. BOD/acre/day, yielding anaerobic conditions, but are located mostly in isolated areas. A number of poultry processing plants in Ontario and Manitoba use oxidation basins with a BOD loading range of 20 upwards to 135 lb./day/acre, the upper loadings yielding very septic conditions and offensive odors. One rendering plant in Ontario uses this method of waste treatment with an average loading of 44 lb. BOD/day/acre and a removal efficiency of 95%. (Prodehl-EPA, Corvallis)
W78-00477

ANAEROBIC STABILIZATION POND TREATMENT OF MEAT PACKING WASTES,
South Dakota State Univ., Brooking. Dept. of Civil Engineering.
D. W. Rollag, and J. N. Dornbush.
In: Proceedings 21st Industrial Waste Conference, Purdue Univ., Engr. Ext. Series No 121 Pt. 2, p 768-782, May 1966. 5 fig, 5 tab, 20 ref.

Descriptors: *Stabilization, *Anaerobic digestion, *Aerobic treatment, *Food processing industry, *Lagoons, *Ponds, Costs, Design criteria, Laboratory tests, Biochemical oxygen demand, *Waste water treatment, Water analysis, Minnesota.
Identifiers: *Meat packing wastes, *Anaerobic lagoons.

An investigation was conducted on anaerobic - aerobic stabilization pond system treating the wastewater from the Minnesota-Iowa-Dakota (MID) Packing Co., Luverne, Minnesota, where approximately 400 beeves per day are killed and dressed. The organic, hydraulic and temperature characteristics of the wastewater were studied at various locations along its flow-path through the treatment system. The primary objective of the study was to evaluate the design and performance of this treatment system during winter operation, studies being conducted in February and early March. Design criteria and construction of the treatment system are discussed. Operational data for the test period is tabulated and discussed. Conclusions of the study show that the treatment system as investigated appears to be an efficient

and economical slaughterhouse waste treatment method, at an initial cost of about $7.00 per BOD population equivalent and 95% overall removal efficiency. (Prodehl-EPA, Corvallis)
W78-00478

DESIGN AND PERFORMANCE EVALUATION OF AN ANAEROBIC STABILIZATION POND SYSTEM FOR MEAT-PROCESSING WASTES,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
D. A. Rollag, and J. N. Dornbush.
Journal Water Pollution Control Federation, Vol 38, No 11, November 1966, p 1805-1812. 5 fig, 2 tab.

Descriptors: *Anaerobic digestion, *Aerobic treatment, *Food processing industry, *Stabilization, *Lagoons, *Ponds, Costs, Design criteria, Biochemical oxygen demand, *Waste water treatment, Water analysis, Minnesota.
Identifiers: *Meat packing wastes, *Anaerobic lagoons.

Description of the treatment system, design criteria, and start-up of the anaerobic - aerobic stabilization pond system at the Minnesota-Iowa-Dakota (MID) Packing Co., Luverne, Minnesota, is presented. Performance data, as analyzed by the Minnesota Department of Health Personnel, is discussed, the organic hydraulic and temperature characteristics of the wastewater being studied at various locations along its flow-path through the treatment system. The anaerobic-aerobic pond system at the MID Packing Co. has proved to be an efficient and economical slaughterhouse waste treatment method at an initial cost of about $7.00/BOD population equivalent and 95% overall removal efficiency. (Prodehl-EPA, Corvallis)
W78-00479

DESIGN CONSIDERATIONS FOR ANAEROBIC CONTACT SYSTEMS,
Clark, Dietz, and Associates, Urbana, IL.
J. C. Dietz, P. W. Clinebeil, and A. L. Strub.
Journal Water Pollution Control Federation, Vol. 38, No. 4, April 1966, p. 517-530, 10 fig, 3 tab, 10 ref.

Descriptors: *Anaerobic digestion, *Food processing industry, *Lagoons, *Ponds, Biochemical oxygen demand, Cost comparisons, Design criteria, Oil wastes, *Waste water treatment.
Identifiers: *Meat packing wastes, *Anaerobic contact, Grease.

Design considerations are presented for both the anaerobic contact process and anaerobic lagoons. Results of a pilot lagoon study at the Union City, Tenn., Municipal Wastewater Treatment Plant include data derived from temperature, BOD loading, grease, and suspended solids variable rates. The data demonstrates the ability of the anaerobic lagoon to absorb wide fluctuations in influent strength and the ability to assimilate grease quite readily. BOD removals in the pilot lagoon consistantly remained above 80% and exceeded 90% as the temperature increased above 80F. Specific design considerations for the anaerobic contact process and for anaerobic lagoons are individually discussed, including reference to application of meat processing wastes. (Prodehl - EPA, Corvallis)
W78-00480

THE ECONOMICS OF POOR HOUSEKEEPING IN THE MEAT-PACKING INDUSTRY,
Hormel (George A.), and Co., Chicago, IL.
W. J. Fullen, and K. V. Hill.
Journal Water Pollution Control Federation, Vol. 39, No. 4, April 1967, p. 659 - 664, 2 tab, 4 ref.

Descriptors: *Biochemical oxygen demand, *Cost comparisons, *Food processing industry, *Nitrogen compounds, *Oil wastes, Chlorides, Industrial wastes, Waste water treatment, Water pollution sources.
Identifiers: *Meat packing wastes, *In-plant control, Protein, Grease.

The purpose is to point out the potential values of the nitrogen and fat in a packer's waste and to relate them to BOD in the waste, and hence, the size of the necessary treatment plants. The method of calculating the potential value of the grease and nitrogen is presented. Losses of BOD and nitrogen from various plants are tabulated. Costs of waste treatment due to poor housekeeping techniques are given and examples presented. The ratio of concentration of nitrogen to 5-day BOD indicated that proteins contribute substantially to the total BOD load. (Prodehl-EPA, Corvallis)
W78-00481

SPRAY IRRIGATION OF WASTES FROM THE MANUFACTURE OF HARDBOARD,
Masonite Corp., Chicago, IL.
For primary bibliographic entry see Field 5E.
W78-00483

EQUALIZATION OF LIQUID WASTES,
New Jersey Inst. of Tech., Newark. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-00484

SEPARATION OF SOLIDS IN THE ANAEROBIC CONTACT PROCESS,
Wilson and Co., Inc., Chicago, IL.
A. J. Steffen, and M. Bedker.
Public Works, Vol. 91, No. 7, July 1960, p. 100 - 102, 2 fig, 5 ref.

Descriptors: *Anaerobic digestion, *Flotation, *Food processing industry, *Aeration, *Sedimentation, Biochemical oxygen demand, Cost comparisons, *Waste water treatment, Minnesota, *Separation techniques.
Identifiers: *Meat packing wastes, Anaerobic contact.

Solids separation in the anaerobic contact process at the Wilson and Company, Inc. meat packing plant was one of the principal research problems encountered. To permit separation of the solids from the mixed liquor by gravity, a 20-inch vacuum is drawn on the entire effluent from the digesters to remove residual gases. The gassified liquor is then discharged into a sedimentation tank (separator). Although vacuum degassification was successful in removing solids from the mixed liquor, alternative sludge removal methods were tried. Tests of vacuum degassification with series operation of the separators rather than parallel showed secondary gas generation and no improvement in sludge concentration. Laboratory and pilot scale tests with degassification by the aeration process indicated that methane and excess carbon dioxide gases are successfully removed yielding superior effluent, but produced odor and was found less economical. A tested air flotation unit yielded a consistently higher quality effluent to a very definite break point in solids loading of 88 lbs./sq.ft./day. From the studies it was concluded that vacuum degassification is the most economical and practical method, however, direct aeration and air flotation present possibilities under less stringent effluent quality requirements. (Prodehl - EPA, Corvallis)
W78-00488

PACKING WASTES TREATED AUTOMATICALLY,
Kahn's (E.) Sons, Inc., Cincinnati, OH.
E. G. Anderson.
Public Works, Vol 86, November 1955, p 103 - 104, 2 fig.

Descriptors: *Chemical precipitation, *Coagulation, *Flotation, *Food processing industry, *Oil wastes, *Automatic control, Biochemical oxygen demand, Costs, Suspended solids, *Waste water treatment, Ohio.
Identifiers: *Meat packing wastes.

Because of a high production of approximately 1,000 cattle and 6,000 hogs per week at the E. Kahn's Sons, Inc. meat packing plant and average waste flow of 500,000 gal./day, a high percentage of fats, grease and oil was discharged to the city sewers resulting in high charges based on loading. BOD contents of the waste ranged 2,000 - 2,500 ppm and suspended solids 1,200 - 1,400 ppm. A Coldoidair unit, made by Bulkley, Dunton Processes, Inc., was installed. The systems operating principle, as discussed, is chemical flocculation, followed by dissolved air flotation, followed by mechanical skimming of floated solids. The unit is fully automatic. The effluent discharges at 800 - 900 ppm. BOD and 500 - 600 ppm. suspended solids, and the sludge is blended for rendering. Fifteen thousand dollars/year are saved on sewerage charges and about 10.000 lb. of valuable fats, tallow and protein solids are recovered each week. (Prodehl - EPA, Corvallis)
W78-00489

PUBLIC HEALTH SERVICE GUIDE TELLS HOW TO TREAT MEAT WASTES BY FILTRATION WITH SEWAGE.
Wastes Engineering, February 1956, p 76 - 86, 1 tab.

Descriptors: *Food processing industry, *Trickling filters, *Waste water treatment, *Sewage, Aerobic treatment, Biochemical oxygen demand, Biological treatment, Chemical precipitation, Activated sludge.
Identifiers: *Meat packing wastes.

Since meat wastes are amenable to biological treatment in plants of the type in common use for treatment of domestic sewage, the most satisfactory method is to treat them in conjunction with domestic sewage. Examples of cities using such treatment methods are given. Methods of treatment and results are discussed on the extensive studies of treatment for meat packing wastes by the District of Chicago through the operation of the Packingtown testing station in 1912 - 1918. Description and results of packing plants using double filtration, high rate filtration, and chemical precipitation are presented. (Prodehl - EPA, Corvallis)
W78-00490

TREATING MEAT PROCESSING WASTES,
Wilson and Co., Inc., Chicago, IL.
A. J. Steffen.
Public Works, Vol 87, p 167 - 170, August 1956. 6 ref.

Descriptors: *Activated sludge, *Anaerobic digestion, *Chemical precipitation, *Flotation, *Filters, *Food processing industry, *Irrigation systems, *Septic tanks, *Sedimentation, *Trickling filters, Biochemical oxygen demand, Cost comparisons, Screens, Oil wastes, *Waste water treatment.
Identifiers: *Meat packing wastes.

Various treatment process methods available to the small slaughterhouse operator are discussed. In-plant waste prevention and handling, screening, and grease recovery as preliminary waste reduction measures to waste treatment, are discussed. Evaluations of the following waste treatment methods are presented: (1) solids removal by sedimentation and dissolved air flotation yielding a minimum BOD removal of 25 - 40%; (2) septic tanks, at 70 - 90% BOD reduction; (3) intermittent sand filters yielding BOD reductions of approximately 95% in the summer and 85% in the winter; (4) trickling filters with BOD removals in excess of

95%; (5) chemical treatment using chlorine, alum, ferric salts and lime yielding reductions of approximately 60 - 95% BOD depending on amount of process cooking; (6) anaerobic digestion with loading rates of 4 times that of conventional aerobic proceses; and (7) treatment and disposal by irrigation. (Prodehl - EPA, Corvallis)
W78-00491

RUPTURED DIGESTER COVER DUE TO PACKINGHOUSE WASTES,
V. A. Vaseen.
Wastes Engineering, Vol 24, July 1954, p 316-317, 3 draw, 3 fig.

Descriptors: *Anaerobic digestion, *Digestion tanks, *Food processing industry, Design data, Hydraulic equipment, *Waste water treatment.

Cracking of an anerobic digester cover at the Clear Creek Valley Water and Sanitation District Sewage Treatment plant occurred because of manure and stockyard cleanup material washed down the municipal drains. The exceedingly thick scum blanket of manure, hair, straw and other materials in the digester increased to a depth where it extended over the entry of the automatic overflow - antisiphon mechanism, clogging it, and causing excessive pressures from generated gases and continuous inflow from the sludge pump. Detailed sketches are shown of a 2-foot-square by approximately 2-foot-high metal pressure relief hatch which is to set in an oil seal in the repaired cover, acting as a pressure failure unit. (Prodehl - EPA, Corvallis)
W78-00492

ODOR CONTROL BY CHEMICAL OXIDATION,
Woodward-Envicon, Inc., Phoenix, AZ.
C. Suydam.
Plant Engineering, Sept 12, 1974, p 81 - 83. 3 fig, 2 tab.

Descriptors: *Oxidation, Odor, *Food processing industry, *Chemical reactions, Design criteria, Incineration, Cost comparisons, Waste treatment.
Identifiers: *Chemical oxidation, *Odor control.

Chemical oxidation - if used properly - is an effective odor control method. Cost comparisons and physical and chemical comparisons of chemical oxidation to incineration are analyzed. Parameters are presented on odorant properties, oxidant properties, and equipment design considerations on which to conduct a study to obtain the relations between removal efficiencies and the critical design parameters. Discussions of oxidation kinetics, oxidation products, solubility and stability and storage properties are included. (Prodehl - EPA, Corvallis)
W78-00493

LAND TREATMENT OF FOOD PROCESSING WASTEWATER,
Campbell Soup Co., Camden, NJ.
L. C. Gilde.
American Society of Civil Engineers, Vol. 99, Mo. IR3, p 339-352. September 1973. 9 fig, 3 tab, 3 ref.

Descriptors: *Food processing industry, *Irrigation systems, *Land use, Biochemical oxygen demand, Design data, Environmental effects, Flow rates, Hydraulic design, Nitrogen, Phosphorous, *Waste water treatment.
Identifiers: *Poultry processing wastes.

Two methods of spray irrigation land treatment were examined and utilized for wastewater treatment, conventional infiltration type irrigation being used for poultry processing wastes and overland flow spray irrigation being used for vegetable canning wastes. Ground treated water is retreived by buried drain tile to a polishing lagoon in the first case and surface treated water drained to a receiving stream in the second case. Analysis of the reed canary grass used in both cases has shown the mineral content to be higher than normal, concentrations of nitrogen-crude protein ranging up to 23% and phosphorous to be nearly double its normal value. Approximately 98% BOD removal efficiencies were found in both treatment sites, both having high buffering capacities. (Prodehl - EPA, Corvallis)
W78-00494

5E. Ultimate Disposal Of Wastes

AMINO ACID COMPOSITION OF DRIED CITRUS SLUDGE AND ITS POTENTIAL AS A POULTRY FEEDSTUFF,
Agricultural Research Service, Winter Haven, FL. Citrus and Subtropical Products Lab.
For primary bibliographic entry see Field 5B.
W78-00018

USING FOOD-PROCESSING WASTEWATER FOR IRRIGATION,
California Univ., Parlier. Cooperative Extension.
J. L. Meyer.
California Agriculture, Vol. 31, No. 5, p 38, May, 1977.

Descriptors: *Return flow, *Irrigation practices, *Canneries, *California, *Nutrient removal, Industrial wastes, Food processing industry, Soil-water-plant relationships, Salts, Biochemical oxygen demand, Water quality management(Applied), Waste water treatment, Effluents, Waste water disposal.

Food processing waste disposal practices in California are described. Plants in the Central Valley of California produce 2-4 mgd of effluent which could be used to irrigate 400-800 acres of cropland at the site of each processing plant. Constituents in food processing waste waters which may require treatment include added nutrients such as nitrogen and phosphorus, added salts which contribute to salinity and the total dissolved solids, and fruit sugar which results in biochemical oxygen demand. These problems may be minimized by the use of plants to reduce nutrient levels; the addition of calcium to reduce the effects of sodium in salt; and the reduction of effects associated with BOD, such as odor and anaerobic soil conditions, by shallow irrigation and cultivation within 3-4 days after the effluent is applied. Effective water quality monitoring, management, and irrigation practices are suggested as important in the reuse of waste water for irrigation. Waste water irrigation has been successfully employed with a variety of crops, including pasture grasses, alfalfa, sorghum, barley, oats, and grapes. (Schulz-FIRL)
W78-00026

SURVEYING MASSACHUSETTS' HAZARDOUS WASTES,
GCA Corp., Bedford, MA.
P. F. Fennelly, M. A. Chillingworth, P. D. Spawn, M. I. Bornstein, and H. I. Bonne.
Environmental Science and Technology, Vol 11, No 8, p 762-766, August, 1977. 2 fig, 4 tab, 1 ref.

Descriptors: *Surveys, *Industrial wastes, *Massachusetts, *Waste disposal, *On-site data collections, Equipment, Oil wastes, Sludge disposal, Chemical wastes, Solvents, Metals, Waste water disposal.

An inventory of hazardous wastes was conducted by the Massachusetts Division of Water Pollution Control to estimate the quantities of hazardous wastes generated according to category and geographic distribution, to identify disposal and recycling options, and to recommend disposal options on an immediate (3 mo-1 yr) and long-term (1-5 yr) basis. State files of annual permit applications and monthly reports from waste haulers licensed and operating in Massachusetts were reviewed. A telephone survey of businesses and industries was conducted to determine the amount, geographic distribution, and current disposal practices for hazardous wastes generated in the state. Waste was categorized by county and type of waste, including oil, solvent, metal sludge plating, miscellaneous sludge, acid and alkali, auto waste oil, and other hazardous waste. Survey results are compared to the state permit data. Recommendations for immediate action on waste disposal include: consolidation of authority for a hazardous waste program, modification of several existing landfills to accept hazardous wastes, stricter enforcement of waste disposal regulations, the use of transfer stations, more efficient waste-oil disposal practices, and the development of public relations and educational programs. (Schulz-FIRL)
W78-00059

STUDY EXAMINES WASTE DISPOSAL AT PITTSBURGH PLANTS,
Westinghouse Research Labs., Pittsburgh, PA.
W. G. Vaux.
Industrial Wastes, Vol 23, No 4, p 36-39, July/August, 1977. 2 fig, 5 tab.

Descriptors: *Resources development, *Waste disposal, *Ultimate disposal, *Mathematical models, *Costs, Energy, Oil wastes, Solvents, Solid wastes, Incineration, Cost comparisons, Fuels, Chemical wastes, Industrials, Waste water disposal, Landfills, Economic feasibility.
Identifiers: Waste disposal costs, Resource recovery.

Results of an evaluation of waste disposal practices by the Westinghouse Corporation for its southwestern Pennsylvania plants are presented. The first phase study which examined parameters, procedures, and costs of waste disposal indicated that costs and methods of waste disposal among Westinghouse sites were highly variable. The potential for resource recovery in waste disposal was investigated in the second phase of the study. The third phase of the study attempted to minimize the overall, net disposal cost for plants in the region and produce a flexible disposal system for changes in waste amounts. A mathematical model for comparing waste disposal alternatives is presented. Descriptions and costs for on-site and centralized means of disposal are presented. Conclusions which are based on the particular geographic area and waste amounts are presented. On-site disposal and mixing of waste solvents with boiler fuel is the recommended method for solvents disposal. Fullers earth reclamation at two central sites or on-site mixing with boiler fuel is the suggested means of lube oil disposal. On-site reclamation of insulating oil and landfilling of cutting fluid are recommended. Steam generation with waste solids at two sites is the suggested means of disposal for plastic, wood, and rubbish. The sale of waste paper products to private processors is suggested. Distillation of chlorinated solvents for reuse is recommended. (Schulz-FIRL)
W78-00060

AGRICULTURAL USE OF SEWAGE SLUDGE: PROBLEMS OF INDUSTRIAL EFFLUENTS (LANDWIRTSCHAFTLICHE VERWERTUNG VON KLAERSCHLAMM: PROBLEME DURCH INDUSTRIEABWAESSER),
Eidgenoessische Forschungsanstalt fuer Agrikulturchemie und Umwelthygiene, Bern (Switzerland).
O. J. Furrer.
Textilveredelung, Vol 12, No 6, p 244-247, 1977. 7 fig, 4 tab, 7 ref.

Descriptors: *Fertilizers, *Nutrient removal, *Heavy metals, *Sewage bacteria, *Pesticides, Industrial wastes, Municipal wastes, Nitrogen, Phosphorus, Sludge disposal, Organic wastes,

Soil-water-plant relationships, Salmonella, Waste water treatment, *Waste water disposal.

Biochemical characteristics of sewage sludge from municipal waste water are described, and the problems caused by industrial waste waters in connection with the agricultural use of sewage sludge are discussed. Sewage sludge analyses at a waste water treatment plant in Switzerland revealed a total nitrogen content of 46 g/kg of dry matter, 15 g/kg ammonium nitrogen, 23 g/kg phosphorus, 3.1 g/kg potassium, 82 g/kg calcium, and 6.8 g/kg. Consequently, sewage sludge can be regarded as a phosphate fertilizer. Agricultural use of sewage sludge requires thorough stabilization for odor control, the destruction of pathogenic germs such as Salmonella, and the absence of high concentrations of heavy metals and pesticides. Sewage sludge from domestic waste water usually contains heavy metals in favorable, physiologically necessary concentrations, while industrial effluents may render sewage sludge unfit for use on farmlands because heavy metals and stable organic compounds tend to accumulate in the soil and inhibit the growth of soil microorganisms. (Takacs-FIRL)
W78-00067

PHOSPHATE REMOVAL BY SANDS AND SOILS,
New York State Dept. of Environmental Conservation, Albany. Research Unit.
For primary bibliographic entry see Field 5D.
W78-00092

AGRONOMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES,
Institut National de la Recherche Agronomique, Versailles (France). Station Centrale d'Agronomie.
A. Morisot, and R. Gras.
Report BTR-76-12, (1976), 39 p. Translated from Annales Agronomiques, Vol. 25, No. 2-3, 1974, p. 243 - 266. 6 fig, 14 tab, 3 ref.

Descriptors: *Agriculture, *Infiltration, *Land use, *Food processing wastes, *Phosphorous, *Ultimate disposal, Biological treatment, Crops, Industrial wastes, Rural areas, Self-purification, Waste disposal, Wastewater treatment.
Identifiers: *Meat packing wastes, *Soil effects, *Vegetation effects, Soil analysis, Slaughterhouse.

This survey, carried out in 1972, on 32 factories of the agricultural industry permitted the agronomic effects of land disposal of process water to be specified. Particular attention was given to marking the evolution of the physical and chemical properties of the soils, which permitted cases of overfertilization to be observed; and particular emphasis was given to the importance of interactions between the nature of the soil to which it was applied in the evolution of the physical properties of the soil. The effects of these applications on the farms which used them are also described. (Prodehl - EPA, Corvallis)
W78-00102

SCREW PRESS DEWATERING SOLVES COSTLY WASTE DISPOSAL PROBLEM,
Cross Bros. Meat Packers, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5D.
W78-00105

COMPOSTING PAUNCH MANURE,
King and Co. Indianapolis, IN.
V. R. Rupp.
In: Proceedings of the 6th Industrial Waste Conference, Feb 1951, Purdue University, Lafayette, Indiana, p. 363-366, 1 fig.

Descriptors: *Food processing industry, *Land use, *Waste disposal, *Ultimate disposal, *Decomposing organic matter, Heat, Lime, Sewage treatment, Self-purification, Soils, Temperature aerobic treatment, Industrial wastes, Waste treatment.
Identifiers: *Meat packing wastes, *Soil fertilizer, Packinghouse, Beef processing, *Composting.

Properly drained paunch manure is well suited for compost making since it is light, packs loosely, and readily admits air to the pile, and since animal manure contributes microbiological life necessary for digestion. A method of composting paunch material is discussed where a two-foot deep and five foot wide trench is dug and filled with layers of paunch manure, loam and ground limestone, and pen manure. The heap is turned at prescribed interval and kept moist. The typical temperature variation in the heap is graphed. In 11 weeks the finished compost is friable, black in color, containing a faint earthy odor. Paunch weed seeds are destroyed by the prolonged heating. Slow digestion of the compost in the winter and high labor costs are the problems with this method of disposal. (Prodehl - EPA, Corvallis)
W78-00106

FATE OF ANIMAL VIRUSES IN EFFLUENT FROM LIQUID FARM WASTES,
Guelph Univ. (Ontario). Dept. of Veterinary Microbiology and Immunology.
For primary bibliographic entry see Field 5B.
W78-00116

WASTE DISPOSAL IN BEEF FEEDLOTS,
New Zealand Agricultural Engineering Inst., Lincoln.
For primary bibliographic entry see Field 5G.
W78-00117

LIVESTOCK WASTE MANAGEMENT - STATE OF THE ART,
Agricultural Research Service, Lincoln, NE.
For primary bibliographic entry see Field 5G.
W78-00118

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA DAIRYMEN.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
Publication Number ID-81, 1972. Cooperative Extension Service, Purdue University. 12 p. 3 fig, 3 tab.

Descriptors: *Waste disposal, *Indiana, Legal aspects, *Dairy industry, Regulation, *Waste disposal, Design, Solid wastes, Liquid wastes, Waste storage, Land disposal, *Farm wastes, Water pollution, Agricultural runoff, Rates of application.
Identifiers: *Waste management, Pasture system, Drylot system, Covered system, Odor control.

The purpose is: (1) to acquaint the Indiana dairy farmer with present pollution laws and regulations that most directly affect him, and (2) to present waste handling and disposal guidelines that will help the dairyman determine how nearly he complies with these laws and regulations or how he might develop a system that will comply. The Indiana Stream Pollution Control Board and the Indiana Air Pollution Control Board have the authority to adopt and enforce rules and regulations concerning their respective types of pollution problems. Indiana's Confined Feeding Control Law supplements the Indiana Stream Pollution Control Law in attempting to prevent water pollution. It is now against the law for anyone to start building a confined feedlot operation without approval by the Stream Pollution Control Board. The kind of waste handling system a dairyman should have, facilities needed, their capacities and design, and types of management practices depend, to a large extent, on the number of animals and how they are handled. Systems for handling dairy cattle usually fall into three broad categories -- pasture, drylot, and covered systems. Each of these is described and recommended grazing and housing intensities are given. Guidelines are given for design and management. Either solid manure handling systems, liquid manure handling systms, or partial treatment manure handling systems may be utilized in handling and storing wastes. Design recommendations are given for the various management methods utilized in each of these systems. Most dairy wastes are still disposed of on the land. Factors affecting land application rates, how acceptable land application rates may be determined, and precautions that should be taken when returning manure to the land are discussed. Suggestions for minimizing odor problems during disposal are given. (Rowe-East Central)
W78-00119

WASTEWATER RESEARCH EXPANDS,
C. Woods.
Sunshine State Agricultural Research Report, Vol. 17, No. 5-6, p 3-5, Nov.-Dec., 1972. 3 fig.

Descriptors: *Municipal wastes, Sewage, Forages, Crop response, Sprinkler irrigation, Sampling, Chemical properties, Biological properties, Groundwater, Water pollution, Waste disposal, *Recycling.
Identifiers: Land disposal.

A grant from the U.S. Environmental Protection Agency was awarded to the Institute of Food and Agricultural Sciences, Florida to test a new method of recycling municipal sewage water onto farmland. A major goal of the research is to demonstrate the feasibility of discharging about 2-1/2 million gallons of effluent from the Tallahassee Southwest Wastewater Treatment Plant over farmland through a sprinkler-irrigation system. The research is also attempting to determine the response of forage crops (oats, rye, ryegrass, sorghum, kenaf, corn, millet and coastal bermudagrass) to various application rates and frequencies--ranging from 1 to 8 inches/week. Plant and soil samples will be collected from each test plot for analysis. Plant responses to nutrients in wastewater, efficiency of removal, and forage quality for animal feed will be checked. Wells will be installed to monitor changes in the chemical and bacteriological levels of groundwater. Emphasis will be placed on developing operational guidelines for this type of sewage disposal system. (Bates-East Central)
W78-00122

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
For primary bibliographic entry see Field 5G.
W78-00126

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
For primary bibliographic entry see Field 5G.
W78-00127

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA BEEF PRODUCERS.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
For primary bibliographic entry see Field 5G.
W78-00128

NITROGEN AND PHOSPHORUS: FOOD PRODUCTION, WASTE AND THE ENVIRONMENT.
New York State Coll. of Agriculture and Life Sciences, Ithaca.

For primary bibliographic entry see Field 5B.
W78-00130

FLOWS OF NITROGEN AND PHOSPHORUS ON LAND,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-00132

COASTAL WATER RESEARCH PROJECT ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1976.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00134

CHROMIUM SPECIATION IN MUNICIPAL WASTEWATER AND SEAWATER,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00135

FAUNA OF OFFSHORE STRUCTURES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00158

RESPONSE AND RECOVERY OF THE BENTHOS AT ORANGE COUNTY,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00159

PARTIAL RECOVERY OF THE BENTHOS AT PALOS VERDES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00160

COMPARISON OF THE BENTHOS AT SEVERAL WASTEWATER DISCHARGE SITES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00161

DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
T. A. Wastler, C. K. Offutt, C. K. Fitzsimmons, and P. E. Des Rosiers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 979, Price codes: A10 in paper copy, A01 in microfiche.
Environmental Protection Agency, Final Environmental Impact Statement Maritime Administration Chemical Waste Incinerator Ship Project, Report EPA-430/9-75-014, July 1975. 237 p, 6 fig, 6 tab, 6 append.

Descriptors: *Waste disposal, *Water pollution sources, *Chemical wastes, *Incineration, Gulf of Mexico, Monitoring.
Identifiers: *Outer Continental Shelf, *Ocean dumping Organochlorine, Offshore mining, Chlorinated hydrocarbons, Trichloropropane, Trichloroethane.

The first officially sanctioned incident of ocean incineration in the United States occurred aboard the M/T VULCANS in the Gulf of Mexico from October 1974 through January 1975 under an ocean dumping permit for ocean incineration of organochlorine wastes. The report described the monitoring activities undertaken to evaluate ocean incineration as a disposal method. Stack gas emissions were monitored for plume dispersion characteristics and to determine combustion efficiency. The findings indicate that more than 99.9 percent of the wastes were oxidized. Marine monitoring surveys indicate that there were no measurable increases in concentrations of trace metals and organochlorides in the water and marine life. Results of the project indicate that ocean incineration could be a viable alternative of waste disposal which should be considered along with other disposal methods including direct ocean disposal, land disposal, and land incineration. (Sinha-OEIS)
W78-00165

ECONOMIC ANALYSIS OF SPRAY IRRIGATION OF POULTRY PROCESSING WASTEWATER VS. UPGRADING OF WASTEWATER TREATMENT FACILITIES,
Mogul Corp., Chagrin Falls, OH.
For primary bibliographic entry see Field 5D.
W78-00179

CHICK HATCHERY WASTES DISPOSAL,
Buchart-Horn, Lewisburg, PA.
M. Goldman.
Industrial Wastes, January/February 1977, p 28-31, 5 tab.

Descriptors: *Cost comparison, *Feasibility studies, *Land use, *Waste disposal, Fertilizers, Food processing industry, Industrial wastes, Water analyses, Pennsylvania.
Identifiers: *Poultry processing wastes, Equalization, Chemical coagulation, Land application.

In February 1976, the Snyder County, Pennsylvania sewage treatment plant encountered operating difficulties associated with poor effluent quality, caused by high organically loaded wastes from an egg hatchery. Wastes consist of eggshells, infertile eggs, dead chicks, washwater from cleaning operations, and ordinary sanitary wastewater. Three approaches were considered in studying the problem by Buchart-Horn Consulting Engineers: (1) Chemial pretreatment with discharge of the partially treated waste to the sewage treatment plant; (2) equalization of the waste flow to the sewage treatment plant and acclimation of treatment microorganisms to the heavier organic loadings (3) disposal of egg shell and liquid waste on farmland. All three solutions appeared technically feasible. Composite samples were analyzed and are tabulated. An economic analysis (costs comparison) showed land disposal to be least expensive. The waste is high organic, high-nitrogen material, with N-P-K values of 15-trace-0. Economics involved with the land application are discussed. (Prodehl-EPA, Corvallis)
W78-00186

SLUDGE HANDLING AND DISPOSAL: A SPECIAL REPORT,
Nalco Chemical Co., Oak Brook, IL.
J. A. Beardsley, F. J. Biermann, A. Blok, W. R. Hallen, and J. D. Innes.
Pollution Engineering, Vol 8, No 1, p 22-33, January 1976. 11 fig, 14 tab.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge disposal, Coagulation, Dewatering, Filtration, Incineration, Design data, Economics, Costs, *Polymers.

Techniques discussed in the treatment and handling of sludge include concentration, dewatering, coagulation, gravity separation, and filtration. Disposal methods discussed are incineration and use of sludge as a fertilizer and soil conditioner. The use of organic polymers rather than metal salts as chemical conditioners for dewatering is described, advantages given, and recommended polymer application strengths and costs tabulated. Influent points of polymer addition during concentration are advised. Solids separation by vacuum filtration, gravity belt filtration, centrifuges, plate and frame filtration, gravity separation, and sludge beds are described, and some design parameters given. In determining the amounts of primary and secondary sludge, it is necessary to perform a partial solids balance on the primary clarifier, the secondary treatment process, and the sludge digester. Example calculations are shown. Two methods of incineration are discussed: (1) fluidized bed; (2) multihearth. Included is a layout plan of Organic-Recycling Inc. for processing sludge into fertilizer. (Prodehl-EPA, Corvallis)
W78-00187

EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE WESTERN SNAKE PLAIN AQUIFER, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00197

NATURE AND EXTENT OF GROUND-WATER-QUALITY CHANGES RESULTING FROM SOLID-WASTE DISPOSAL, MARION COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00205

RESPONSE BY PEARL MILLET TO SOIL INCORPORATION OF WATERHYACINTHS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-00259

DEEPWATER DUMPSITE 106 BATHYMETRY AND BOTTOM MORPHOLOGY,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 2L.
W78-00311

SIX DIVES TO THE LOWER CONTINENTAL SLOPE AND UPPER CONTINENTAL RISE SOUTHWEST OF HUDSON CANYON GEOLOGICAL ASPECTS,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 2L.
W78-00312

THE GENERAL PHYSICAL OCEANOGRAPHY OF DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 2L.
W78-00313

PHYSICAL OCEANOGRAPHY OF DEEPWATER DUMPSITE 106, UPDATE: JULY 1975,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 2L.
W78-00314

CLIMATIC STUDY OF NEW YORK BIGHT,
National Climatic Center, Asheville, NC.
For primary bibliographic entry see Field 2B.
W78-00316

PHYTOPLANKTON IN THE VICINITY OF DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-00317

DEEPWATER DUMPSITE 106: ZOOPLANKTON STUDIES,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab.
For primary bibliographic entry see Field 5B.
W78-00318

GELATINOUS ZOOPLANKTON AT DEEPWATER DUMPSITE 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5B.
W78-00319

APEX PREDATORS IN DEEPWATER DUMPSITE 106,
National Marine Fisheries Service, Narragansett, RI. Narragansett Lab.
For primary bibliographic entry see Field 5C.
W78-00320

DISTRIBUTION AND ABUNDANCE OF MESOPELAGIC FISHES ON CRUISES 2 AND 3 AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-00321

OBSERVATIONS FROM THE DSRV ALVIN ON POPULATIONS OF BENTHIC FISHES AND SELECTED LARGER INVERTEBRATES IN AND NEAR DWD-106,
National Marine Fisheries Service, Washington, DC. Systematics Lab.
For primary bibliographic entry see Field 5C.
W78-00322

EPIBENTHIC INVERTEBRATES,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 5C.
W78-00323

EPIFAUNAL MEGABENTHOS IN DWD 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-00324

FINAL REPORT ON BENTHIC INFAUNA OF DEEPWATER DUMPSITE 106 AND ADJACENT AREAS,
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-00325

NEUSTON FISH AT DWL 106,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-00326

A SUMMARY OF THE INPUT OF INDUSTRIAL WASTE CHEMICALS AT DEEPWATER DUMPSITE 106 DURING 1974 AND 1975,
National Marine Fisheries Service, Narragansett, RI. Atlantic Environmental Group.
For primary bibliographic entry see Field 5B.
W78-00327

RESULTS OF STUDIES ON THE DISTRIBUTION OF SOME TRANSITION AND HEAVY METALS AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00328

RECENT ANALYSES OF COPPER, CADMIUM AND LEAD AT DEEPWATER DUMPSITE 106,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W78-00329

FINAL REPORT ON HEAVY METALS IN SMALL PELAGIC FINFISH, EUPHAUSID CRUSTACEANS AND APEX PREDATORS, INCLUDING SHARKS, AS WELL AS ON HEAVY METALS AND HYDROCARBONS (C15+) IN SEDIMENTS COLLECTED AT STATIONS IN AND NEAR DWD 106,
National Marine Fisheries Service, Milford, CT. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-00330

APPENDIX, (NOAA DUMPSITE EVALUATION REPORT),
National Marine Fisheries Service, Washington, DC. National Systematics Lab.
E. M. Cohen.
In: NOAA Dumpsite Evaluation Report 77-1, Baseline Report of Environmental Conditions in Deepwater Dumpsite 106, Vol 3, Contaminent Inputs and Chemical Characteristics - Appendix, p 565-798, June 1977. 10 append.

Descriptors: *Baseline studies, *Waste disposal, *Environmental effects, *Water pollution, Ecology, Phytoplankton, Zooplankton, Benthos, Predation, Nekton.
Identifiers: *Outer continental shelf, *Ocean dumping.

This section contains baseline data in the following categories: Operational cruise report July 1975; Operational cruise report February 1976; Ten dives of the DSRV ALVIN in and near the DWD 106 dumpsite, 25 July - 3 August 1975 - Introduction, station data, general observations and conclusions; Phytoplankton data for DWD 106; Zooplankton data for DWD 106; Epibenthos data for DWD 106; Digested STD data (USCGC DALLAS) June 1976; Hydrostation data (RV KNORR) August-September 1976; Apex predator data for DWD 106; and Mid-water nekton data for DWD 106. (Sinha - OEIS)
W78-00331

AN INVESTIGATION INTO THE DISPOSAL OF BLOOD BY ANAEROBIC DIGESTION,
Kent Sewage Treatment Plant, OH.
For primary bibliographic entry see Field 5D.
W78-00462

OPERATION OF FULL-SCALE ANAEROBIC CONTACT TREATMENT PLANT FOR MEAT-PACKING WASTES,
Wilson and Co., Inc., Albert Lea, MN. Albert Lea Waste Treatment Plant.
For primary bibliographic entry see Field 5D.
W78-00465

SPRAY IRRIGATION OF WASTES FROM THE MANUFACTURE OF HARDBOARD,
Masonite Corp., Chicago, IL.
W. C. Parsons.
In: Proceedings 22nd Industrial Waste Conference, Purdue Univ., Engr. Ext. Series 129, p 602-607, May 1967. 4 fig.

Descriptors: *Irrigation system, *Irrigation effects, *Waste disposal, Biochemical oxygen demand, Chemical oxygen demand, Design criteria, Food processing industry, Industrial wastes, Land use, Suspended solids, Waste water treatment.
Identifiers: *Spray irrigation.

Description of the concepts and natural phenomena involved in purification of wastewater by irrigation and natural filtration is presented. Methods used in applying effluent from a storage lagoon, at increasing loading rates, to a field of reed canary grass are discussed. Load was gradually increased up to a satisfactory rate of 400 to 500 lb. solids/acre/day. By the end of 1964, it was firmly established that an approximate rate of 550 lbs./day/acre could be maintained on a year round basis with brief shock loads in the summer of up to 700 lbs. Various problems encountered with the vegetation from 1962 to 1965 are presented. Advantages and disadvantages of spray irrigation application of effluent are listed. BOD and COD at indicator wells, control wells, and a nearby river, over a four-year period are presented graphically. (Prodehl - EPA, Corvallis)
W78-00483

5F. Water Treatment and Quality Alteration

MUNICIPAL WATER SUPPLIES IN LEE COUNTY FLORIDA, 1974,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00198

RESIDUE TOLERANCES FOR AQUATIC HERBICIDES,
Environmental Protection Agency, DC. Chemistry Branch.
For primary bibliographic entry see Field 5G.
W78-00241

WATER PURIFICATION PROCESS,
Hoeschst A.G., Frankfurt am Main (West Germany).
K-E. Quentin, L. Weil, and H. Berger.
U.S. Patent No. 4,028,233, 5 p, 2 tab, 12 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 300, June 7, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Separation techniques, Flocculation, Polymers, Oily water, Organic wastes, Potable water.
Identifiers: *Hydrocarbon removal.

Drinking water is prepared by a process for removing hydrocarbons or halogenated hydrocarbon contaminants dissolved in crude water in concentrations below 10 mg/l. The water is mixed with a polymer substance selected from the group consisting of a polymer of ethylene, a polymer of substituted ethylene and a copolymer of ethylene and less than 50% by weight of another ethylenically unsaturated monomer. The crude water is subjected to a conventional flocculation procedure either before, during or after the mixing or after the mixing with polymer substance and then separated from the polymer substance and flocculant. (Sinha-OEIS)
W78-00280

BUFFERING AGENTS,
Aerojet-General Corp., El Monte, CA. (Assignee).
For primary bibliographic entry see Field 3A.
W78-00281

APPARATUS FOR AND METHOD OF RECOVERING WATER USED TO BACKWASH AND RINSE A FILTER,
Hungerford and Terry, Inc., Clayton, NJ. (Assignee).
R. R. Davis, A. M. Langberg, and A. P. Debus.
U.S. Patent No. 4,028,241, 9 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 302, June 7, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, *Filtration,

Cleaning, Polyelectrolytes, Manganese, Iron, Zeolites, Separation techniques, Water reuse.
Identifiers: *Backwashing.

This invention relates generally to a system for recovering treated water used to backwash and rinse filters used to remove manganese and iron impurities from water. A recovery basin is provided into which water used to backwash and rinse a manganese oxide filter is deposited. A coagulating agent such as a polyelectrolyte is added to the backwash and rinse water, the coagulating agent and water is agitated in the recovery basin, and then the precipitates or other impurities removed from the filter are allowed to settle to the bottom of the recovery basin. The treated water from which the impurities have settled is then returned to the filter inlet and passed through the filter in normal filtering operation so that the water used to backwash and rinse the filter exits from the filtering system as pure treated water. Settling is preferred to other methods for separating the removed precipitates from the backwash and rinse water. It is preferred to employ a polyelectrolyte because settling requires less than one to two hours. (Sinha-OEIS)
W78-00286

ELECTROSTATIC WATER TREATMENT APPARATUS,
Progressive Equipment Corp., Erie, PA. (Assignee).
D. C. Clark, L. H. Silverman, and J. K. Barnard.
U.S. Patent No. 4,024,047, 4 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 1189, May 17, 1977.

Descriptors: *Patents, *Water treatment, Water quality control, *Water pollution treatment, *Water purification, Electrolysis, Electrodes, Equipment.
Identifiers: Dielectric coating, *Electrostatic treatment.

This invention is intended to simplify the construction and increase the reliability of operation of electrostatic water treating apparatus by an improved structure for supporting the charging electrode and for preventing injury to the dielectric coating during assembly or disassembly for inspection and repair. A hollow electrode having an insultating coating on its outer surface is positively charged by a high voltage. The electrode is at the center of an externally grounded metal shell and the water to be treated enters through a fitting. While the annular stream of water flows past the electrode the positive charge on the electrode attracts free electrons from the water and minerals and causes electron collisions with mineral and biological material in the water. As a result, the mineral and biological materials settle out and may be periodically flushed down a drain. (Sinha - OEIS)
W78-00294

APPARATUS AND METHOD USING ACTIVATED CARBON TO PURIFY LIQUID WASTES,
Eastman Kodak Co., Rochester, NY. (Assignee).
For primary bibliographic entry see Field 5D.
W78-00304

WATER FILTER DEVICE,
Gelman Instrument Co., Ann Arbor, MI. (Assignee).
C. Gelman, and A. Vadnay.
U.S. Patent No. 4,025,438, 7 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 958, no 4, p 1662, May 24, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, Filtration, Domestic water, Water quality control, *Carbon filters, Potable water, Separation techniques.

There is need for a water filtering device for attachment to a faucet which at one and the same time provides potable water for today's high standards for potable water, and on a cost basis which is easily within the budget of the average householder. The object of this invention is to fulfill this need. A water filter and water filter cartridge is provided having an upper water filtering layer containing charcoal particles, a lower filtering layer having a submicron pore size and an intermediate filtering layer having a pore size greater than that of the lower layer but less than the particle size of the charcoal in the upper layer. (Sinha-OEIS)
W78-00308

INSOLUBLE ADSORBER RESIN SUITABLE FOR TREATING DRINKING WATER AND SEWAGE,
Farbenfabriken Bayer A.G., Leverkusen (West Germany). Assignee.
H. Corte, H. Heller, M. Lange, and O. Netz.
U.S. Patent No. 4,025,705, 4 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 958, no 4, p 1729, May 24, 1977.

Descriptors: *Patents, *Water treatment, Water quality control, *Water purification, *Adsorption, Odors, Taste-producing algae, Water pollution treatment, *Resins, *Polymers.

A process for removing oleophilic odor- and taste-producing substances from water by treatment with an insoluble macroporous absorber resin comprises a matrix based on a crosslinked organic polymer containing aromatic nuclei, the polymer containing chloromethyl groups as substituents; some of the chlorine atoms in the chlormethyl groups can be reacted with ammonia or amines. The polymers used as matrix in the process are known such as, copolymers containing monomeric units of an aromatic monovinyl compound and at least one aromatic polyvinyl compound have proved to be particularly advantageous. (Sinha-OEIS)
W78-00310

OZONE DISINFECTION OF FLOWING WATER,
Oregon Dept. of Fish and Wildlife, Clackamas.
J. F. Conrad, R. A. Holt, and T. D. Kreps.
The Progressive Fish Culturist, Vol. 37, No. 3, p. 134-136, 1975; 2 tab, 4 ref.

Descriptors: *Design, *Research and development, *Research equipment, *Fish diseases, *Fish hatcheries, *Aquatic bacteria, *Ozone, *Disinfection, Fish handling facilities, Fish parasites, Salmonids, Salmon, Aquaria, Water purification, Aquiculture.
Identifiers: *Ozone disinfection, Flexibacter columnaris.

A small experimental ozonator capable of producing 1 g ozone/hr of capacity to disinfect 22.7 l/min waterflow was developed. Spring water regulated at 13 degrees and 21 degrees was introduced into a 132-l reservoir and distributed into four tanks. Water flow to 2 tanks passed through a mixing chamber where it was exposed to ozone. Tests on the efficiency of ozone for inactivating bacterial flora (Flexibacter columnaris) were made with coho salmon fingerlings. Tests demonstrated that ozone significantly reduced the numbers of viable F. columnaris cells in flowing water. (Katz)
W78-00432

5G. Water Quality Control

USING FOOD-PROCESSING WASTEWATER FOR IRRIGATION,
California Univ., Parlier. Cooperative Extension.
For primary bibliographic entry see Field 5E.
W78-00026

MEETING BPT STANDARDS FOR REFINERY WASTEWATER TREATMENT.
Engineering-Science, Inc., Pasadena, CA.
For primary bibliographic entry see Field 5D.
W78-00041

SURVEYING MASSACHUSETTS' HAZARDOUS WASTES,
GCA Corp., Bedford, MA.
For primary bibliographic entry see Field 5E.
W78-00059

PRETREATMENT STRATEGIES FOR INDUSTRIAL WASTE CONTROL PROPOSED BY EPA,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol 49, No 7, p 1578-1580, July, 1977. 1 tab.

Descriptors: *Industrial wastes, *Legislation, *Regulation, *Sewage treatment, *Pre-treatment(Water), Water pollution control, Municipal wastes, Treatment facilities, Metals, Toxicity, *Waste water treatment, Water quality standards.
Identifiers: *Industrial waste pre-treatment.

Since industrial pollutants entering public-owned treatment works may interfere with treatment processes, limit sludge disposal alternatives, and require additional treatment, four proposed alternative pretreatment strategies for the control of industrial wastes discharged to municipal sewer systems are discussed. The options include local enforcement of technology standards; local enforcement of technology standards or water quality variances; local enforcement of toxic technology standards; and federal/state enforcement of technology standards. In general, the options differ according to primary enforcement responsibility and in terms of the number and type of pollutants and sources that would be covered by national standards. According to the new regulations, pollutants will be classified on the basis of being compatible or incompatible with a public-owned treatment works. The proposed pretreatment strategies are part of a series of regulations on industrial waste control which have been designated to replace the existing pretreatment regulation, 40 CFR 128. (Schulz-FIRL)
W78-00061

PESTICIDE POLLUTION STUDIES.
Public Health Service, Atlanta, GA. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5B.
W78-00098

WASTE DISPOSAL IN BEEF FEEDLOTS,
New Zealand Agricultural Engineering Inst., Lincoln.
D. J. Hills.
New Zealand Journal of Agriculture, Vol. 128, No. 3, p. 33-35, March, 1974. 5 fig.

Descriptors: *Feed lots, Management, Agricultural runoff, Water pollution, Groundwater, *Waste disposal, *Farm wastes, Rates of application.
Identifiers: *New Zealand, Windrows, Land spreading.

Feedlot management practices in the United States that could be adapted in New Zealand are described. Two problems associated with feedlot waste are removal and disposal of manure, and the possible water pollution of streams, lakes, and groundwater when rainfall runoff comes in contact with the manure. The manure should be rationed on the feedlot surface so that biological decomposition and drying process will reduce the quantity and improve its characteristics. Then the waste should be removed from the feedlot surface mechanically once or twice a year and stockpiled or windrowed. The next step is to transport it to

and spread it on farm land, not so much for its fertilizer value, but because land disposal is a low-cost method of disposal. One acre of crop land can safely use 10 tons of dry manure a year. The management of feedlot runoff depends on the hydrology and topography of the location of the feedlot. Rain falling into the feedlot should be collected in drain ditches, pass through a settling basin and be stored in a detention pond. This stored runoff should be spread on crop land before the next storm. The location of a feedlot farm should be about 3 miles from urban area, at least 1 mile from a housing development and 0.5 miles from the nearest residence. (East Central)
W78-00117

LIVESTOCK WASTE MANAGEMENT - STATE OF THE ART,
Agricultural Research Service, Lincoln, NE.
C. B. Gilbertson.
Report presented at the request of the Institute on Environmental Quality, State of Illinois, Carbondale, Illinois, and entered as testimony in the State of Illinois Public Hearing Minutes, February 1, 1973. 9 p. 14 ref.

Descriptors: Feed lots, *Livestock, Cattle, Nebraska, Odor, Agricultural runoff, Water pollution, Groundwater, Overland flow, *Reviews, *Farm wastes, *Management, Rates of application, *Waste disposal.
Identifiers: *Waste management, Soil pollution, Land application.

An overview of livestock waste management problems and research results is presented. Beef cattle on outdoor feedlots are particularly considered. The report is based on results derived from research initiated in 1968 on beef cattle feedlots located in Nebraska and from the author's personal experience. Included are brief descriptions of beef cattle feedlots, the quantity and quality of feedlot runoff, groundwater and soil pollution potential, and methods of runoff control. Research is still required to determine: (1) Alternative systems to relieve odors from livestock operations (outdoor and housed feedlots), (2) Alternatives for debris basin cleaning or management, (3) Recommended land application rates of liquids and solids that will not have long-term, adverse effects on soil, groundwater, and crops, (4) Effect of ration on runoff quantity and quality, (5) Effect of distance of overland flow, topography, and vegetation cover on pollution characteristics of feedlot runoff, and (6) Materials handling and processing component design for alternate methods of utilization of animal wastes other than land disposal. (Merryman-East Central)
W78-00118

PRODUCTION AND TRANSPORT OF GASEOUS NH3 AND H2S ASSOCIATED WITH LIVESTOCK PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 908, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-76-239, Sept. 1976. 70 p, 7 fig. 26 tab, 59 ref.

Descriptors: *Air pollution, Water pollution, *Odor, *Ammonia, *Hydrogen sulfide, Amines, Masking agents, Rations, Cattle manure, Confinement pens, Surfaces, *Farm wastes, *Gases, *Livestock.

Current livestock production techniques release a large variety of volatile organic compounds to the atmosphere. This release results in complaints due to their odorous nature and has been identified as a source of surface water pollution as these compounds are absorbed from the air. Ammonia has been identified as the compound of greatest concern relative to water pollution and is of considerable interest relative to odor complaints due to its ease of measurement and its relationship to more odorous gas evolution. Gas sampling and measuring schemes based upon the use of solid absorbents were studied. Use of an absorbent suspended in a stainless steel screen container which could be exposed in an atmosphere to be sampled showed promise. The evolution of ammonia, hydrogen sulfide and odorous volatiles was investigated as a function of beef cattle ration. Addition of essential oil, mint oil, was found to mask the odor of fresh manure. Mint oil was carried in the urine. Ammonia evolution from fresh manure was largely from urine. Fecal contributions became significant only after significant decomposition had occurred. A technique was devised for measuring ammonia evolution rates from surfaces. This measurement provided an accurate measure of anaerobic biological activity and a quantitative means for comparing treatment procedures designed to minimize volatile material evolution rates. Evolution rates for a variety of surfaces associated with livestock production enterprises were measured. (East Central)
W78-00120

FEEDLOTS AND RECREATION LAKES: AN EXAMPLE OF HOW THEY CAN BE GOOD NEIGHBORS,
Agricultural Research Service, Lincoln, NE.
J. A. Nienaber, J. L. Gartung, and C. B. Gilbertson.
Reprint from Farm, Ranch, and Home Quarterly, Nebraska Agricultural Experiment Station, Vol. 22, No. 2, Summer, 1975, 2 p. 1 fig.

Descriptors: *Feed lots, Agricultural runoff, Irrigation, Rainfall, Lakes, Recreation, Ponds, *Waste disposal, Farm wastes, Pollution abatement.
Identifiers: *Recreation lakes, Runoff control, Debris basins, Holdings ponds, Land disposal.

A feedlot disposal system was designed by the Agricultural Engineering Department of the University of Nebraska-Lincoln to prevent contamination of a recreational lake. EPA awarded a contract to L. P. Schram Feedlot Inc. to carry out research in cooperation with the University. Three system components were used to manage precipitation runoff from the feedlot: (1) debris basin, which collected runoff and removed settleable solids from the liquid to be handled with conventional pumps, (2) holding pond, which collected liquid drained from debris basin and stored it for application to the land, (3) disposal system which distributed liquids on the land by irrigation techniques. The system provided sufficient runoff control in both average and above average rainfall periods. (Albertson-East Central)
W78-00123

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA POULTRYMEN.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
Publication Number ID-82, 1972, Cooperative Extension Service, Purdue University. 13 p. 2 fig, 3 tab.

Descriptors: *Waste disposal, *Indiana, Legal aspects, *Regulation, *Water pollution, Odor, Liquid wastes, Solid wastes, Drying, Incineration, Flies, *Waste water disposal, Rates of application, Farm wastes.
Identifiers: Waste management, Poultry wastes, Digestion methods, *Land application.

The purpose is to briefly explain the pollution laws and regulations that directly affect Indiana poultry producers and to provide waste handling and disposal guidelines that will prevent pollution problems. The Indiana Stream Pollution Control Board and the Indiana Air Pollution Control Board have the authority to control and prevent water and air pollution in the state of Indiana. Indiana's Confined Feeding Control Law supplements the Indiana Stream Pollution Control Law in attempting to prevent water pollution. It is now against the law for anyone to start building a confined feeding operation without approval by the Stream Pollution Control Board. The production system that a poultryman adopts depends largely on the kind of poultry he produces (broilers, layers, etc.). Manure production rates for the different kinds of birds are given. Solid manure handling systems include shallow pit system, deep pit system, litter system, and partial slotted-floor system. The shallow pit system may also be adapted to liquid handling, but it is not recommended for new housing because of extra labor for frequent cleaning, greater volume of waste because of the extra water used for cleaning, pollution danger from disposing during the winter, and probable odors. Outdoor confinement rearing can be a source of pollution; therefore, proper management of these facilities is essential. Poultry confinement units are sources of odor and fly problems. Odor and fly control methods are discussed. Poultry wastes may be disposed by means of drying methods, incineration methods, digestion methods, or land application methods. Design recommendations are given for the various management and disposal methods that are discussed. Guidelines are given for returning poultry wastes to the land. Suggestions are given for minimizing odor during disposal. Suggestions are given for treating and disposing of wastewater. (Rowe-East Central)
W78-00126

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA SWINE PRODUCERS.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
Publication Number ID-83, Cooperative Extension Service, Purdue University, 1972, 12 p. 2 fig, 2 tab.

Descriptors: *Waste disposal, *Indiana, Legal aspects, *Regulation, *Water pollution, Liquid wastes, Solid wastes, Agricultural runoff, *Farm wastes.
Identifiers: Waste management, *Swine wastes, Land application, Odor control, Housing.

The purpose was to acquaint the Indiana swine producer with present pollution laws and regulations that most directly affect him and to present waste handling and disposal guidelines that will help the producer determine how nearly he complies with these laws and regulations or how he might develop a system that will comply. The Indiana Stream Pollution Control Board and the Indiana Air Pollution Control Board have the authority to control and prevent water and air pollution in the state of Indiana. Indiana's Confined Feeding Control Law supplements the Indiana Stream Pollution Control Law in attempting to prevent water pollution. It is now unlawful for anyone to start construction of a confined feeding operation without prior approval by the Stream Pollution Control Board. The type of swine waste handling system used depends upon location, number of animals, and method of housing. Housing systems include pasture, drylot, and enclosed. Management recommendations are made for each of these types of systems. Drylot and enclosed systems of management call for waste handling and storage facilities that may be categorized as follows: (1) solid manure handling systems, (2) liquid manure handling systems, and (3) partial-treatment manure handling systems. Methods of waste handling which are utilized under each of these categories are described. Most swine producers still dispose of their swine manure by returning it to the land by surface application, surface application with immediate plowdown, or injection or knifing into the soil. Factors affecting land application are manure nitrogen content, loss of nitrogen by volatilization and denitrification before field application, type and management of crops to be grown, and the soil itself. Guidelines

are given for determining acceptable application rates. Precautions are outlined which should be considered when applying wastes. Odor control techniques are given for minimizing odor during disposal. (Rowe-East Central)
W78-00127

WASTE HANDLING AND DISPOSAL GUIDELINES FOR INDIANA BEEF PRODUCERS.
Purdue Univ., Lafayette, IN. Animal Waste Committee.
Publication Number ID-84, 1972, Cooperative Extension Service, Purdue University. 13 p. 3 fig, 3 tab.

Descriptors: *Waste disposal, *Indiana, Legal aspects, *Cattle, Regulation, Design, Solid wastes, Liquid wastes, Waste storage, *Water pollution, Agricultural runoff, *Farm wastes, Rates of application.
Identifiers: Waste management, Housing systems, Land disposal, Odor control.

The purpose is: (1) to acquaint the Indiana beef producer with present pollution laws and regulations that most directly affect him, and (2) to present waste handling and disposal guidelines that will help the beef man determine how nearly he complies with these laws and regulations or how he might develop a system that will comply. The Indiana Stream Pollution Control Board and the Indiana Air Pollution Control Board have the authority to adopt and enforce rules and regulations concerning their respective types of pollution problems. Indiana's Confined Feeding Control Law supplements the Indiana Stream Pollution Control Law in attempting to prevent water pollution. It is now against the law for anyone to start building a confined feedlot operation without approval by the Stream Pollution Control Board. The kind of waste handling system a beef producer should have depends upon the location of his operation, the number of animals, and how they are housed. Guidelines are given for design and management of pasture systems, feedlot systems, and total confinement systems. Types of beef waste handling and storage facilities include: (1) solid manure handling systems, (2) liquid manure handling systems, and (3) partial-treatment manure handling systems. Design recommendations are given for the various methods of handling these wastes. The last step of any manure handling system is disposal of the waste product. Most beef producers dispose of the manure by returning it to the land. A discussion is given concerning factors affecting land application rates, how acceptable land application rates may be determined, and precautions that should be taken when returning manure to the land. Suggestions for minimizing odor problems during disposal are given. (Rowe-East Central)
W78-00128

POLLUTION POTENTIAL OF MANURE SPREAD ON FROZEN GROUND,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 5B.
W78-00129

NITROGEN AND PHOSPHORUS: FOOD PRODUCTION, WASTE AND THE ENVIRONMENT.
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5B.
W78-00130

THE INFLUENCE OF HUMAN ACTIVITY ON THE EXPORT OF PHOSPHORUS AND NITRATE FROM FALL CREEK,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00131

ECONOMIC ANALYSIS OF REDUCING PHOSPHORUS LOSSES FROM AGRICULTURAL PRODUCTION,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W78-00133

SUPERTANKERS AND SUPERPORTS (CITATIONS FROM THE ENGINEERING INDEX DATA BASE).
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5B.
W78-00164

AMI DESCRIBES HOW MEAT PLANTS HAVE SAVED ENERGY.
American Meat Inst., Washington, DC. Energy Task Force.
For primary bibliographic entry see Field 3E.
W78-00171

TOTAL SYMBIOTIC POLLUTIONLESS SYSTEMS FOR EFFICIENCY MANAGING WATER, EFFLUENTS, SOLID ORGANIC WASTES, AND ODORS IN FOOD PROCESSING AND SIMILAR INDUSTRIES,
Manitoba Univ., Winnipeg. Dept. of Food Science.
For primary bibliographic entry see Field 5D.
W78-00185

OPTIMAL AERATION POLICIES FOR THE ABATEMENT OF POLLUTION IN RIVER BASINS,
Columbia Univ., New York. Dept. of Mechanical Engineering.; and Columbia Univ., New York. Dept. of Nuclear Engineering.
R. W. Longman.
Completion Report, August 1977, 150 p. OWRT B-053-NY(1), 14-34-0001-6102.

Descriptors: *River basins, *Optimization, *Aeration, *Energy conservation, Networks, Management, Filters, *Water quality, *Pollution abatement, Water pollution control.
Identifiers: *In-stream aeration, Artificial aeration.

Under appropriate conditions, substantial monetary savings can be realized by using artificial in-stream aeration, rather than more conventional techniques, to improve the environmental quality of heavily polluted rivers. Careful attention to efficient management of such systems can result in a saving of 175,000 kilowatt-hours per day in electrical energy expended in operation. Methods of optimally controlling each aerator in an aeration system are determined. Feedback control policies are obtained in order to automatically account for changing conditions. A stochastic model is used to include uncertainties in plant driving terms and water quality measurements. Kalman filters are developed for use as water quality estimates when DO, time lagged BOD, and TOC measurements are available. A regional approach is taken in the development of the optimal control policies so that aeration in a region containing one or more rivers together with their tributaries is treated. The regional interdependence of optimal aeration rates in one tributary on water quality in other tributaries is illustrated.
W78-00213

CRITERIA FOR THE ECOLOGIC EVALUATION OF THE LOWER RIVER MAIN: II. INVESTIGATIONS OF THE ORGANIC METABOLIC PROCESSES, (IN GERMAN),
Forschunginstitut und Natur-Museum Senckenberg, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5B.
W78-00217

RESPONSE OF POTAMOGETON PECTINATUS L. TO NORFLURAZON,
Massachusetts Univ., East Wareham. Lab. of Experimental Biology.
R. M. Devlin, and S. J. Karczmarczyk.
Aquatic Botany, Vol. 1, No. 3, p. 263-268, September 1975. 2 tab, 19 ref.

Descriptors: *Herbicides, *Aquatic weed control, Light intensity, Drainage effects, Environmental effects, Stagnant water, Horticultural crops, Cranberries, Massachusetts.
Identifiers: *Potamogeton pectinatus L., *Norflurazon, Cranberry growers.

The present study examines effects of the herbicide norflurazon, on Potamogeton pectinatus L., grown under high and low light intensities in the laboratory. This weed often clogs ditches in cranberry bogs in southeastern Massachusetts. P. pectinatus growing under a light intensity of 10, 760 lux, and norflurazon showed a significant reduction in chlorophyll content. At low concentrations of 0.01 and 0.1 mg/l, total chlorophyll was down 8 and 22% respectively. A dose of 1 mg/l of norflurazon, resulted in a sharp and probably lethal drop in chlorophyll content of 75%. Doses of 10 and 100 mg/l caused practically total chlorosis. Reduction of chlorophyll-a and b due to the herbicide paralleled that of total chlorophyll. Chlorophyll production was considerably lower when it was grown under a low light intensity of 108 lux. The influence of norflurazon on chlorophyll of low light intensity plants was greatly reduced. High light intensity caused a 75% reduction of chlorophyll content with 1 mg/l of norflurazon, while there was only a 37% reduction at the lower intensity. At 10 mg/l, norflurazon only caused a 38% reduction in low light intensity plants. Aside from effects on chlorophyll content, it had no other observable effects on the plants. The data suggest that norflurazon should be directly tested as an aquatic weed herbicide and that good control could be obtained where there is good light penetration and relatively stagnant water. (Spaeth-Wisconsin)
W78-00221

SUITABILITY OF SHELLFISH FOR PROCESSING: 2. SEASONAL CHANGES IN HEAVY METAL CONTENT OF BABY CLAM, (IN KOREAN)
Pusan Fisheries Coll. (Republic of Korea). Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5A.
W78-00225

BASIC DATA AND ANALYSES: SELECTED ASPECTS OF GREAT LAKES ENFORCEMENT.
Enviro Control, Inc., Rockville , Md.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 327, Price codes: A05 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Washington, D. C., December 1971. 72 p, 11 tab, 16 ref. 68-04-0018.

Descriptors: *Water pollution, *Legislation, *Effluents, *Great Lakes, Lake Michigan, Lake Superior, Lake Erie, Legal aspects, Regulation, Water quality control, Baseline studies, *Law enforcement.

In an effort to analyze the legal and historical basis of water discharge enforcement in the Great Lakes, cases of 343 dischargers under enforcement proceedings are analyzed by types of pollution problems, enforcement mechanisms used, compliance status, and economic impact. Findings are related to differences among states, and the relative impact of state and federal programs. Legal tools available to enforcement personnel are surveyed, and results of legal action by state and federal agencies are analyzed. Water pollution legislation and judicial precedents prior to the environmental legislation of the 1960's, as well as current state and federal legislation, are also

reviewed. The study area includes the drainage basins of lakes Erie, Michigan, and Superior. Tables five categorizations of (1) pollution problems, (2) types of enforcement, and (3) compliance status. A breakdown of pollution problems by lake basin is presented. The most widespread pollution problems are solids (36% of all cases), BOD (18%), oil (16%), heavy metals (14%), nutrients (13%), acidity (9%), and cyanides (7%). Lakes Erie and Michigan primarily have problems with BOD, soil, and heavy metals, while in Lake Superior the problems center around BOD and solids. Enforcement status by basin and state, and construction compliance status, are given in tables. (Lynch-Wisconsin)
W78-00232

COMPARATIVE EVALUATION OF WATER QUALITY ON THE ST. JOSEPH RIVER (MICHIGAN AND INDIANA, U.S.A.) BY THREE METHODS OF ALGAL ANALYSIS,
California Academy of Sciences, San Francisco. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-00236

ENVIRONMENTAL CONTROL OF PRIMARY PRODUCTIVITY IN ALASKAN TUNDRA PONDS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00237

STATUS OF CLASSIFICATION OF AQUATIC HERBICIDES,
Environmental Protection Agency, Washington, DC. Criteria and Evaluation Div.
L. W. J. Anderson.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 1-3. 1 tab.

Descriptors: Herbicides, Pesticides, *Legislation, *Pesticide toxicity, *Aquatic weed control, Legal aspects, Water pollution control, Classification.
Identifiers: *Federal insecticide, Fungicide, and Rodenticide Act of 1975, Rodenticides.

An overview is given of the amended Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), published 3 July 1975 in the Federal Register, which requires all pesticides to be classified for either 'general' or 'restricted' use. After 21 October 1977 'restricted' pesticides can be used only under supervision of Certified Applicators. The U.S. Environmental Protection Agency (EPA) is responsible both for implementation and for setting certification standards for applicators. Determinants for pesticide classification are: (1) toxicity, (2) use, and (3) labeling. Toxicity criteria relate to active ingredient(s), formulated concentration, and final use concentration. Regarding toxicity, an 'unreasonable adverse effect' is defined by FIFRA as 'any unreasonable risk to man or the environment, taking into account the economic, social and environmental costs and benefits of the use of any pesticide.' Failure to meet this standard would place the pesticide in the 'restricted' category. Many, if not most, aquatic herbicides are likely to be classified 'restricted.' A governor of a state wishing to certify applicators must submit plans to the regional EPA office for approval. Details of basic criteria for toxicity and labeling are given, along with the current status of state certification plans. (Lynch-Wisconsin)
W78-00240

RESIDUE TOLERANCES FOR AQUATIC HERBICIDES,
Environmental Protection Agency, DC. Chemistry Branch.
J. C. Cummings.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 4-6. 1 tab.

Descriptors: *Aquatic weed control, *Pesticides, *Herbicides, *Legislation, *Pesticide residues, *Potable water, Legal aspects, History, 2,4-D, 2,4,5-T, Diquat, Dalapon, Federal Government.
Identifiers: Federal Food, Drug and Cosmetic Act, Drinking Water Standards, Endothal, Glyphosate, Dichlobenil, Fenac, 2,4-D BEE, *Pesticide control policy.

The development since the late 1960's of control policies for aquatic pesticide usage and procedures for gauging pesticide residues are described. Policy development began about 1969 when federal agencies engaged in large-scale aquatic weed control programs were pressured to restrict their use of pesticides. They in turn approached federal regulatory agencies for an aquatic herbicide sanctioning mechanism. It was determined that potable water was to be considered a processed food under the Federal Food, Drug and Cosmetic Act (FFDC), and therefore pesticide residues were food additives subject to FFDC tolerances. In March of 1970 an official directive required establishment of FFDC tolerances for pesticide residues in potable water. The Food and Drug Administration, and later the Environmental Protection Agency, set about developing data requirements. Each agency petitioning for the use of pesticides has been issued specific regulations for agency policy. Due to wide variations in pesticide usage, individual pesticides are not given blanket restrictions, but are instead geared to the user agency. A table showing the status of several current petitions is presented. Tolerances for residues in potable water set by the FFDC act are compared with the EPA's Drinking Water Standards. (Lynch-Wisconsin)
W78-00241

THE AQUATIC PLANT REGULATION PROGRAM IN FLORIDA,
Florida Dept. of Natural Resources, Tallahassee. Bureau of Aquatic Plant Research and Control.
T. L. Goldsby, D. Tarver, R. Theriot, and R. Lazor.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 7-8. 1 ref.

Descriptors: *Aquatic weed control, *Regulation, *Legislation, *Florida, Aquaria, Permits, Legal aspects, Nuisance algae.

Florida is attempting to solve a severe aquatic weed problem caused by: an abundance of shallow lakes, rivers, and canals; an unusually long growing season; and most importantly, the presence of several exotic nuisance weeds. Most control efforts have been aimed at water hyacinth, hydrilla, Eurasian watermilfoil, and Brazilian elodea. Florida's extremely large aquaria industry is responsible for the introduction and spread of various exotic plants, and legislative efforts have tried to regulate this industry. A 1969 state statute prohibited import, transport, or cultivation of aquatic plants without a permit. In 1974 new regulations included lists of approved and prohibited species. All other plants would be placed on a restricted list and subject to one-year quarantine. The Federal Noxious Weed Act (effective 4 January 1975) deals with control and eradication of noxious weeds and their commerce. A list of prohibited plants is being formulated to accompany this law. (Lynch-Wisconsin)
W78-00242

POTENTIAL GROWTH OF AQUATIC PLANTS IN THE REPUBLIC OF THE PHILIPPINES AND PROJECTED METHODS OF CONTROL,
Office of the Chief of Engineers (Army), DC. Aquatic Plant Control Program.
E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 10-14. 1 tab, 20 ref.

Descriptors: *Aquatic weed control, *River basin development, *Biocontrol, *Mechanical control, River basin development, Herbicides, 2,4-D, Water hyacinth, Agriculture, Transportation, Flood control, Nuisance algae.
Identifiers: *Philippines, *White amur, *Ctenopharyngodon idella, *Amur.

Surveys of seven Philippine Island river basins and their associated agricultural development are presented, together with an inventory of aquatic plants and measures for their control. Water hyacinth, water lettuce, and water fern are the most common floating aquatic plants. Water hyacinth is the most troublesome interfering with navigation and the operation of water control locks and gates. Of submerged plants, vallisinaria, hydrilla, and ottelia present the greatest problems. Water primrose and water morning glory are the worst marginal nuisance plants, but often can be controlled by mechanical means and the foliage used for agriculture. Aquatic plant control measures once were largely limited to mechanical devices (floating booms, draglines, and hand tools). For water hyacinth control the best means was the 'destroyer' or 'sawboat' armed with cotton-gin saws. Since World War II herbicides have been the most common aquatic plant control measure, particularly 2,4-D for water hyacinths. Biological control measures under consideration include insects and herbivorous fish. An especially-promising weed control fish is the white amur (Ctenopharyngodon idella), which is highly tolerant of temperature changes, salinity to 10,000 ppm, and oxygen concentrations as low as 0.5 ppm. It consumes more than its weight daily of submersed plants, such as pondweeds, coontail, elodea, cattails, and hydrilla. (Lynch-Wisconsin)
W78-00243

COLOR AERIAL PHOTOGRAPHY FOR AQUATIC PLANT MONITORING,
Texas A and M Univ., College Station. Remote Sensing Center.
A. R. Benton, Jr., and R. M. Newman.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 14-16. 6 ref.

Descriptors: *Aquatic weed control, *Aquatic plants, *Remote sensing, *Aerial photography, *Monitoring, *Water hyacinth, Reservoirs, Films, Texas, Cameras, Herbicides, Nuisance algae.
Identifiers: Lake Livingston(Tex), Hydrilla, Duckweed, Coontail, 2,4-D BEE, Infrared film, Watermilfoil.

Color aerial photography to detect and assess areas infested with aquatic plants was initiated in 1974 on Lake Livingston reservoir north of Houston, Texas. A. DeHavilland Beaver aircraft with two 70 mm electrically driven Hasselblad cameras was used, with Kodak Aerial Infrared Film 2443 and a yellow-orange filter, and Kodak Ektachrome MS Aerographic Film 2448 without filter. The films were developed in Kodak E-4 chemicals. Photography centered on water hyacinth and hydrilla concentrations, plus coontail and watermilfoil. The color infrared image of water hyacinth is pale to medium lavender in youth, magenta in maturity, deep red-brown in late season, and green-brown with the onset of senescence. The effect of 2,4-D BEE is clearly seen on color infrared film. An initial green-brown change is noted, followed by lightening to brown and tan. If herbicide treatment is stopped, regrowth almost always occurs, starting with lavender and darkening to magenta and rust-red. Normal color film was of much less value than the infrared. Differentiating submersed species with color photography proved more difficult than for emersed species, but was still useful. (Lynch-Wisconsin)
W78-00244

A QUANTITTATIVE SAMPLING METHOD FOR HYDRILLA-INHABITING MACROINVERTEBRATES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.

R. G. Martin, and J. V. Shireman.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 16-19. 3 fig, 1 tab, 7 ref.

Descriptors: *Aquatic plants, *Sampling, *Invertebrates, Census, Data collections, Florida, Insects, Diptera, Crustaceans, Gastropods, Equipment, Research equipment, Lakes.
Identifiers: *Hydrilla, Lake Wales(Fla).

A four-sided plexiglas box with a remotely-controlled blade was designed for sampling hydrilla. The blade on the bottom of the 0.5 cu m box is powered by two tightly-stretched pieces of rubber tubing, and is cocked by means of a rod inserted into a hole and controlled by a rope extending to the water surface. The box, which weighs 18.14 kg, is lowered onto the vegetation, which is then sheared off by the blade. The device was used to sample aquatic macroinvertebrates living on hydrilla in Lake Wales, Polk County, Florida, in May, June, and September of 1975. The mean number of organisms per kg of drained hydrilla were determined. Diptera larvae and pupae (chironomids) accounted for 80.7% of the total number of organisms for all samples. The gastropod Gyraulus accounted for 9.8% Ephemeroptera nymphs 3.1%, the decapod Hyalella azteca 1.5%, Trichoptera larvae 1.3%, and hydracarinids 1.1%. Large increases in chironomids and Gyraulus were noted between May-June and September. The organisms were very similar in number and Taxonomy to those inhabiting hydrilla in Lake Inglis in western Florida, and seem to represent a typical hydrilla invertebrate community for central Florida lakes. The data indicate that many invertebrates which are important food sources for fish inhabit hydrilla, although extreme amounts of hydrilla are not beneficial to the fishery. (Lynch-Wisconsin)
W78-00245

A BIOASSAY USING COMMON DUCKWEED TO EVALUATE THE RELEASE OF AVAILABLE PHOSPHORUS FROM POND SEDIMENTS,
New Jersey Dept. of Transportation, Trenton. Bureau of Environmental Analysis.
For primary bibliographic entry see Field 5A.
W78-00246

SEASONAL PRODUCTION AND GERMINATION OF HYDRILLA VEGETATIVE PROPAGULES,
Florida Univ., Gainesville. Dept. of Agronomy.
W. T. Haller, J. L. Miller, and L. A. Garrard.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 26-29. 3 fig, 2 tab, 9 ref.

Descriptors: *Aquatic weed control, *Reproduction, *Growth stages, *Drawdown, Aquatic plants, Plant growth, Florida, Reservoirs, Seasonal, Water temperature.
Identifiers: *Hydrilla, *Hydrilla verticillata, Rodman Reservoir(Fla), Propagules, Tubers, Turions, Lake Ockalawaha(Fla).

The vegetative propagules (tubers and turions) of Hydrilla verticillata are the most important sources of regrowth. Data on growth characteristics of these propagules can be used effectively for hydrilla control. A one-year study at Rodman Reservoir in north-central Florida included a 0.91 m late winter drawdown which exposed the lake bottom. One sheet each of clear and black plastic was placed over sections of the hydrilla mat to study the effect of light and dark on tuber germination. The most important information collected was on seasonal formation of propagules and the stimulatory effect of the drawdown on tuber germination. A proposed drawdown schedule for hydrilla control is as follows: an optional winter drawdown (February to April) aerates the hydrosoil, kills existing hydrilla, and promotes extensive early summer tuber germination. A second drawdown in late summer (September to November) is essential, as it kills Hydrilla regrowth from the germinated tubers, which prevents any new tuber formation. Tuber formation normally occurs from October to May. Since tubers only germinate once, and if the plant is destroyed after germination, the tuber cannot cause regrowth. Turions proved to be insignificant in causing regrowth. Optimum germination temperatures for tubers are 15-35 C, but carbon dioxide and oxygen levels in the hydrosoil are also important. (Lynch-Wisconsin)
W78-00247

SOME CHARACTERISTICS OF HYDRILLA TUBERS TAKEN FROM LAKE OCKLAWAHA DURING DRAWDOWN,
Florida Univ., Gainesville. Dept. of Agronomy.
J. L. Miller, L. A. Garrard, and W. T. Haller.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 29-31. 4 tab, 10 ref.

Descriptors: *Reproduction, *Aquatic plants, *Growth stages, *Chemical analysis, *Reservoirs, Plant growth, Florida, Drawdown, Depth.
Identifiers: *Hydrilla verticillata, *Hydrilla, *Tubers, Lake Ockalawaha(Fla), Rodman Reservoir(Fla).

Tubers are considered the primary mode of hydrilla reinfestation. A study at Lake Ocklawaha (Rodman Reservoir) in northcentral Florida in January 1975 during a drawdown attempted to define chemical and physical characteristics of tubers and to relate sprouting differences to depth. Light quality had no effect on sprouting, but light presence stimulated sprouting under both aerobic and anaerobic conditions, and appeared to have the most well-defined regulatory effect. The number and weight of tubers increased significantly with increases in depth, and tubers harvested between depths of 0.6 and 1.2 m sprouted more successfully in either light or darkness than those from 0.3 or 1.5 m depths. The presence of large numbers of mature nonsprouted tubers at great depths may be due to high concentrations of CO2 in the tubers, water, and hydrosoil. Laboratory experiments confirmed that CO2 was effective in inhibiting tuber sprouting. Starch was the main carbohydrate storage form, and Ca and K were the principal mineral components. (Lynch-Wisconsin)
W78-00248

RESPONSE OF EURASIAN WATERMILFOIL TO SUBFREEZING TEMPERATURES,
Tennessee Valley Authority, Muscle Shoals, AL. Environmental Biology Branch.
R. A. Stanley.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 36-39. 3 fig, 3 tab, 7 ref.

Descriptors: *Cold resistance, *Aquatic plants, *Aquatic weed control, Reservoirs, Biomass, Temperature, Dewatering, Nuisance algae, Tennessee Valley Authority.
Identifiers: *Eurasian water milfoil, *Myriophyllum spicatum, *Water milfoil.

Experiments show that Eurasian water milfoil (Myriophyllum spicatum), a serious aquatic weed nuisance in Tennessee Valley Authority reservoirs, may be eliminated by dewatered cold treatment of at least 1.6 days duration. Greenhouse-grown specimens in shallow water and dewatered, and the effect on final weight of roots and shoots measured. One group was exposed to variable outdoor cold temperatures submersed in 10 cm of water. A second group was exposed to a constant -1 in incubators, some submersed and some dewatered. The biomass of the roots and shoots of plants exposed to outdoor cold decreased linearly with decreasing temperature and increasing exposure time. Of plants exposed in the incubators, those dewatered suffered much more more detrimental effects than those submersed in 10 cm of water. Ninety-six hours of exposure to -1 C lowered plant biomass 99%, while submersed plants were lowered only 35%. Some data suggest that one longer exposure to cold was more effective in reducing biomass than two shorter exposures. (Lynch-Wisconsin)
W78-00249

LONG-TERM EFFECTS OF GLYPHOSATE APPLICATIONS TO PHRAGMITES,
New Jersey Agricultural Experiment Station, New Brunswick. Dept. of Soils and Crops.
D. N. Riemer.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 39-43, 8 fig, 1 tab, 3 ref.

Descriptors: *Herbicides, *Aquatic weed control, *Pesticides, New Jersey, Rivers, Monitoring, Aquatic weed control.
Identifiers: *Glyphosate, *Phragmites communis, *Phragmites, Cohansey River(NJ).

Control of phragmites, a nuisance plant of flood plains, tidal marshes, ditches, and other low-lying, poorly drained areas, was tested with the herbicide Glyphosate to determine long-range effects of one and two applications a year apart. The herbicide was applied to phragmites on the Cohansey River flood plain near Bridgeton, N.J. in June 1972 and June 1973. Visual rating of the effects on a scale of 0 (no effect) to 10 (complete control) were made during 1972, 1973, and 1974. Differences in spray volume did not appear to affect plant vigor or stand density except at the lowest application rate (2 lb ae/A) in which 20 gpa was more effective than 80 gpa. Application of an additional surfactant was also only effective at the low application rate. The optimum application rate appears to be between 4 and 6 lb ae/A. Control with only one application declined to 50% by the end of the third growing season, while plots treated twice were still totally free of phragmites during the fourth growing season after the initial application, even those treated with the lowest rate. (Lyoch-Wisconsin)
W78-00250

DISSIPATION OF RESIDUES OF 2,4-D IN WATER, HYDROSOIL, AND FISH,
Fish and Wildlife, Warm Springs, GA. Fish Pesticide Research Lab.
D. P. Schultz, and E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 43-45. 1 tab, 6 ref.

Descriptors: *2,4-D, *Herbicides, *Aquatic weed control, *Pesticide residues, Pesticides, Water pollution, Water quality control, Soil contamination, Pollutants, Florida, Georgia, Water hyacinth, Fish, Ponds, Dispersion.

Tests were conducted in three ponds near Crystal River, Fla. and four near Warm Springs, Ga. to determine uptake and dissipation of the dimenthylamine salt of the herbicide 2,4-D in fish, water, and hydrosoil. All were stocked with water hyacinth to 5-10% of the surface area, along with four species of fish, then sprayed with 2.24, 4.48, or 8.96 kg 2.4-D acid equivalent per ha (.5, 1, and 2 times the recommended treatment rate). Water, hydrosoil, and fish samples were taken at intervals of from 0 to 140 days after treatment. The highest residue in water was three days after treatment (0.345 mg per liter in Florida ponds and 0.692 in Georgia ponds). Residues declined to between 0.05 and 0.005 fourteen days after treatment. In the hydrosoil the highest residue in Florida ponds was 0.046 mg per kg three days after treatment, and in ponds in Georgia 0.042 mg per kg seven days after treatment. The highest residues in fish were 0.080 mg per kg one day after treatment in Florida ponds, and 0.043 mg per kg fourteen days after treatment in the Georgia ponds. Seven days after spraying an estimated 98% of the plants were killed by the herbicide, with no apparent relationship to treatment level. (Lynch-Wisconsin)
W78-00251

BIOLOGICAL CONTROL OPERATIONS ON ALLIGATORWEED,
Office of the Chief of Engineers (Army), Washington, DC.
E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 50-53. 3 tab, 8 ref.

Descriptors: *Biocontrol, *Alligatorweed, *Aquatic weed control, Insects, Southeast U.S., Southwest U.S., History, South America, Aquatic plants, Hosts.
Identifiers: *Alligatorweed flea beetle, *Agasicles hygrophila, Alligatorweed thrips, Amynothrips andersoni, Stem-boring moth, Bogtia malloi, Host specificity.

Biocontrol, as the third phase (following mechanical and chemcontrol) of a U.S. Army Corps of Engineers program to suppress alligatorweed, is described. A search for insect enemies of alligatorweed, a serious problem in the southern United States, was begun in 1959 in South America by the U.S. Corps of Engineers. The alligatorweed flea beetle (Agasicles hygrophila) cannot complete its life cycle on any plant studied except alligatorweed, and will feed on only one other (Atriplex hastata). Adult flea beetles feed on surface leaves; eggs are laid on the undersides of leaves; young larvae feed on the undersurface of leaves; mature larvae bore into the stems, where they develop into adults; adults eat their way back out to begin the cycle again. The plant is either killed outright or made vulnerable to disease, wind and wave action, and competition from other plants. Release of the flea beetle was unsuccessful in South Carolina in 1964, but Florida in 1965 led to successful alligatorweed control. Additional beetles were released in other states of the South and Southeast. Chemical control methods for alligatorweed have reduced infested acres in the South from 97,186 in 1963 to 78,030 in 1973. Successful use of insect control has made possible the reduction of acres under herbicide treatment from 21,805 in 1963 to 5,594 in 1973. Where insect controls have been released alligatorweed has generally been reduced to a negligible population. Other insects released for alligatorweed control are Amynothrips andersoni and Vogtia malloi. (Lynch-Wisconsin)
W78-00253

ECOLOGICAL STUDIES OF NEOCHETINA BRUCHI AND N. EICHHORNIAE ON WATERHYACINTH IN ARGENTINA,
Agricultural Research Service, H Hurlingham (Argentina). Biological Control of Weeds Research Lab.
C. J. Deloach, and H. A. Cordo.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 53-59. 1 fig, 2 tab, 11 ref.

Descriptors: *Ecology, *Water hyacinth, *Aquatic weed control, *Biocontrol, Insects, Hosts, Growth stages, Reproduction, Aquatic plants, Lagoons, South America, Oviposition, South America.
Identifiers: *Neochetina bruchi, *Chevroned water hyacinth weevil, *Neochetina eichhorniae, *Mottled water hyacinth weevil, Weevils, *Argentina.

Two native Argentinian weevil species, Neochetina bruchi and N. eichhorniae, natural enemies of water hyacinth, are among the most promising control organisms, according to a study which shows how two such similar species can apparently occupy identical ecological niches and how they would interact if both were introduced into the U.S. There was little evidence of segregation of the species among plants in the same area. Seasonal alternation in abundance, evidently due to interaction of their ovipositional behavior, rates of increase, and temperature tolerances with the seasonal changes in the growth form of the plant, probably allow the coexistence of the two species on water hyacinth. They would in fact seem to complement one another in a control program by attacking plants in different growth stages and at different times of the year. However, the same balance present in Argentina might not be achieved in the U.S., because other organisms in the system are different. Both N. Bruchi and N. eichhorniae produce three generations per year; N. burchi was more abundant in summer and early fall (until March or April), and N. eichhorniae was more abundant in late fall and winter. The adult weevils of both species feed on the leaves, and larvae tunnel in the petioles and crown, causing extensive damage (at a maximum during the summer). Eliminating nematodes and other natural enemies of the weevils would increase their usefulness as control agents. (Lynch-Wisconsin)
W78-00254

HOST SPECIFICITY OF NEOCHETINA BRUCHI HUSTACHE (COLEOPTERA CURCULIONIDAE), A BIOLOGICAL CONTROL AGENT FOR WATERHYACINTH,
Agricultural Research Service, Fort Lauderdale, FL. Aquatic Plant Management Lab.
B. D. Perkins, and D. M. Maddox.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 59-64. 4 tab, 5 ref.

Descriptors: *Hosts, *Aquatic weed control, *Water hyacinth, *Biocontrol, Aquatic plants, Insects, South America, California, Reproduction, Growth stages.
Identifiers: *Host specificity, *Neochetina bruchi, *Mottled water hyacinth weevil, Weevils, Argentina.

The mottled water hyacinth weevil (Neochetina bruchi) was tested for host specificity to water hyacinth (Eichhornia crassipes). Tests in Argentina, where the weevil is native, and in California show that N. bruchi might be safely introduced into the U.S. as a biological control for water hyacinth. Federal approval was granted, and the first introductions were made in July, 1974. The weevil was subjected to starvation or no-choice tests, paired plant tests, plant group tests, and larval tests. Twenty-eight plant species (17 families) were compared with water hyacinth for weevil feeding damage, oviposition, and oocyte development. This insect has never been recorded as a pest of any cultivated crop in South America, and the life cycle can only be completed on water hyacinth due to the underwater pupation site in the plant's roots. In the starvation tests, 11 of 25 plants were fed on, with the greatest feeding occurring on E. crassipes, E. azurea, and Pontederia cordata. The same three plants were fed upon most notably in the paired plant tests (10 plants tested); Commelina virginica and Tripogandra elongata were fed on slightly. In the plant group tests (9 plantstested) only E. crassipes and E. azurea were fed on (2,463 vs 18 feeding spots). Ten plants were tested with larvae; five were entered, but larvae survived only on E. crassipes. Of five plants tested in California in the no-choice tests, feeding occurred only on E. crassipes (89.25% of feeding spots), Sparganium americanum (10,20%), and Ludwigia arcuati (0.55%). (Lynch-Wisconsin)
W78-00255

COMBINATION OF THE MOTTLED WATERHYACINTH WEEVIL AND THE WHITE AMUR FOR BIOLOGICAL CONTROL OF WATERHYACINTH,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
E. S. Del Fosse, D. L. Sutton, and B. D. Perkins.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 64-67. 3 tab, 16 ref.

Descriptors: *Biocontrol, *Aquatic weed control, *Water hyacinth, Florida, Hosts, Insects, Fish, Water pollution control.
Identifiers: *Amur, *White amur, *Ctenopharyngodon idella, *Mottled water hyacinth weevil, *Neochetina eichorniae, Weevils.

The effect on water hyacinth of white amur (Ctenopharyngodon idella) and the mottled water hyacinth weevil (Neochetina eichhorniae) alone and combination was tested. These organisms generally attack different parts of a water hyacinth plant--white amur feed on roots and leaves; adult weevils feed on leaves and petioles; larvae feed on the insides of leaves or petioles. The experiments were conducted in plastic pools between January, 1974 and January, 1975, and covered winter, late spring-summer, and summer-early winter. Pools with the combination of white amur and mottled water hyacinth weevil generally produced the greatest reduction in plant size and biomass, as well as general damage to the plants. The amur-weevil combination reduced the growth of the plants by 20-38% as compared with water hyacinth grown without these organisms. The fish apparently did not inhibit weevil activity. Fish alone produced the next-best results, followed by weevils alone. While N. eichhorniae is monophagous, C. idella is polyphagous, and in fact water hyacinth is not one of its favored aquatic weeds in a mixed-culture situation. The white amur will, however, eat water hyacinth if it exists in a nearly monocultural environment. (Lynch-Wisconsin)
W78-00256

A REVIEW OF METHODS FOR OBTAINING MONOSEX FISH AND PROGRESS REPORT ON PRODUCTION OF MONOSEX WHITE AMUR,
Fish Farming Experimental Station, Stuttgart, AR.
J. G. Stanley.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 68-70. 1 tab, 16 ref.

Descriptors: *Biocontrol, *Aquatic weed control, *Reproduction, Fish, Methodology, Water pollution control.
Identifiers: *White amur, *Ctenopharyngodon idella, *Monosex fish, *Amur, Broodfish carp, Carp, Cyprinus carpio, Androgenesis, Gynogenesis, Sex reversal.

Previous work suggests that fish exclusively of one sex would be useful for testing the aquatic weed control possibilities of exotic species without the danger of their reproducing in a native habitat. Methods of producing monosex fish gynogenetically and androgenetically are presented, in the present study along with sex reversal techniques. For gynogenesis, white amur eggs were treated with irradiated broodfish carp (Cyprinus carpio) milt. All gynogenetic white amur examined have been females. Use of gynogenesis to produce monosexes is limited to those species with XX females and XY males. Yield is low, and therefore is feasible only in species with high fecundity, such as white amur. The androgenetic method involves fertilizing carp eggs with nonirradiated white amur milt, and can be used to produce only male fish. Sex reversal has been used to produce only female goldfish and Tilapia mossambica. Young are fed an androglen to reverse females into apparent males. Each male is mated with a normal XX female/ sex-reversed males sire all females. For white amur this process would take about five years, but a test cross to distinguish sex-reversed from ordinary males is unnecessary if monosex gynogenetic females are used, and the time required would be much shorter. It is estimated that monosex fish can be produced and raised to stocking size for about $1 each, an estimated annual cost of $10/ha, or less than 0.1 the cost of chemical or mechanical treatment. (Lynch-Wisconsin)
W78-00257

RESPONSE BY PEARL MILLET TO SOIL INCORPORATION OF WATERHYACINTHS,
Florida Univ., Gainesville. Dept. of Soil Science.
J. V. Parra, and C. C. Hortenstine.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p 75-79. 3 tab, 42 ref.

Descriptors: *Water hyacinth, *Recycling, *Fertilizers, Fertilization, Organic matter, Agriculture, Crops, *Crop production, Productivity, Nutrients, Essential nutrients, Chemical analysis, Florida.
Identifiers: *Pearl millet, Millet, Pennisetum americanum, Lake Alice(Fla), Uptake.

Water hyacinths contain relatively high concentrations of plant nutrients, and are very desirable green manures. This study shows the effects on yields of pearl millet (Pennisetum americanum) of field use of fresh water hyacinths and the resulting change in soil chemical make-up. Water hyacinths removed from Lake Alice (Florida), and allowed to dehydrate and partially decompose, were added to a Spodosol classified as Wachula fine sand. Plots were prepared as follows: water hyacinths only (two levels); N-P-K fertilizer only (two levels); combinations of both; and a control containing neither. Water hyacinth applications along increased yields in the first harvest (19 July 1974), and nearly doubled or tripled yields in the second harvest (4 September 1974), depending on level of application yields of 3245 kg/ha control vs 6330 kg/ha and 8774 kg/ha). No effects from fertilizer alone were observed in the first harvest; somewhat higher yields were noted in the second harvest at the higher application level (60-26-50). Heavy rainfall probably negated the effect of mineral fertilizers in the first harvest. Reduced rainfall and application of additional N to all plots in the second harvest increased overall yields. In the second harvest the mineral fertilizer depressed yields and nutrient uptake on plots containing water hyacinths. 27,000 kg/ha of water hyacinths produced maximum yield. C, N, P, K, Ca, Hg, Zn, Mn, and Cl content/ in the soil were all increased by addition of water hyacinths. (Lynch-Wisconsin)
W78-00259

PROCEEDINGS: LAKE TAHOE RESEARCH SEMINAR III.
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 479, Price codes: A08 in paper copy, A01 in microfiche.
Lake Tahoe Research Seminar III, January 17, 1975, Sands Vagabond Convention Center, South Lake Tahoe, California. NSF-RA-G-75-001, NSF ISR 73-09293-A02.

Descriptors: *Watershed management, Water quality control, Erosion control, Surface runoff, Environmental effects, Revegetation, Snow removal, Ice, *California, *Nevada, Pollutants, Census, Planning, Legal aspects, Recreation, Vegetation establishment, Regulation, Watersheds(Basins), Regional development.
Identifiers: *Lake Tahoe Basin(Cal-Nev), Sierra Nevada Mountains(Cal-Nev), TRPA Plan, CTRPA Plan, Tahoe Regional Planning Agency.

Seven papers are presented as part of a quarterly series held by the Lake Tahoe Area Research Coordination Board and the Lake Tahoe Environmental Education Consortium, mostly verbatim transcriptions of tapes recorded at the seminar. Highway Ice and Snow Removal and Deicing Salt Problems at Lake Tahoe reviews alternative methods to salt for ice and snow control. '1975 Census and the Tahoe Basin' describes a census and questionnaire to be administered in six California counties, including the Tahoe Basin. 'Legal Review of Land Use Controls' discusses, land use regulation and litigation as it related to the TRPA and CTRPA. 'Erosion and Sediment Control Technology', the text of a slide presentation, presents information on an erosion control project at Northstar, Cal., a ski resort. 'Revegetation and Erosion Control at Heavenly Valley' gives deals with various methods of controlling erosion caused by snowmelt (also a slide presentation). 'Establishing Forest Cover on Harsh Sites in the Sierra Nevada' gives the results of reforestation experiments using Jeffrey pine seedlings in plantable containers. (Areawide Waste Treatment and Erosion Control Planning' discusses the purposes of the TRPA under Section 208 of the Federal Water Pollution Control Act. (See also W78-00261 thru W78-00265) (Lynch-Wisconsin)
W78-00260

HIGHWAY ICE AND SNOW REMOVAL AND DEICING SALT PROBLEMS AT LAKE TAHOE,
California State Dept. of Transportation, Sacramento.
For primary bibliographic entry see Field 5B.
W78-00261

LEGAL REVIEW OF LAND USE CONTROLS,
California Univ., Berkeley.
M. Heyman.
In: Proceedings: Lake Tahoe Research Seminar III, January 17, 1975, p. 44-75. NSF-RA-G'75-001, NSF ISR73-09293-A02.

Descriptors: *Legal aspects, *Land use, *Legislation, Regulation, Planning, Recreation, Lakes, Water quality control, Environmental effects, California, Nevada.
Identifiers: *Lake Tahoe Basin(Cal-Nev), TRPA Plan, CTRPA Plan, Tahoe Regional Planning Agency.

Developments in the Lake Tahoe Basin since the organization of the Tahoe Regional Planning Agency (TRPA) as a grant experiment in legal techniques and governmental organization are discussed. Major topics covered are land use regulation and processes of governments. TRPA and CTRPA plans are referred to. The major concern of these plans has been the protection of water quality in Lake Tahoe and other Basin lakes, and the preservation of the vegetation and natural land forms. Air pollution and shoreline regulation are mentioned. The second part of the paper is devoted to litigation dealing with land use. (See also W78-00260) (Lynch-Wisconsin)
W78-00262

EROSION AND SEDIMENT CONTROL TECHNOLOGY,
California State Water Resources Control Board, Sacramento.
A. L. Franks.
In: Proceedings: Lake Tahoe Research Seminar III, January 17, 1975, p. 76-95. NSF-RA-G'75-001, NSF ISR73-09293-A02.

Descriptors: *Erosion control, *Sediment control, Recreation, Planning, Water quality control, *California.
Identifiers: Northstar(Cal).

This is the text of a slide presentation illustrating existing and proposed methods of erosion sediment control arising from the California Water Resources Control Board's demonstration of such technology at Northstar California. The area is devoted half to living quarters and half to a ski area and to other recreational purposes. The project was begun in 1968 and by 1971 thirteen mosaics of vegetation types based on soil, geology, and reestablishment of vegetation were developed. As a result, only a few areas at Northstar have problems with erosion. Most of the soil in the area is a high-infiltration volcanic type; the runoff from most impervious areas was diverted and percolated. When this was impossible, standard methods of debris traps, drop inlet structures, screens, and energy dissipators were used. (See also W78-00260) (Lynch-Wisconsin)
W78-00263

REVEGETATION AND EROSION CONTROL AT HEAVENLY VALLEY,
H. Seibert, and M. Penniman.
In: Proceedings: Lake Tahoe Research Seminar III, January 17, 1975, p. 96-115. 1 tab. NSF-RA-G'75-001, NSF ISR73-09293-A02.

Descriptors: *Erosion control, *Revegetation, *California, *Nevada, Recreation.
Identifiers: Heavenly Valley(Cal Nev), Lake Tahoe Basin(Cal Nev).

At Heavenly Valley in the Lake Tahoe Basin of California and Nevada, the largest ski resort in the U.S. with 20 square miles of skiable terrain, one of the biggest problems in any ski area is erosion during the spring runoff. The entire mountain at Heavenly Valley is granodiorite which has been weakly glaciated, resulting in a shallow soil mantle. The surface consists of rocks mixed with finer soil. Because of its sandy nature, the soil has poor internal stability and a small amount of water causes erosion. Serration, berms, heavy jute netting, log placement, and revegetation (grass, squaw carpet, manzanita) were used in an effort to control erosion from snowmelt. Grass planting (wheatgrass and alpine timothy), using a mulching process and jute netting, cost about $10,000 per acre. To prevent vegetative disruption, ski lifts have been installed by means of helicopters, at a cost of $23,000 per lift. A table showing cost breakdown is appended to this paper, which is the test of a slide presentation. (See also W78-00260), (Lynch-Wisconsin)
W78-00264

AREAWIDE WASTE TREATMENT AND EROSION CONTROL PLANNING,
F. McLaren.
In: Proceedings: Lake Tahoe Research Seminar III, January 17, 1975, p. 125-146. NSF-RA-G'75-001, NSF ISR73-09293-A02.

Descriptors: *Erosion control, *Federal Water Pollution Control Act, Water quality control, Waste disposal, Surface runoff, Legislation, Watersheds(Basins), Planning.
Identifiers: *Lake Tahoe Basin(Cal Nev), Tahoe Regional Planning Agency, TRPA.

Under section 208 of the Federal Water Pollution Control Act, the Tahoe Regional Planning Agency (TRPA) was designated the planning agency for the Tahoe Basin, and is the only such agency in Region IX. The purpose of the project is to develop a regional water quality facilities plan, not a report or study. It will define implementable improvements necessary to control surface water runoff in the Tahoe Basin's erosion control program. Water quality standards will not be reevaluated; the program will be designed to implement existing standards. Management of all the surface water runoff, especially from urban areas, will be basic to the plan. Runoff from filling stations, golf courses, parking lots, logging areas, and streets will be considered, as well as fertilizer use, waste disposal in marinas, solid waste management, septic tanks, and shoreline erosion. (See also W78-00260), (Lynch-Wisconsin)
W78-00265

FLOATING-MATTER REMOVING APPARATUS,
Kabushiki Kaisha World Chemical, Tokyo (Japan). (Assignee).
Y. Mori.
U.S. Patent No. 4,024,063, 13 p, 16 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 1195, May 17, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, *Skimming, *Floating, Oil pollution, Oily water, Scum, Equipment, Separation techniques.

The polluting matter skimming apparatus removes matter such as oil, scum, etc. floating in rivers and lakes, oceans, setting tanks, and water tanks by skimming. The skimming apparatus is comprised

of a vessel having a main floating body with at least one inlet opening provided in the sidewall and a storage container in fluid communication with the inlet opening. A gate with an opening is provided which slides over each side wall opening. When the openings are aligned polluting matter may enter. A float block at each side of the gate plate maintains the gate at a fixed level in relation to the surface of the body of water. A water jet may be used to push the polluting material to the opening of the apparatus. (Sinha - OEIS)
W78-00298

MAN'S IMPACT ON ESTUARINE SEDIMENTATION,
State Univ. of New York at Stony Brook.
J. R. Schubel, and R. H. Meade.
In: Proceedings of Conference on 'Estuarine Pollution Control and Assessment.' U.S. Environmental Protection Agency, Washington, DC, 1977. p 193-209, 6 ref. SUNY Marine Science Research Center Contribution 116.

Descriptors: *Estuaries, *Sedimentation, *Water quality control, *Baseline studies, Environmental effects, *Waste disposal, *Pollution abatement, Dreding, Estuarine environment.
Identifiers: *Outer Continental Shelf, Spoil disposal.

Estuaries are the major sites for the accumulation of sediment along the coastline. The rate of sediment accumulation in estuaries, which is already naturally high, has been increased by man's activities. The primary purposes of this report are: (1) to review some of the characteristic estuarine sedimentation processes; (2) to look at some of the ways in which man has altered these processes; (3) to assess the significance of the effects of these changes on the estuarine milieu; and (4) to recommend the types of research needed for significant advances in our understanding of estuarine sedimentation processes. (Sinha - OEIS)
W78-00392

HYDROCARBON BUDGETS FOR LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00394

SHAGAWA LAKE RECOVERY CHARACTERISTICS AS DEPICTED BY PREDICTIVE MODELING,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-00417

OZONE DISINFECTION OF FLOWING WATER,
Oregon Dept. of Fish and Wildlife, Clackamas.
For primary bibliographic entry see Field 5F.
W78-00432

ACCELERATED SALT TRANSPORT METHOD FOR MANAGING GROUND WATER QUALITY,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00442

APPLICATION OF A NEW NONLINEAR PROGRAMMING CODE WITH DECOMPOSITION TO THE REGIONAL WASTEWATER-COLLECTION AND TREATMENT-LOCATION PROBLEM,
West Virginia Univ., Morgantown. Computer Center.
L. R. Padgett, A. H. Montgomery, and L. Romino, Jr.
Environment and Planning A, Vol. 8, No. 5, August 1976, p 563-571, 4 tab, 2 fig, 16 ref. OWRT A-026-WVA(1).

Descriptors: *Waste water treatment, *Mathematical models, Optimization, Systems analysis, Algorithms, Cost comparison, Management.
Identifiers: *Non-linear programming, *Decomposition.

A new, highly reliable nonlinear programming algorithm is coupled with decomposition to find the optimal solution to a regional sewage treatment system problem. The objective is to find an optimal system configuration of sources and disposal locations, and to minimize total costs. Constraints force material balances to be satisfied and require all wastewater to receive secondary treatment. The objective function is the sum of the costs of each possible component of the system, including gravity trunk sewers, force mains, pumping facilities, and treatment plants. A reliable and efficient nonlinear programming method called sequential heuristic optimization program (SHOP) is used to solve the problem. The algorithm is a penalty-function, nongradient, direct-search method. To facilitate solving this rather large, complex nonlinear problem, the wastewater system is decomposed into subsystems composed of sources and disposal locations. After optimizing the subsystems, their solution must be adjusted in such a way that they produce an optimal solution for the entire system, which requires a reliable nonlinear programming algorithm. The optimizing techniques illustrated in this study are seen as the first non-subjective method for identifying the optimal system that is available to design engineers. (Nessa-NC)
W78-00448

COOPERATIVE INSTREAM FLOW SERVICE GROUP: THE FIRST YEAR.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
For primary bibliographic entry see Field 4A.
W78-00497

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL AERATION POLICIES FOR THE ABATEMENT OF POLLUTION IN RIVER BASINS,
Columbia Univ., New York. Dept. of Mechanical Engineering.; and Columbia Univ., New York. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5G.
W78-00213

THE HUMAN DIMENSIONS OF WATER-RESOURCES PLANNING,
Anacapa Sciences, Inc., Santa Barbara, CA.
For primary bibliographic entry see Field 6B.
W78-00441

ALTERNATIVE MODELS FOR ESTIMATING THE TIME SERIES COMPONENTS OF WATER CONSUMPTION DATA,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
H. Yamauchi, and W-y. Huang.
Water Resources Bulletin, Vol. 13, No. 3, p 599-610, June 1977. 2 fig, 2 tab, 16 ref. OWRT A-030-HI(4).

Descriptors: *Water consumption(Except consumptive use), *Estimating, *Time series analysis, *Mathematical models, Data collections, Behavior, Regression, Water supply, Seasonal, Equations, System analysis, Water policy.
Identifiers: *Additive and multiplicative models, Irregular components, Dummy variables, Water consumption patterns.

Understanding the behavior of different time-series components of water consumption data is essential for a more effective analysis of economic incentive effects of alternative policy measures and for closer integration of water supply and demand management. Additive and multiplicative models are used to analyze the trend (T), cyclical (C), seasonal (S) and irregular (I) components. The stepwise regression method was applied to 187 data points (January 1960 to July 1975), each representing average daily water consumption within the service area of the Honolulu Board of Water Supply. Although statistically similar results (R2 0.95 and 0.96 and respective corresponding F-ratios 277 and 307) might suggest little difference in model performances, closer analysis of the results point to important multiplicative effects which should be considered in both short-run and long-term analyses. (Bell-Cornell)
W78-00443

A HIERARCHY OF RESPONSE FUNCTIONS FOR GROUNDWATER MANAGEMENT,
Mekoroth Water Co., Tel-Aviv (Israel). Systems Engineering Dept.
For primary bibliographic entry see Field 4B.
W78-00444

A DECOMPOSITION APPROACH TO THE CAPACITY EXPANSION PROBLEM,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W78-00500

6B. Evaluation Process

THE HUMAN DIMENSIONS OF WATER-RESOURCES PLANNING,
Anacapa Sciences, Inc., Santa Barbara, CA.
D. H. Harris.
Human Factors, Vol. 19, No. 3, June 1977, p 241-251. 1 fig, 5 tab, 13 ref. OWRT C-3064(3680)(3).

Descriptors: *Water resources, *Planning, *Decision making, *Scaling, Water quality, Reliability, Social aspects, Computers, Computer programs, Graphical analysis, Management, Conservation, Evaluation.
Identifiers: *Human factors, *Multidimensional analysis, Factor analysis, Least squares criterion, Public participation.

A framework was developed for incorporating human factors (those which concern human well-being and quality of human life) along with technical and economic factors into the water-resources planning-decision process. Initially, 388 water-resources concepts from the human domain were collected, screened, and grouped to define 42 different factors. Then, from ratings of similarity-dissimilarity by 300 raters, a matrix was generated of mean distances between all 861 possible factor pairs; the matrix was analyzed by computer-based multidimensional scaling techniques to determine the underlying dimensional structure. Finally, using procedures that paralleled those for determining factor similarity-dissimilarity, a value reflecting social importance was developed for each of the 42 factors and for the 5 basic dimensions which emerged from the multidimensional analysis. These values were found to cover a wide range; however, values for the same factors and dimensions were found to be nearly identical among different subgroups of people, even those with potentially divergent viewpoints, such as behavioral scientists and water-works professionals. (Bell-Cornell)
W78-00441

ALTERNATIVE MODELS FOR ESTIMATING THE TIME SERIES COMPONENTS OF WATER CONSUMPTION DATA,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6A.
W78-00443

GUIDE TO LAND COVER AND USE CLASSIFICATION SYSTEMS EMPLOYED BY WESTERN GOVERNMENTAL AGENCIES,
Ecology Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-00496

GUIDELINES FOR PREPARING EXPERT TESTIMONY IN WATER MANAGEMENT DECISIONS RELATED TO INSTREAM FLOW ISSUES.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
For primary bibliographic entry see Field 6E.
W78-00498

ENERGY, PUBLIC CHOICES AND ENVIRONMENTAL DATA NEEDS,
Institute of Public Administration, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-00499

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AMI DESCRIBES HOW MEAT PLANTS HAVE SAVED ENERGY.
American Meat Inst., Washington, DC. Energy Task Force.
For primary bibliographic entry see Field 3E.
W78-00171

ECONOMIC ANALYSIS OF SPRAY IRRIGATION OF POULTRY PROCESSING WASTEWATER VS. UPGRADING OF WASTEWATER TREATMENT FACILITIES,
Mogul Corp., Chagrin Falls, OH.
For primary bibliographic entry see Field 5D.
W78-00179

OPERATING AND ECONOMIC FACTORS INVOLVED IN THE STUDY OF A PACKING WASTE PROBLEM,
Illinois Univ. at Urbana-Champaign. Dept. of Bacteriology.
For primary bibliographic entry see Field 5D.
W78-00182

FEASIBILITY STUDY FOR IRRIGATING THE TRIBAL FARM ON THE CROW CREEK RESERVATION, FORT THOMPSON, SOUTH DAKOTA,
Roubal (Dana Larson) and Associates, Pierre, SD.
For primary bibliographic entry see Field 3F.
W78-00216

THE ECONOMICS OF POOR HOUSEKEEPING IN THE MEAT-PACKING INDUSTRY,
Hormel (George A.), and Co., Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-00481

6D. Water Demand

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1975,
Geological Survey, Reston, VA. Water Resources Div.
C. R. Murray, and E. B. Reeves.
Available from Branch of Distribution 1200 S. Eads St., Arlington, VA 22202. Circular 765, 1977. 39 p, 13 fig, 18 tab, 100 ref.

Descriptors: *Water utilization, *Water supply, *United States, *Water consumption(Except consumptive use), *Consumptive use, Municipal water, Domestic water, Livestock, Industrial water, Irrigation water, Hydroelectric plants, Surface waters, Groundwater, Freshwater, Saline water, Water reuse.
Identifiers: *Average annual water use(United States), *Per capita use, Water Resources Council regions.

Estimates of water use in the United States in 1975 indicate that an average of about 420 bgd (billion gallons per day)--about 1,900 gallons per capita per day--was withdrawn for the four principal off-channel uses which are (1) public-supply (for domestic, commercial, and industrial uses), (2) rural (domestic and livestock), (3) irrigation, and (4) self-supplied industrial (including thermoelectric power). In 1975, withdrawals for these uses exceeded by 11.5 percent the 370 bgd estimated for 1970. Increases in the various categories of off-channel water use since 1970 were: approximately 12.8 percent for self-supplied industry (mainly in electric-utility thermoelectric plants), 7.6 percent for public supplies, 10.0 percent for rural supplies, and 10.8 percent for irrigation. The quantity of freshwater consumed--that is, water made unavailable for further possible withdrawal because of evaporation, incorporation in crops and manufactured products, and other causes--was estimated to average 95 bgd for 1975, an increase of about 10 percent since 1970. Estimates of water withdrawn from the principal sources indicated that 82 bgd came from fresh ground water, 1 bgd came from saline ground water, 260 bgd came from fresh surface water, 69 bgd came from saline surface water, and 0.5 bgd was reclaimed sewage. (Woodard-USGS)
W78-00194

MUNICIPAL WATER SUPPLIES IN LEE COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00198

6E. Water Law and Institutions

BASIC DATA AND ANALYSES: SELECTED ASPECTS OF GREAT LAKES ENFORCEMENT.
Enviro Control, Inc., Rockville , Md.
For primary bibliographic entry see Field 5G.
W78-00232

RESIDUE TOLERANCES FOR AQUATIC HERBICIDES,
Environmental Protection Agency, DC. Chemistry Branch.
For primary bibliographic entry see Field 5G.
W78-00241

THE AQUATIC PLANT REGULATION PROGRAM IN FLORIDA,
Florida Dept. of Natural Resources, Tallahassee. Bureau of Aquatic Plant Research and Control.
For primary bibliographic entry see Field 5G.
W78-00242

LEGAL REVIEW OF LAND USE CONTROLS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-00262

UNIFORMITY AMONG WEATHER MODIFICATION LAWS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3B.
W78-00440

GUIDELINES FOR PREPARING EXPERT TESTIMONY IN WATER MANAGEMENT DECISIONS RELATED TO INSTREAM FLOW ISSUES.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 597, Price codes: A03 in paper copy, A01 in microfiche. Publication No. FWS/OBS-77/19, July 1977. 30 p. Edited by Berton L. Lamb.

Descriptors: Flow, *Water law, *Legal aspects, Institutions, Institutional constraints, *Administration, Management, *Judicial decision, *Streamflow.
Identifiers: *Instream flow.

The guidelines provide instructions and background information to biologists who believe their work may become part of a formal adjudication or administrative hearing. Topics covered include types of hearings, discovery procedures, rules of evidence and samples of testimony. (Fish and Wildlife Service)
W78-00498

6G. Ecologic Impact Of Water Development

AQUATIC SURVEY OF BIG CREEK, RICH COUNTY, UTAH,--A CRITICAL HABITAT STREAM ON NATIONAL RESOURCE LANDS AFFECTED BY LIVESTOCK.
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
R. N. Winget, R. W. Baumann, and R. Williams.
Funded by Bureau of Land Management, Final Report, 17 October, 1977. 30 p, v 17 tab, 2 fig. YA-510-PH6-123.

Descriptors: *Watershed management, *Macrobenthos, *Stream improvement, *Water quality, *Coliforms, Bank stability, Land management, Grazing.
Identifiers: Environmental impact evaluation, National resource lands, Critical aquatic habitat, Grazing impacts.

Surveys were made to provide aquatic habitat and water quality baseline data to the U.S. Bureau of Land Management to be used in evaluating (1) livestock grazing impacts on the flora and fauna of Big Creek, Utah; and (2) the effectiveness of a livestock enclosure and habitat structures for stream rehabilitation. Included in the analyses are: description of existing aquatic habitats; characterizations of macroinvertebrate communities; water quality summary; and comparisons of 1975 data (from a previous study) with 1976 data. The assemblage, analysis, and recommendations presented will form the basis for land/water management decisions. Analyses indicate: riparian vegetation is possibly the most critical factor for quality aquatic habitats in small streams; optimal riffle to pool ratio should approach 3 riffle to 2 pool in area as too many pools reduce macroinvertebrate diversity and density; and grazing along stream banks should be highly controlled. (BLM)
W78-00004

AQUATIC SURVEY OF BIRCH CREEK, BEAVER COUNTY, UTAH--CRITICAL HABITAT STREAM ON NATIONAL RESOURCE LANDS AFFECTED BY LIVESTOCK,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
R. N. Winget, R. W. Baumann, and R. Williams.
Funded by Bureau of Land Management, Final Report, 17 October 1977. 33 p, iv, 15 tab, 2 fig.

Descriptors: *Watershed management, *Macrobenthos, *Stream improvement, *Water quality, *Coliforms, Bank stability, Land management, Grazing, Cutthroat trout.
Identifiers: Environmental impact evaluation, National resource lands, Critical aquatic habitat, Grazing impacts.

Surveys were made to provide aquatic habitat and water quality baseline data to the U.S. Bureau of Land Management to be used in evaluating livestock grazing impacts on the flora and fauna of Birch Creek, Utah and evaluate the potential of Birch Creek as a critical habitat for pure strain cutthroat trout. Included in the analyses are: description of existing aquatic habitats; characterization of macroinvertebrate communities; water quality summary; and changes in 1975 data from a previous study compared with 1976 data. The assemblage, analysis, and recommendations presented will form the basis for land and water management decisions and future studies involving aquatic habitats and related fauna in Birch Creek and other similar Utah streams. Analyses indicate: riparian vegetation is probably the most critical factor for quality aquatic habitats in small streams. Grazing impacts on Birch Creek are extreme with apparent damage in most of the river. The most critical factors in relation to pure strain cutthroat trout are the low stream discharges and unstable stream channels. Managed grazing could drastically improve the stream banks, but low flows in the lower stretches may limit establishment of cutthroat trout in this part of the river. If cutthroat trout were to be successfully placed in Birch Creek, quality pools will have to be established as an integral part of the available aquatic habitat of Birch Creek. (BLM)
W78-00005

NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY: THE CHARACTER OF PARTICLE DISPERSION AND WATER MOVEMENT IN MASSACHUSETTS BAY AND ADJACENT WATERS,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological.
For primary bibliographic entry see Field 5B.
W78-00086

COASTAL WATER RESEARCH PROJECT ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1976.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00134

SLUDGE IN SANTA MONICA BAY,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-00144

FIN EROSION PREVALENCE AND ENVIRONMENTAL CHANGES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00153

COMPARISON OF FIN EROSION DISEASE: LOS ANGELES AND SEATTLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00154

EFFECTS OF CHROMIUM ON REPRODUCTION IN POLYCHAETES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00157

FAUNA OF OFFSHORE STRUCTURES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00158

RESPONSE AND RECOVERY OF THE BENTHOS AT ORANGE COUNTY,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00159

PARTIAL RECOVERY OF THE BENTHOS AT PALOS VERDES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00160

COMPARISON OF THE BENTHOS AT SEVERAL WASTEWATER DISCHARGE SITES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00161

REGIONAL AND LOCAL VARIATION OF BOTTOM FISH AND INVERTEBRATE POPULATIONS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00162

LIFE HISTORY OF THE DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-00163

MAN'S IMPACT ON ESTUARINE SEDIMENTATION,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-00392

THE ECOLOGICAL EFFECTS OF COAL STRIP-MINING: A BIBLIOGRAPHY WITH ABSTRACTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-00495

GUIDE TO LAND COVER AND USE CLASSIFICATION SYSTEMS EMPLOYED BY WESTERN GOVERNMENTAL AGENCIES,
Ecology Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-00496

COOPERATIVE INSTREAM FLOW SERVICE GROUP: THE FIRST YEAR.
Fish and Wildlife Service, Fort Collins, CO. Cooperative Instream Flow Service Group.
For primary bibliographic entry see Field 4A.
W78-00497

ENERGY, PUBLIC CHOICES AND ENVIRONMENTAL DATA NEEDS,
Institute of Public Administration, Washington, DC.
F. M. Graves, and H. P. Bretsch.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Publication No. FWS/OBS-77/04, March 1977, 126 p. WELUT No. 029-76, FWS 14-16-0008-2103.

Descriptors: *Land management, *Decision making, *Information transfer, Water resources, Coal, *Energy, Wildlife, Fish, Planning, US Water Resources Council, Colorado, Montana, New Mexico, Utah, Wyoming.

The energy-related decision processes are described of the Bureau of Land Management, Geological Survey, Forest Service, Bureau of Reclamation, Energy Research and Development Administration, Water Resources Council, and the States of Montana, New Mexico, Utah, Colorado and Wyoming. On the basis of formal decision processes and interviews with numerous agency personnel, recommendations are made whereby the Fish and Wildlife Service can more effectively communicate wildlife information to decision makers. (Fish and Wildlife Service)
W78-00499

7. RESOURCES DATA

7B. Data Acquisition

CALCULATORS IN TIMER-COUNTERS FOR CURRENT METERS,
Papuea New Guinea Univ. of Tech., Lae (New Guinea). Dept. of Electrical and Communications Engineering.
S. R. Kormilo.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13230, p 1031-1036, September 1977. 2 fig, 1 ref, 2 append.

Descriptors: *Instrumentation, *Current meters, *Equipment, Electronics, Laboratory tests, Flow, Measurement, Time, Timing, Engineering, Electrical engineering, Hydrology.
Identifiers: *Time interval counters, Electronic calculators, Counters.

An accurate, compact, low-cost, calculator-based electronic timer-counter for current meters was constructed and laboratory tested. Electronic calculators often offer an economically attractive alternative to both electromechanical and other forms of electronic counters. The modification of calculators so that they can act as timer-counters was described in general terms. A summary of the results of tests to determine the effect of temperature and voltage variations on the timing accuracy of a prototype electronic timer-counter was given. Laboratory tests also were performed which compared the prototype to two different electromechanical counters in operation. The tests indicated that, with a few minor changes, the electronic timer-counter would provide many advantages over the electromechanical counters. (Sims-ISWS)
W78-00077

PASSIVE REMOTE SENSING OF PHYTOPLANKTON VIA CHLOROPHYLL ALPHA FLORESCENCE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
R. A. Neville, and J. F. R. Gower.
Journal of Geophysical Research, Vol 82, No 24, p 3487-3493, August 20, 1977. 8 fig, 23 ref.

Descriptors: *Remote sensing, *Chlorophyll, *Phytoplankton, Fluorescence, Aircraft, Equipment, Spectrometers, Reflectance, Lakes, Oceans, Aquatic life, Plankton, Marine plants, Limnology, Oceanography.
Identifiers: *Passive remote sensing.

The spectrum of light backscattered from the sea in the visible and near infrared and, in particular, the chlorophyll alpha fluorescence line at 685 nm were observed from an aircraft under natural illumination by using a multichannel silicon diode spectrometer. The instrument was mounted in the aircraft so as to view the water surface at the Brewster angle by using a polarizer to reduce reflected skylight substantially, even under rough surface conditions. This and the relatively high red sensitivity of the ilicon diode detectors explain why the line appears here but not in previous airborne observations. The observed line height was compared with chlorophyll depth distribution measurements made from a launch and was shown to be proportional to an average of the chlorophyll concentration near the surface, weighted with depth to allow for absorption by the water of light at 685 nm. The observations were made at low (150 m) altitude, but it was shown that the observed line height is insensitive to altitude up to 1200 m. Although the lowest chlorophyll concentration encountered was 2 mg/cu m, the technique is expected to be useful for airborne mapping of chlorophyll at concentration several times smaller than this. (Sims-ISWS)
W78-00090

CALIFORNIA COASTAL PROCESSES STUDY - SKYLAB FINAL REPORT - EPN 492,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 2L.
W78-00096

CALCULATION OF EVAPOTRANSPIRATION USING COLOR-INFRARED PHOTOGRAPHY,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2D.
W78-00212

COLOR AERIAL PHOTOGRAPHY FOR AQUATIC PLANT MONITORING,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 5G.
W78-00244

A QUANTITATIVE SAMPLING METHOD FOR HYDRILLA-INHABITING MACROINVERTEBRATES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5G.
W78-00245

WATER FLOW METER,
S. J. Niskin.
U.S. Patent No. 4,026,148, 5 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 1904, May 31, 1977.

Descriptors: *Patents, *Water measurement, *Flow, *Flow measurement, Instrumentation, Flowmeters, Water pollution control.

The object of the invention is to provide a water flow meter with means in the propeller hub for collecting excess oil in the meter caused by changes in pressure and temperature of the oil in the housing that also contains the counter mechanism whereby a reverse change in temperature and pressure will restore the oil to the housing. Oil is prevented from being discharged from the meter and intake of air or water is prevented from entering on a reverse change in pressure and temperature. A reservoir of oil within a flexible diaphragm is provided that is exposed to the atmosphere and water so that as an increase in temperature or lowering of pressure will permit the oil in the housing to expand and flow into the reservoir and a decrease in temperature and increase in pressure will permit the return of the oil from the reservoir to the housing. The water flow meter has a hollow housing adapted to contain counter mechanism, a propeller shaft extending into the housing, a hollow propeller hub mounted on the free end of the shaft, an opening in the hub, a bore extending through the shaft from the hub to the housing, a flexible diaphragm extending over the bore in the hub adapted to contain a liquid lubricant capable of flowing to and from the housing effected by changes in temperature and pressure and seal means mounted on the housing and extending about the shaft preventing the ingress of water. (Sinha-OEIS)
W78-00266

MEASURING DEVICE FOR WATER FLOW IN A BURIED PIPE,
J. C. Fitzgerald.
U.S. Patent No. 4,026,151, 6 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 958, No 5, p 1906, May 31, 1977.

Descriptors: *Patents, *Water measurement, Flow, Flow measurement, Instrumentation, Sediments, Silts, Pipes, Pipe flow.

A measuring device to determine the depth of sediment in the floor of a buried pipe and the rate of flow of water through the pipe includes a first shaft with a sleeve telescoped on the saft with the lower end of the shaft being adapted to engage the floor of the pipe and with the lower end of the sleeve being adapted to rest on the surface of sediment in the pipe so that the relative axial displacement of the sleeve in relation to the pipe will measure the depth of the sediment in the floor. A float which is connected to the sleeve and includes a lift member for raising and lowering the float on a suspension means is connected to a switch. When tension on the suspension means is relaxed and the float is supported by the water instead of a suspension means, energy from a source flows through the switch and indicates the relaxation of the tension. A member on the float is provided which is movable in response to the rate of water flow through the pipe and an electrical circuit indicates the rate of flow of water through the pipe. (Sinha - OEIS)
W78-00267

LATCH RELEASING MECHANISM FOR WATER SAMPLERS,
Trippensee Corporation, Saginaw, MI. (Assignee).
R. P. Snyder, and E. P. Deja.
U.S. Patent No 4,027,538, 6 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 75, June 7, 1977.

Descriptors: *Patents, *Sampling, *Water sampling, Remote control, Equipment.
Identifiers: Kemmerer style water sampler.

A Kemmerer style water sampler has a tubular body open at both ends and through which extends a connecting rod. The lower end of the connecting rod is fixed to a closure for the lower end of the body. The upper end of the connecting rod is latched to an upper closure and carries a latch member. A pair of clasp members mounted on the upper closure move in and out of latching position. Each clasp member is provided with an upstanding motion transmitting member having inclined, confronting surfaces spaced apart to provide a chamber. Reciprocably accommodated in the chamber is an operating member that is tapered complementally to the inclination of the surfaces of the motion transmitting members so that movement of the operating member axially in one direction effects movement of the clasp members out of latching engagement with the latch member, thereby enabling the upper and lower closures to seal the opposite ends of the body. (Sinha-OEIS)
W78-00279

WASTE WATER SAMPLING SYSTEM,
For primary bibliographic entry see Field 5A.
W78-00301

7C. Evaluation, Processing and Publication

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT - WATERSHED HYDRO-CLIMATOLOGY AND DATA FOR WATER YEARS 1960-1974,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2C.
W78-00068

RAINFALL SYNTHESIS WITH SCANTY DATA,
Universidad Catolica de Chile, Santiago. Escuela de Ingenieria.
For primary bibliographic entry see Field 2B.
W78-00082

CALIFORNIA COASTAL PROCESSES STUDY - SKYLAB FINAL REPORT - EPN 492,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 2L.
W78-00096

GROUND-WATER LEVELS IN THE UNITED STATES, 1972-74. NORTH-CENTRAL STATES.
Geological SSurvey, Reston, Va. Water Resources Div.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, price $2.25. Water-Supply Paper 2163, 1977. 89 p, 9 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, *Central US, Iowa, Kansas, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin, Basic data collections, Aquifers, Water utilization.
Identifiers: *North-central states.

This report was prepared from ground-water levels measured from 1972-74, by the U.S. Geological Survey in cooperation with the States of Iowa, Kansas, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-00191

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. SOUTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, price $2.25. Water-Supply Paper 2162, 1977. 86 p, 6 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, *Southwest US, Arizona, California, Hawaii, Nevada, New Mexico, Basic data collections, Aquifers, Water utilization.

This report was prepared from ground-water levels measured from 1971-74, by the U.S. Geological Survey in cooperation with the States of Arizona, California, Hawaii, Nevada, and New Mexico, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-sur-

face datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-00192

SUMMARY GROUND-WATER RESOURCES OF LUZERNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00193

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1976.
Geological Survey, Doraville, GA. Water Resources Div.
Water-Data Report GA-76-1, April 1977. 411 p, 5 fig

Descriptors: *Georgia, *Hydrologic data, *Surface waters, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1976 water year for Georgia consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs. This report contains discharge records for 99 gaging stations; stage for 9 gaging stations, stage and contents for 16 lakes and reservoirs; water quality for 20 continuous stations and 108 periodic stations. Also included are 115 crest-stage stations, 3 miscellaneous discharge measurements and miscellaneous sediment samples at 24 gaging stations. Records for a few pertinent stations in bordering States are also included in this report. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Georgia. (Woodard-USGS)
W78-00200

FLUVIAL SEDIMENT DATA FOR IOWA: SUSPENDED-SEDIMENT CONCENTRATIONS, LOADS AND SIZES: BED-MATERIAL SIZES: AND RESERVOIR SILTATION,
Geological Survey, Cheyenne, WY. Water Resources Div.; and Geological Survey, Iowa City, IA.
J. R. Schuetz, and W. J. Matthes Jr.
Iowa Geological Survey, Iowa City, Technical Information Series No 6, May 1977. 410 p, 1 fig, 2 tab, 21 ref.

Descriptors: *Sediment transport, *Iowa, *Streams, *Sediment discharge, *Reservoir silting, Suspended load, Particle size, Sediment yield, Sedimentation, Bottom sediments.

This report is a compilation of the fluvial sediment data collected and published by the U.S. Geological Survey and other Federal agencies for the State of Iowa. The compilation includes daily extremes, monthly summaries, particle-size analyses of suspended-sediment, particle-size analyses of bed materials at some daily suspended-sediment stations, suspended-sediment concentrations and loads for samples collected at periodic and miscellaneous sites, and reservoir sedimentation studies on streams. (Woodard-USGS)
W78-00201

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 1. NEW YORK EXCLUDING LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
Water-Data Report NY-76-1, June 1977. 615 p, 8 fig, 1 tab.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water quality of precipitation; and water levels and water quality of ground water. This report (Volume 1) contains discharge records for 210 gaging stations; stage only records for 41 gaging stations (includes 31 lake and reservoir stations, 8 tide stations, and 2 other river stations); stage and contents for 21 other lakes and reservoirs; water quality for 74 gaging stations, 15 partial-record stations, and 8 precipitation stations; and water levels for 16 observation wells. Also included are 146 crest-stage partial-record stations and 5 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey in cooperation with State, Federal, and other agencies in New York. (Woodard-USGS)
W78-00202

WATER RESOURCES DATA FOR NEBRASKA, WATER YEAR 1976.
Geological Survey, Lincoln, NE. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 441, Price codes: A16 in paper copy, A01 in microfiche.
Water-Data Report NE-76-1, May 1977. 407 p, 5 fig, 3 tab.

Descriptors: *Nebraska, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, Water temperature.

Water resources data for the 1976 water year for Nebraska consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 146 gaging stations; stage and contents for 9 lakes and reservoirs; water quality for 40 gaging stations, 18 ungaged stations, 27 partial-record flow stations, and 96 wells; and water levels for 66 observation wells. Also included are 114 crest-stage partial-record stations and 12 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nebraska. (Woodard-USGS)
W78-00203

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Austin, TX. Water Resources Div.
R. M. Slade, Jr., and J. M. Taylor.
Geological Survey open-file report 77-266, June 1977. 96 p, 3 fig, 5 tab.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Storm runoff, *Urban runoff, *Hydrologic data, Small watersheds, Streamflow, Flow rates, Peak discharge, Flood profiles, Watershed management, *Texas.
Identifiers: *Fort Worth(Tex).

This report contains rainfall and runoff data collected during the 1975 water year for Sycamore Creek, Sycamore Creek tributary, Dry Branch, and Little Fossil Creek study areas in Fort Worth, Texas. The information will be useful in determining the extent to which progressive urbanization will affect the yield and mode of occurrence of storm runoff. Detailed rainfall-runoff computations, including hydrographs and mass curves, are presented for nine storm periods during the water year. (Woodard-USGS)
W78-00209

WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1976--VOLUME 2. LONG ISLAND.
Geological Survey, Albany, NY. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161, Water-Data Report NY-76-2, May 1977. 180 p, 8 fig, 1 tab.

Descriptors: *New York, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.
Identifiers: *Long Island(NY).

Water resources data for the 1976 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water quality of precipitation; and water levels and water quality of ground water. This report (Volume 2) contains discharge records for 17 gaging stations; water quality for 17 gaging stations, 3 partial-record stations, 292 wells, and 3 precipitation stations; and water levels for 103 observation wells. Also included are 88 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey in cooperation with State, Federal, and other agencies in New York. (Woodard-USGS)
W78-00210

NATIONAL WATER QUALITY INVENTORY. 1974 REPORT TO THE CONGRESS. VOLUME I.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W78-00214

WHERE TO FIND WEATHER AND CLIMATIC DATA FOR FOREST RESEARCH STUDIES AND MANAGEMENT PLANNING,
North Central Forest Experiment Station, St. Paul, MN.
D. A. Haines.
USDA Forest Service General Technical Report NC-27, St. Paul, Minnesota, 1977. 15 p, 16 fig, 11 ref, append.

Descriptors: *Climatic data, *Weather data, *Information retrieval, Metereology, *Forest management, Research and development, *Data collections, Networks, Data storage and retrieval, Statistics.

Weather and climatic data are needed for a variety of forest research studies and management planning. Much of this data has already been recorded and published. This document describes the weather-observing networks already in operation, the data available from them, and where the information is stored. (Witt-IPC)
W78-00386

APPLICATION OF A NEW NONLINEAR PROGRAMMING CODE WITH DECOMPOSITION TO THE REGIONAL WASTEWATER-COLLECTION AND TREATMENT-LOCATION PROBLEM,
West Virginia Univ., Morgantown. Computer Center.
For primary bibliographic entry see Field 5G.
W78-00448

A DECOMPOSITION APPROACH TO THE CAPACITY EXPANSION PROBLEM,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W78-00500

8. ENGINEERING WORKS

8A. Structures

SETTLEMENT OF LARGE HYDRAULIC STRUCTURES,
Army Engineer Div. Lower Mississippi Valley, Vicksburg. Technical Engineering Branch.
For primary bibliographic entry see Field 8D.
W78-00099

8B. Hydraulics

LONGITUDINAL DISPERSION WITH DEAD ZONES,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00075

FINITE ELEMENT APPROACH TO WAVES DUE TO LANDSLIDES,
Thessaloniki Univ., Salonika (Greece). Faculty of Technology.
C. G. Koutitas.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13218, p 1021-1029, September 1977. 10 fig, 11 ref, 2 append.

Descriptors: *Waves(Water), *Landslides, *Model studies, Mathematical models, Reservoirs, Finite element analysis, Numerical analysis, Energy, Soils, Soil stability, Hazards, Safety, Hydraulics.
Identifiers: *Wave action.

The finite element method based on the weighted residuals principle was used for the description of the generation and the unidirectional propagation of waves in a channel due to the temporal vibration of some cross sections of it (lateral earth motion due to landslide on the channel bank). The deriving algebraic system was solved by iterations. The integration in time was achieved by a leap frog finite differences scheme for the computation of surface elevation and velocity functions. The finite element model was applied on a typical channel, and several controls on the obtained solutions proved the descriptive capacity of the model. (Sims-ISWS)
W78-00076

CALCULATORS IN TIMER-COUNTERS FOR CURRENT METERS,
Papuea New Guinea Univ. of Tech., Lae (New Guinea). Dept. of Electrical and Communications Engineering.
For primary bibliographic entry see Field 7B.
W78-00077

UNIFIED VIEW OF WASH LOAD AND BED MATERIAL LOAD,
Thessaloniki Univ., Salonika (Greece).; and Florida Univ., Gainesville. Dept. of Engineering Sciences.
For primary bibliographic entry see Field 2J.
W78-00078

SOME ASPECTS OF QUADRATIC WEIRS,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
K. K. Murthy, and K. G. Pillai.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY9, Proceedings Paper 13231, p 1059-1076, September 1977. 10 fig, 3 tab, 19 ref, 2 append.

Descriptors: *Weirs, *Flow measurement, Orifice flow, Orifices, Discharge(Water), Flow, Hydraulic models, Laboratory tests, Hydraulics, Water resources.
Identifiers: *Quadratic weirs, Proportional weirs, Weir design.

The theory of proportional weirs, including the slope discharge continuity theorem, was applied to obtain an excellent solution to the design of a quadratic weir having a compound base. Nine differently shaped quadratic weirs were designed, and pertinent data for their use were given in enclosed tables. A total of 8 weirs with 3 different shapes were tested hydraulically, and results showed consistent discharge coefficient values between 0.607 and 0.610. One particular shape of weir was the most sensitive and had the additional advantage of having equal slopes at the junction of the base weir and the upper 'complimentary weir.' The importance of the quadratic weirs as proportional orifices and notch-orifices was stressed. Also the usefulness of quadratic weirs as the most sensitive weirs with the least relative error was underlined. (Sims-ISWS)
W78-00079

BASIC PRINCIPLES OF RIVER HYDRAULICS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-00080

WORLD-WIDE VARIATIONS IN HYDRAULIC GEOMETRY EXPONENTS OF STREAM CHANNELS: AN ANALYSIS AND SOME OBSERVATIONS,
Saint David's Univ. Coll., Dyfed (Wales). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-00081

A REGIONAL RESERVOIR STORAGE ANALYSIS FOR EASTERN MASSACHUSETTS AND RHODE ISLAND,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00195

THE STRUCTURE OF A TURBULENT FLOW IN A CHANNEL OF COMPLEX SHAPE,
Geological Survey, Atlanta, GA. Water Resources Div.
H. J. Tracy.
For sale by GPO, Supt. of Documents, Washington, DC 20402. Professional Paper 983, 1976. 24 p, 20 fig, 9 ref.

Descriptors: *Channel flow, *Turbulent flow, *Shear stress, *Momentum transfer, Model studies, Rotational flow, Hydrodynamics, Channel morphology, Closed conduit flow.

Measurements of the Reynolds stresses and the mean motion pattern were made in a uniform turbulent motion in a conduit consisting of a large, nearly square section joined by a smaller rectangular section. The results indicate that the boundary shearing stress is nearly constant over large segments of the boundaries. The magnitudes of the lateral and the vertical components of turbulence are not the same near a boundary and the component normal to the boundary is smaller than the component parallel to the boundary. The difference in the two components in the corner regions of the channel produces secondary mean motions in the plane of the channel section. The strength of the motion depends upon the angle subtended by the corner. A principal function of the secondary motions is to transfer momentum into the corner regions and, elsewhere, to compensate for the excess force due to the shear gradients. In the absence of the secondary motions, the fluid must stagnate and separate from the boundaries in certain regions and be greatly accelerated in others. The secondary motions are conventionally described in terms of symmetrical rotations in cells bounded by the corner bisectors. The measured motion pattern is at variance with this view, unless the symmetry is confined to a very local region. (Woodard-USGS)
W78-00211

ADJUSTABLY SUBMERSIBLE BREAKWATER,
E. T. Dougherty.
U.S. Patent No 4,027,486, 6 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 57-58, June 7, 1977.

Descriptors: *Patents, *Breakwaters, *Engineering structures, *Shore protection, Harbors, Coastal structures, Waves(Water), Ocean waves.

A new and useful breakwater assembly is disclosed which employees elongated tanks which are in parallel relationship with respect to each other, and are interconnected at their aligned ends to form an undulating breakwater structure. The lower end tank is suitably moored and all the tanks are individually adjustable with regard to the buoyance so that some of the tanks will float on the surface of the water and other of the tanks will be submerged at various depths below the surface. The floating tanks serve to dampen wave action and the submerged tanks provide an anchoring stability to the breakwater assembly and will also dampen undercurrents. The anchoring or mooring stability provided to the breakwater assembly by the submerged tanks is due to the inherent resistance of submerged objects to sudden movements. In addition to the submersible feature, the breakwater assembly is variable as to the length and width to accomodate the needs of particular installation sites. It includes the capability of easily changing the number of tanks in parallel relationship and the capability of axially interconnecting as many of the tanks as are needed to achieve any desired width of the breakwater. (Sinha-OEIS)
W78-00277

FLOATING BREAKWATER,
J. G. O. Watson.
U.S. Patent No. 4,023,370, 10 p, 12 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 965, May 17, 1977.

Descriptors: *Patents, *Breakwaters, *Engineering structures, *Shore protection, Floating, Waves(Water), Ocean waves, Wave length, Attenuation.

A floating breakwater comprises a buoyant structure including open spaces the sides of which join each other at angles other than right angles and each of which encloses a body of surface water. Preferably the structure is composed of several joined bodies at least some of which are buoyant and surfaces of which form sides of the spaces. In one form of the invention the bodies are elongated and are joined at their ends to form triangulat

spaces. Conveniently the distance separating the base and apex of each triangular space is substantially the same and the bodies are so arranged in the structure that adjacent spaces have an opposite aspect to provide the structure with a continuous substantially parallel sea and lee wall. (Sinha - OEIS)
W78-00291

PRESSURIZED WATER WHEEL,
For primary bibliographic entry see Field 4A.
W78-00293

HYDRAULIC COEFFICIENTS FOR PE PIPE OF LARGE DIAMETER: STUDIES ON THE PIPE DISTRIBUTION IN SYSTEMS FOR SPRINKLER IRRIGATION: V, (IN JAPANESE),
Okayama Univ. (Japan). Faculty of Agriculture.
Y. Murakami, H. Kobashi, and S. Kubo.
Trans Jap Soc Irrig Drain Reclam Eng. 37, p 47-53, 1971.

Descriptors: Pipes, *Plastic pipes, *Sprinkler irrigation, Hydraulics, Irrigation systems, Distribution systems.
Identifiers: *Hydraulic coefficient, *Polyethylene pipes.

Measured values of the coefficients in hydraulic flow formulas were: f = 0.011 approx. 0.012, C = 170 approx. 177, for the 600 mm straight pipe (PE, polyethylene) and f = 0.018 approx. 0.019, C = 130 approx. 132, Ks = 0.33 approx. 0.34, n = 0.011 for the inverted siphon, respectively. The cause of increased resistance against flow for the inverted siphon is regarded due mainly to the effect of air in the pipe. Judging from the coefficients and Reynolds numbers for the straight pipe and inverted siphon, the Darcy-Weisbach formula can be applied for the former pipe and the Scobey formula for the latter. Diagrams were prepared to estimate the coefficients measured within the region of diameter where Hazen-Williams formula or Scobey formula is applicable respectively. In using a certain constant in place of correct coefficient in a restricted range of diameters it is preferable to adopt 2 respective constants for 2 subdivided range of diameter, e.g. by dividing a total range of 65 approx. 1500 mm at 300 mm, rather than use single constant for the whole range. Both the values of C determined with the Matsuda's slide-rule for hydraulic use and of K from the prepared nomograph agreed accurately with corresponding logarithmic calculations.--Copyright 1974, Biological Abstracts, Inc.
W78-00297

8C. Hydraulic Machinery

ELETROMAGNETIC PISTON PUMP.
Water and Waste Treatment, Vol 20, No 6, p 30, June, 1977.

Descriptors: *Pumps, *Hydraulic equipment, *Construction materials, *Liquid wastes, *Equipment, Water conveyance, Chemical wastes.

An electromagnetic piston pump produced by Appliance Components for use with a wide range of both corrosive and non-corrosive liquids is described. The pump is suggested for application in chemical and pharmaceutical industries, for use with industrial and municipal water, and for use with medical or laboratory equipment. The self-priming pump is 2.25 in x 3.25 in and has a capacity of 11 gal/hr with a maximum discharge height of 65 ft and a maximum lift of 10 ft. Because the metal piston is the only moving part, the pump does not require a driving motor and pump arrangement, drive shaft, moveable gasket, or delicate diaphragm. Corrosion- and high wear-resistant materials are used for the internal components. The materials used for the molded seals and valves can be varied according to the liquids being handled. (Schulz-FIRL)
W78-00063

METHOD FOR ADJUSTING AN AUTOMATIC SLUICE WITH A VIEW TO ENSURING A DETERMINED LEVEL,
Societe Generale de Constructions Electriques et Mecaniques (Alsthom), Paris Cedix (France). (Assignee).
P. Alexandre.
U.S. Patent No 4,027,487, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, no 1, p 58, June 7, 1977.

Descriptors: *Patents, *Sluices, *Sluice gates, Hydraulic equipment, Flow, Water conveyance, Water levels, Water control, Channels.

The automatic sluices of the sector-shaped oscillating float type have a variable opposing couple intended to regulate hydraulically the flow of a canal to keep a constant level upstream of the sluice. The sluices are essentially constituted by a frame comprising a sector-shaped gate, centered on an axis of rotation, a sector-shaped float centered on the same axis of rotation and protruding on the upstream face of the gate and counterweights integral with the frame, the assembly oscillating about the axis situated substantially at the mark of the level to be regulated. These sluices comprise an opening stop which limits the opening to that for which the base of the float is tangent to the upstream level to be regulated, for beyond, the sluice would tilt into an excessively open position. The method consists in introducing a certain quantity of water in the float of the sluice, then in effecting the balancing normally by means of the counterweights, the upstream level regulated by the sluice then being that of its axis of oscillation. Then to regulate the sluice in order for it to ensure the required level above or below the mark of oscillation of its axis, water is added to or withdrawn from the float up to a height equal to the required shift in height of the level. Simultaneously, the opening stop is installed, this fixing the limit travel of the mobile part. (Sinha-OEIS)
W78-00278

FLOATING WAVE POWERED PUMP,
American Cyanamid Co., Stamford, CT. (Assignee).
L. C. Tharaldson.
U.S. Patent No. 4,023,515, 6 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 1014, May 17, 1977.

Descriptors: *Patents, *Waves(Water), Floating, Pumping, Energy conversion, Energy transfer, *Pumps, Pumping plants, Engineering structures.
Identifiers: Swells.

This invention relates to wave powered pumping systems for utilizing the energy of waves and swells in bodies of water, particularly the oceans. The system can accept swells and waves from any direction and of any magnitude and utilize both upward and downward movements. Such a pumping system incorporates a variable stroke double action piston type pump which operates with both upward and downward movements of varying magnitude, without requiring any adjustments for tides and other variations. The floating platform has floats hinged about the periphery of the platform. Nozzles for water jets may be carried on the platform below the water line to provide positioning and/or propulsion forces for the platform. Such a pumping system can be utilized for water pumping directly and/or providing water under pressure for conversion to other forms of energy. (Sinha - OEIS)
W78-00292

8D. Soil Mechanics

FIELD TEST SECTIONS SAVE COST IN TUNNEL SUPPORT,
K. S. Lane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 982, Price codes: A04 in paper copy, A01 in microfiche. Report NSF-RA-T-75-035 from the Underground Construction Research Council, Published by the American Society of Civil Engineers, April 1975. 9 fig, 8 tab, 75 ref, 4 append. NSF G141842.

Descriptors: *Tunneling, *Tunnel construction, *Tunnel design, Tunnel linings, Tunneling machines, Tunnel failure, Dams, Diversion structures, Diversion tunnels, Hydraulic structures, Design, Costs, Civil engineering.
Identifiers: *Tunnel supports, Field test sections, Great Britain, Sweden.

This study summarized 50 case histories where instrumented test sections were a key factor in realizing major savings from newer concepts in designing underground works. Savings were most often in the costly item of tunnel support, using field tests to validate newer approaches and to establish confidence therein. Where the tests formed a coordinated program, savings have been spectacular. One example cited was Britain's saving half the construction cost on recent London tunnels. In Sweden, cost of underground works has been reduced to equal or below that of surface alternatives for many facilities such as power plants, sewage and water treatment, oil storage, and parking. Despite growing objections to locating such facilities in the surface environment, high cost has deterred U.S. planners from considering the underground alternative. Major cost improvement could change this, allowing greater use of the underground to alleviate several U.S. problems: urban congestion, pollution, and energy waste. The case record charts the road: wider trial of newer and less costly concepts (many developed abroad), using field tests to validate applicability for U.S. conditions. (Sims-ISWS)
W78-00097

SETTLEMENT OF LARGE HYDRAULIC STRUCTURES,
Army Engineer Div. Lower Mississippi Valley, Vicksburg. Technical Engineering Branch.
R. I. Kaufman, and W. C. Sherman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A 033 146, Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Miscellaneous Paper S-71-23, October 1971. 33 p, 17 fig, 3 ref.

Descriptors: *Hydraulic structures, *Settlement(Structural), *Soil mechanics, *Mississippi River, Floodways, Flood control, Structures, Concrete structures, Control structures, On-site investigations, Design, Soils, Foundations, Foundation investigations, Floodgates, Civil engineering.

A number of large hydraulic structures have been constructed as features of the project for flood control and improvement of the Lower Mississippi River. The structures are founded on alluvial soils and subjected to differential heads resulting from variations in river stage. Because of the relatively unfavorable foundation conditions and seasonal variations in foundation loadings, movements of the structures were observed during and after construction to determine the performance of the structures with respect to design assumptions. Presented in this paper were the results of the above mentioned observations on three selected structures (the Old River Control Overbank Structure, the Old River Control Lowsill Structure, and the Morganza Control Structure). Also presented were conclusions regarding the performance of the structures. Extensive instrumentation and careful

observations of the large hydraulic structures in alluvial soils indicated that the structures are functioning as designed. It was concluded that proper design procedures based on current soil mechanics techniques can produce acceptable results. Generally, observed settlements were in the range of magnitude of settlements predicted in design. Preload fills were utilized and were successful in eliminating a large part of settlement which would otherwise occur at the structure abutments. With proper design procedures, settlements of large structures in alluvial soils can be controlled to reasonable values. However, some seasonal movement will occur due to variations in temperature and river stages. The structures have performed adequately since construction. (Sims-ISWS)
W78-00099

PREVENTION OF SAND BAR FORMATION AT OUTLETS INTO THE SEA OR OTHER BODIES OF WATER,
Wijesiriwardena (Don Bernard), Arcadia, CA. (Assignee).
L. G. Wirasinha.
U.S. Patent No. 4,023,369, 7 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 958, No 3, p 964, May 17, 1977.

Descriptors: *Patents, *Sand bars, *Shallow water, *Silting, *Deposition, Sediment control, Water pollution sources, Silt, Erosion, Drains.
Identifiers: Gutters.

An apparatus and method carried out for preventing formation of sand bars from sand or silt at the outlet of a body of water emptying from inland into another body of water such as a lake or the sea. At least one elongated gutter is provided at the outlet of the body of water. The gutter is placed above the level of the water in the outlet and may or may not extend through the mouth of the outlet into the receiving body of water. Water is pumped into the gutter to an overflow condition so that it spills over the edges and by gravity falls and creates a splash erosion condition. (Sinha - OEIS)
W78-00290

CHARACTERIZATION OF COARSE POROUS MEDIA,
California Univ., Berkeley. Sanitary Engineering Research Lab.
F. H. Pearson, and A. J. McDonnell.
Journal of the Environmental Engineering Division, Proceedings, American Society of Civil Engineers, Vol. 103, No. EE4, Proceedings Paper 13125, p 615-624, August 1977. 5 fig, 17 ref, 2 append. OWRT A-030-PA(7).

Descriptors: *Porous media, *Particle shape, *Surfaces, Particle size, Filters, Pores, Dimensions, Measurement, Volume, Graphical analysis, Weight, Friction, Head loss.
Identifiers: *Shape factor, *Surface area, Geometrical solids, Unit weight, Flatness, Elongation, Diameter, Crushed limestone.

A methodology was presented to characterize shape factor and surface area of coarse filter media. For several regular geometrical solids, the variation of shape factor with a dimensionless parameter of maximum relationships was similar to variation obtained by measurement on particles of crushed stone. Using this relationship, the shape factor and surface area of a stone particle could be estimated with a standard error of 4% from maximum dimension and weight, where the unit weight is known. (Visocky-ISWS)
W78-00436

8F. Concrete

SETTLEMENT OF LARGE HYDRAULIC STRUCTURES,
Army Engineer Div. Lower Mississippi Valley, Vicksburg. Technical Engineering Branch.
For primary bibliographic entry see Field 8D.
W78-00099

8G. Materials

RUBBER LININGS ALLEVIATE STICKY POLLUTION PROBLEM.
New Civil Engineer, No. 250, p 19, July, 1977.

Descriptors: *Synthetic rubber, *Rubber, *Construction materials, *Linings, *Settling basins, Aeration, Oxidation, Costs, Food processing industry, Industrial wastes, Treatment facilities, *Waste water treatment.
Identifiers: Vaihingen(Germany), Animal glue.

Synthetic rubber has been used to line four pyramidal basins at a waste water treatment plant in Vaihingen, West Germany. Construction costs for the rubber-lined plant, which includes surface aeration in a 4,500 cu m oxidation basin, a 700 cu m settling pond, and a 800 cu m secondary settling pond, were approximately 60% of costs for a concrete equivalent. The waste water treatment facility is designed to treat an effluent flow from an animal glue and gelatin factory of 150-190 cu m/h with peak flows up to 200 cu m/h. Du Pont's Hypalon synthetic rubber was chosed for use at Vaihingen because of its weather resistance, ease of sealing, chemical resistance, flexibility, and tensile strength. A concrete slab and stainless steel dowels are used to hold the lining in place and minimize the effects of suction in the place of the rotors. Waste water dischrged from the new Conradt treatment plant into the Enz River has a pH of 7.2-7.4 and a BOD of 1510 mg/liter. (Schulz-FIRL)
W78-00020

SOME ASPECTS OF QUADRATIC WEIRS,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-00079

MEASURING DEVICE FOR WATER FLOW IN A BURIED PIPE,
For primary bibliographic entry see Field 7B.
W78-00267

INHIBITED ACID COMPOSITION FOR CLEANING WATER SYSTEMS,
G. F. Connelly Jr.
U.S. Patent No. 4,025,359, 6 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 958, No 4, p 1637, May 24, 1977.

Descriptors: *Patents, *Descaling, *Cleaning, *Water conservation, Water conveyance, Pipes, Water utilization, Carbonates, Metals, Separation techniques, *Scaling.
Identifiers: *Pipe cleaning.

This invention relates to the removal of scale comprising metal oxides and carbonates from the interior of galvanized pipes or steel pipes and other galvanized or steel vessel employed for the transport or storage of aqueous fluids. Pipe cleaning compositions which are fundamentally aqueous hydrochloric acid solutions containing a blend of inhibitors including furfural, and diethylthiourea are used to remove scale from galvanized or steel pipes without undue attack on the metal of the pipe. Various ratios of dilution can be used for different purposes, depending upon the type of pipe or water holding vessel which is being cleaned. (Sinha - OEIS)
W78-00302

8I. Fisheries Engineering

ELECTROTAXIC AND NARCOTIC RESPONSES OF CHANNEL CATFISH TO VARIOUS ELECTRICAL PULSE RATES AND VOLTAGE AMPLITUDES,
Fish Farming Experimental Station, Stuttgart, AR.
J. E. Ellis.
The Progressive Fish-Culturist, Vol. 37, No. 3, p. 155-157, 1975; 1 tab, 7 ref.

Descriptors: *Fish behavior, *Fish guiding, *Channel catfish, Size, Electrical studies, Electrical currents, Electrical equipment, Catfishes, Marine fish, Fish physiology, Dimensions.
Identifiers: *Electrotaxic response, *Narcotic response, Electrical pulse rates, Voltage amplitudes.

The combination of voltage and frequency of pulsation required to lead and control channel catfish (Ictalurus punctatus) was investigated. A general relation was found to exist between size of fish, frequency of pulsation, and applied voltage for inducing a taxic or narcotic response. Each frequency tested tended to be selective for fish of a particular size group. The amount of current that any given fish received was dependent upon its length. (Katz)
W78-00433

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

WHERE TO FIND WEATHER AND CLIMATIC DATA FOR FOREST RESEARCH STUDIES AND MANAGEMENT PLANNING,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 7C.
W78-00386

10C. Secondary Publication And Distribution

CHEMICALS AND ALLIED PRODUCTS, (LITERATURE REVIEW),
Union Carbide Corp. South Charleston, W. Va.
For primary bibliographic entry see Field 5D.
W78-00012

FRUIT-, VEGETABLE-, AND GRAIN-PROCESSING WASTES, (LITERATURE REVIEW),
Environmental Associates, Inc., Corvallis, OR.
For primary bibliographic entry see Field 5D.
W78-00025

MEAT-, FISH-, AND POULTRY-PROCESSING WASTES, (LITERATURE REVIEW),
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5D.
W78-00028

FERMENTATION INDUSTRY, (LITERATURE REVIEWS),
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5D.
W78-00029

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) and Associates, Media, PA.
For primary bibliographic entry see Field 05D.
W78-00052

THERMAL EFFECTS, (LITERATURE REVIEWS),
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 05C.
W78-00352

THE ECOLOGICAL EFFECTS OF COAL STRIP-MINING: A BIBLIOGRAPHY WITH ABSTRACTS,
Colorado State Univ., Fort Collins. Natural Resource Ecology Lab.
For primary bibliographic entry see Field 05C.
W78-00495

10F. Preparation Of Reviews

STATE-OF-THE-ART SURVEY AND ECONOMIC COMPARISON OF FREEZING PROCESSES.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 03A.
W78-00003

NEED FOR NEW AND BETTER MEMBRANES,
Office of Water Research and Technology, Washington, D.C. Membrane Processes Div.
For primary bibliographic entry see Field 03A.
W78-00069

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 2
JANUARY 15, 1978

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CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

U.S. DEPARTMENT OF THE INTERIOR
MARCH 3, 1849

VOLUME 11, NUMBER 2
JANUARY 15, 1978

W78-00501 -- 00900

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

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Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

HYDROLOGIC MODELING OF THE DEVILS LAKE BASIN WATERSHEDS,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 4D.
W78-00569

MULTIPURPOSE USE OF CATCHMENT MODELS FOR OPERATIONAL FORECASTING AND PLANNING STUDIES,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
A. Becker.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975, p 22-27. 3 fig, 9 ref.

Descriptors: *Water resources, *Control, *Planning, *Hydrology, *Simulation analysis, Forecasting, Flow, Water balance, Short-term planning, Long-term planning, Hydrographs, Stochastic processes, Mathematical models, Operations research, Flood control, Summer.
Identifiers: *Catchment models, Flow recession.

The first version of the integrated hydrological catchment model EGMO was presented at the Warsaw Symposium in 1971. Since then it has been improved and tested and then applied in the solution of different problems in operational hydrology and water resources control planning. Five applications of the improved EGMO model indicate that such models can be used effectively for deterministic forecasting and--as a necessary submodel--for stochastic flow simulation in river basins. Herein, the following cases of model testing and application are briefly described: Deterministic---operational short-term forecasting of catchment outflow, forecasting of flow recession, and long-term water balance calculation; and Stochastic-deterministic---simulation of summer flow, flood flow simulation, and flood control planning. (See also W77-10419) (Bell-Cornell)
W78-00635

MATHEMATICAL MODEL OF ULUOVA PLAIN, TURKEY - A TRAINING AND MANAGEMENT TOOL,
Belgrad Univ. (Yugoslavia).
J. Karanjac, M. Altunkaynak, and G. Ovul.
Ground Water, Vol. 15, No. 5, p 348-357, September-October 1977. 10 fig, 2 tab, 2 ref.

Descriptors: *Mathematical models, *Aquifer management, *Bodies of water, *Surface-groundwater relationships, Groundwater resources, Groundwater recharge, Groundwater availability, Water wells, Pumping, Hydrogeology, Computer models, Training, Water management(Applied), Drawdown, Foreign countries, Foreign research.
Identifiers: *Uluova Plain(Turkey), *Lake Keban(Turkey).

The modelling of the Uluova Plain in southeastern Turkey was a part of training offered to Turkey's State Hydraulic Work's staff within a UNDP project. The modelling of the 341-sq km plain started with the simple steady-state version, but the model gradually was made more and more complex. At the end of modelling, the entire groundwater system was subjected to various automatic controls. The interesting feature of the model was the interaction between surface water (Keban Reservoir) and groundwater. Lake Keban started encroaching upon the plain in 1974, and by the middle of 1976 it occupied over 100 sq km of the plain. The modelling showed that the planned increase in groundwater withdrawal from about 17 million cubic meters (MCM) in 1975 to about 30 MCM in 1976 was quite realistic and completely sustained by the aquifer. The maximum drawdowns in the 1974-1980 period are of an order of magnitude of 20 meters. Another sharp increase in groundwater development from 30 to 58 MCM that was foreseen for 1981 would create drawdowns in some areas in excess of 35 m. The Uluova model incorporates some advanced and new routines in integrated surface water-groundwater simulation. (Visocky-ISWS)
W78-00692

THE OCCURRENCE OF DROUGHT AND ITS PROBABILITIES IN THE BAIXADA FLUMINENSE, RIO DE JANEIRO, (IN PORTUGESE),
Instituto de Pesquisa Agropecuaria do Centro-Sul, Mato Grosso (Brazil).
D. M. De Menezes, J. Ellis, and S. K. Mueller.
Pesqui Agro Pecu Bras Ser Agron. 8(7), p 181-185, 1973.

Descriptors: *Drought, *Probability, South America, *Data collections, Moisture deficit, Markov processes, *Model studies, Rainfall.
Identifiers: Rio-De-Janeiro, *Brazil(Baixada Fluminense).

The consecutive days without rain for the 30 yr period of 1941 through 1970 are tabulated. The data were taken from the daily record of the Climatological Section of the Instituto de Pesquisa Agropecuaria do Centro-Sul. The data were analyzed statistically utilizing the 1st order Markov chain probability model. The probabilities are derived for the Baixada Fluminense area (Rio de Janeiro, Brazil). The major dry periods were recorded in the months of June, July and Aug. The range of probabilities of dry periods of 5 days duration or longer were from 10% in Dec. to 51% in August. Transition months were noted in April and May and again in Sept.--Copyright 1975, Biological Abstracts, Inc.
W78-00843

2B. Precipitation

WATER CONDITIONS IN CALIFORNIA, BASIC DATA SUPPLEMENT.
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
California Cooperative Snow Surveys, Bulletin No. 120-77, July 1977. 3 fig, 5 tab.

Descriptors: *Snow surveys, *Water resources, *California, *Data collections, Precipitation(Atmospheric), Runoff, Storage, Reservoirs, Reservoir storage, Snowpacks, Density, Moisture content, Profiles, Snow, Water supply.
Identifiers: Water conditions.

This Basic Data Supplement contained snow survey and aerial marker data collected from January through June and precipitation and runoff data from January through May. Also included were May 1 storage in major reservoirs and selected graphical data on snow depth, density, and water content. (Sims-ISWS)
W78-00545

PRECIPITATION (RADAR) PROJECT OF THE IFYGL LAKE METEOROLOGY PROGRAM,
Center for the Environment and Man, Inc., Hartford, CT.
J. W. Wilson, and D. M. Pollock.
International Field Year for the Great Lakes Bulletin (Special), No. 20, July 1977. 52 p, 10 fig, 8 tab, 29 ref, 1 append. NOAA 03-5-022-17.

Descriptors: *Precipitation(Atmospheric), *Great Lakes, *Rain gages, *Radar, *Lake Ontario, Networks, Measurement, Rainfall, Snowfall, Lakes, Effects, Watershed(Basins), Data collections, Projects, Reviews, Climatology, Meteorology, Limnology.
Identifiers: *International Field Year for the Great Lakes.

Precipitation measurements for Lake Ontario and its watershed were derived for the 1-year period from April 1972 to March 1973 of the International Field Year for the Great Lakes (IFYGL). Eight techniques were used in obtaining the estimates. Seven of the techniques were based solely on precipitation gage data. The eighth combined data from 2 weather radars and from 167 precipitation stations to produce a detailed precipitation analysis for the entire basin for each day of the Field Year. The precipitation observation systems and measurement techniques were described, and measurements were compared. Accuracies of the precipitation estimates were evaluated based largely on withheld data from 3 mesonetworks of rain gages. The average error in the monthly precipitation amounts for the watershed was less than 5% and between 10 and 15% for overlake estimates. In addition, it was estimated that the measurements for the warm season average another 7% too low. Confidence in the precipitation estimates and accuracy figures for the cold season was relatively low because of difficulties in accurately measuring snowfall. The lake had a discernable effect on the precipitation approximately 1/2 of the precipitation days. During the warm season, the lake's effect was the suppression of shower activity over the lake, and during the cold season the effect was the initiation of shower activity over and downwind of the lake. The days on which the lake had the greatest impact on precipitation patterns were characterized by scattered, light showers. Thus, while the lake frequently influences precipitation patterns, its effect on total season precipitation was less apparent. (Sims-ISWS)
W78-00546

MONTHLY RAINFALL IN THE UPPSALA-FIELD,
Uppsala Univ. (Sweden). Dept. of Meteorology.
T. Bergeron.
Mesometeorological Studies of Precipitation, V, Report No. 38, 1973. 49 p, 37 fig, 16 ref.

Descriptors: *Rainfall, *Distribution patterns, *Monthly, Orography, Convection, *Maps, Precipitation(Atmospheric), Rain gages, Data processing, Analytical techniques, Data collections, Networks, Weather patterns, Meteorology.
Identifiers: *Uppsala(Sweden), *Sweden.

Forty-nine monthly rainfall maps for an area around Uppsala, Sweden, were presented for the period 1955-1965. The rainfall patterns shown by the maps were discussed. The orography effects on the rainfall patterns were pointed out. (See also W76-13186) (Sims-ISWS)
W78-00548

A REGISTRATION UNIT FOR DRAIN OUTFLOW, GROUNDWATER DEPTH AND PRECIPITATION,
Institute for Land and Water Manage Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 7B.
W78-00682

A COMPARATIVE STUDY OF THE EFFECTS OF ALBEDO CHANGE ON DROUGHT IN SEMI-ARID REGIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
J. Charney, W. J. Quirk, S-H. Chow, and J. Kornfield.

Journal of the Atmospheric Sciences, Vol 34, No 9, p 1366-1385, September 1977. 23 fig, 8 tab, 27 ref, append.

Descriptors: *Albedo, *Precipitation(Atmospheric), *Droughts, *Model studies, Radiation, Solar radiation, Rainfall, Evaporation, Evapotranspiration, Monsoons, Semiarid climates, Deserts, Groundwater, Climatology, Meteorology.

Results from a series of numerical simulations were presented to show the effects of changes in albedo on rainfall in 6 areas, 2 each in Africa, Asia and North America. Each pair consists of a semi-arid area lying at the boundary between a major desert and an adjacent monsoonal region, and an area of the same size located within the monsoonal region itself. The sensitivity of the rainfall to the ground hydrology was determined by performing the albedo simulations with 2 different evapotranspiration parameterizations, 1 giving too high evaporation over land, and the other giving negligible evaporation over land. In the high evaporation case, an albedo change from 0.14 to 0.35 caused large decreases of rainfall in all 3 of the semi-arid test areas and in 2 of the 3 monsoonal test areas. In the negligible evaporation case, the simulations were performed only for the 3 semi-arid areas; in this case, the albedo increase produced a significant decrease in rainfall in only 1 of the areas, the Sahel. Intercomparison of the high and negligible evaporation cases showed that changes in evaporation rate are as important as changes in albedo. Thus, in all but 1 of the 6 areas, local evaporation was a major factor in influencing rainfall. When appreciable evaporation occurs, the mechanism by which an increase of albedo reduces the rainfall is as follows: Initially, the increase of albedo acts to reduce the absorption of solar radiation by the ground and, therefore, the transfer of sensible plus latent heat into the atmosphere. The resulting reduction in convective cloud tends to compensate for the increase of albedo by allowing more solar radiation to reach the ground, but it reduces the downward flux of longwave radiation even more, so that the net absorption of radiation by the ground, solar plus longwave, is decreased. Thus, with or without evaporation, the increase of albedo causes a net decrease of radiative flux into the ground and, therefore, a net decrease of convective cloud and precipitation. (Sims-ISWS)
W78-00686

LIDAR OBSERVATIONS OF HIGH PLAINS THUNDERSTORM PRECIPITATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
K. Sassen.
Journal of the Atmospheric Sciences, Vol. 34, No. 9, p 1444-1457, September 1977. 15 fig, 2 tab, 12 ref. NSF ATM75-02515.

Descriptors: *Remote sensing, *Thunderstorms, *Model studies, Precipitation(Atmospheric), Cloud physics, Snow, Ice, Crystals, Graupel, Rainfall, Clouds, Storms, Measurement, Instrumentation, Meteorology.
Identifiers: *Lidar, Bright bands, Precipitation mechanisms.

The results of a field program using a polarization diversity lidar system to study high plains thunderstorm precipitation were given. The presence of 'reflectivity' bright bands of the general form predicted by a numerical simulation indicated that ice phase precipitation processes were predominantly acting in the storms studied. Depolarization profiles through the melting region, evaluated on the basis of CW laser scattering measurements, were shown to aid in the discrimination of the ice particle types causing the bright bands. Depolarization and returned energy signatures due to graupel were present, primarily during the developing stage, consistent with recent findings in northeastern Colorado. However, melting snowflake signatures were observed predominantly during the mature thunderstorm stage, suggesting that the contribution to thunderstorm rainfall from the ice crystal aggregation process generally has been underestimated. It also was significant that the use of lidar in the study in a manner similar to microwave radar indicated the potential of the lidar depolarization technique for future operational programs of atmospheric research. (Sims-ISWS)
W78-00687

A STUDY OF THE RELIABILITY, DEFICIENCIES AND EXCESSES OF RAINFALL OVER THE HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
O. P. Bishnoi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 26, No. 2, p 211-214, April 1975. 14 fig, 5 ref.

Descriptors: *Rainfall, *Droughts, *Precipitation excess, Precipitation(Atmospheric), Spatial distribution, Rainfall disposition, Monsoons, Maps, Probability, Statistical methods, Data processing, Weather data, Meteorology.
Identifiers: *Haryana(India).

The rainfall data of Haryana State, India, rain gauge stations were analyzed to study the reliability of rainfall on probability basis. Maps were depicted which show the probabilities of occurrence of rainfall of less than 100, 200, 300, 400, and 500 mm during the southwest monsoon season. The maps also show the percentage number of years of significant excesses/deficiencies of rainfall and give information regarding the rainfall distribution in the State. The maps give an idea of the confidence with which certain amounts of rainfall can be expected over the different regions in the State. (Sims-ISWS)
W78-00698

WATER CONDITIONS AND FLOOD EVENTS IN CALIFORNIA, WATER YEAR 1975-76.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2E.
W78-00718

1975 ANNUAL REPORT.
National Oceanic and Atmospheric Administration, Oak Ridge, Air Resources Atmospheric Turbulence and Diffusion Laboratory, TN.
For primary bibliographic entry see Field 5A.
W78-00721

SUMMARY OF ACTIVITIES AND PLANS-FY 1976-1977,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00722

METEOROLOGICAL EFFECTS OF ENERGY DISSIPATION AT LARGE POWER PARKS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00723

PHOTOGRAPHIC ASSESSMENT OF DECIDUOUS FOREST RADIATION REGIMES,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
B. A. Hutchison.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 45-219, September 1976. 69 fig, 8 tab, 102 ref. NSF AG-199, BMS69-01147 A09.

Descriptors: *Radiation, *Solar radiation, *Forests, Model studies, On-site investigations, On-site data collections, Mathematical models, Light, Light intensity, Microenvironment, Vegetation, Trees, Photography, Hardwood, Deciduous forests, Forestry, Meteorology.
Identifiers: Forest canopy.

A model of forest radiation was proposed that assumes that radiation in the forest is composed of a spatially non-varying diffuse component, upon which is superimposed a spatially varying direct beam component. Structural parameters required to drive the model were obtained from measurements made on hemispherical canopy photographs. Predictions calculated using the model and measurement approach were compared to observed data collected in the forest on clear, partly cloudy, and overcast days. Agreement between prediction and observation generally was poor. The assessment technique overestimates the penetrating, transmitted, and down-reflected diffuse radiation in the forest on all days, and it underestimates the transmitted and down-reflected direct beam radiation on clear to partly cloudy days. The predicted space distributions of direct beam radiation extend to higher flux densities than were observed, and the predicted distributions were bimodal. Only at the 16 meter level around midday is there any evidence of bimodality in the observed data. Lack of agreement between prediction and observation was attributed to photo exposure problems and deficiencies in the model. Methods of minimizing the problem arising from photo exposure and modifications of the model were suggested, and further test of this assessment technique were proposed. (See also W78-00721) (Sims-ISWS)
W78-00725

MODELING SMOG ALONG THE LOS ANGELES-PALM SPRINGS TRAJECTORY,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00726

RESEARCH REQUIRED FOR PREDICTING THE BEHAVIOR OF PRESSURIZED GASES ESCAPING INTO THE ATMOSPHERE,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00727

TIME DEPENDENT MESOSCALE WIND FIELDS OVER COMPLEX TERRAIN,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
C. J. Nappo, Jr.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 293-309, September 1976. 8 fig, 1 ref.

Descriptors: *Winds, *Topography, *On-site investigations, *Tennessee, Temporal distribution, Spatial distribution, Variability, Mountains, Stability, Balloons, Atmosphere, Meteorology.
Identifiers: *Mesoscale wind fields, Trajectories, Tetroons.

Wind soundings simultaneously made at 5 stations over a mesoscale region of complex terrain during the Eastern Tennessee Trajectory Experiment (ETTEX) were analyzed, objectively, vertically averaged, and interpolated over a uniform grid. The temporal and spatial variability of the resulting mesoscale wind field was examined for several

observation periods, each lasting about 6 hours. Finally, the observed trajectories of tetroons were compared with trajectories computed using wind fields measured during the tetroon flights. A result of the analysis was that during stable night time conditions, the wind field has marked horizontal variability which diminishes with the development of convective boundary layer. Hence, terrain effects may be more significant in their effect on the mesoscale flow at night than during the day. (See also W78-00721) (Sims-ISWS)
W78-00728

ATMOSPHERIC DISPERSION MODELS FOR ENVIRONMENTAL POLLUTION APPLICATIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00729

RELATIVE DIFFUSION OF TETROON PAIRS DURING CONVECTIVE CONDITIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 357-363, September 1976. 5 fig, 1 tab, 17 ref.

Descriptors: *Winds, *Diffusion, *Tennessee, On-site investigations, Balloons, Shear, Convection, Turbulence, Data processing, Meteorology.
Identifiers: *Tetroons.

Observations of the relative diffusion of 13 sets of tetroon pairs in the mixed layer during convective conditions in eastern Tennessee were reported. The root-mean-square separation, S, is proportional to time, t, raise to a power of 1 for times from 2 to 30 min and a power of 0.75 for times from 30 to 100 min. On the average, the observations are satisfied by the approximation dS/dt = sigma sub v, where sigma sub v is the standard deviation of the lateral wind speed fluctuations, as sensed by the tetroon. (See also W78-00721) (Sims-ISWS)
W78-00731

STANDARD DEVIATION OF WIND DIRECTION AS A FUNCTION OF TIME; THREE HOURS TO FIVE HUNDRED SEVENTY-SIX HOURS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
W. M. Culkowski.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 377-385, September 1976. 2 fig, 1 tab, 7 ref.

Descriptors: *Winds, *Dispersion, *Air pollution, Data processing, Statistics, Time, Climatology, Pollutants, Path of pollutants, Powerplants, Meteorology.
Identifiers: Standard deviation, Wind directions.

The standard deviation of horizontal wind direction, sigma sub theta increases with time of averaging up to a maximum value of 104 degrees. The average standard deviation of horizontal wind directions averaged over periods of 3, 5, 10, 16, 24, 36, 48, 72, 144, 288, and 576 hours were calculated from wind data obtained from a 100 meter tower in the Oak Ridge area. For periods up to 100 hours, sigma sub theta is proportional to t to the 0.28 power; after 100 hours sigma sub theta is proportional to 6.5 ln t. (See also W78-00721) (Sims-ISWS)
W78-00733

BEAM ENRICHMENT OF DIFFUSE RADIATION IN A DECIDUOUS FOREST,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
B. A. Hutchinson, and D. R. Matt.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 395-423, September 1976. 6 fig, 4 tab, 10 ref, 1 append. ERDA AG-199, BMS69-01147 A09.

Descriptors: *Radiation, *Solar radiation, *Forests, *Model studies, Mathematical models, On-site investigations, On-site data collections, Deciduous forests, Trees, Vegetation, Light, Light intensity, Forestry, Meteorology.

By applying a model to solar radiation data collected in and above an East Tennessee deciduous forest, solar radiation budgets were approximated for 3 forest levels within the winter leafless, spring leafless, summer fully leafed, and autumnal fully leafed forest phenoseasons. Beam radiation dominates the budgets throughout the year and varies directly with solar elevations. Although beam radiation penetration is severely reduced in the fully leafed forest, the component still accounts for over 1/2 the total radiation received within the forest in early autumn, the phenoseason of minimal beam penetration. Beam enrichment of diffuse radiation within the forest is also highly dependent upon solar elevation and canopy biomass density. Maximum beam enrichment occurs in summer with the high solar elevation of that season and a fully leafed canopy. Minimum enrichment occurs in the leafless winter forest when solar elevations are lowest and canopy biomass density is minimal. The penetration of diffuse sky radiation is maximal in the leafless forest and minimal in the fully leafed forest but, because of limitations of the model used in the approximation, the quantity appears insensitive to changes in solar elevations. The mentioned limitation is a defect of the model, but it should not alter substantially the indicated results. (See also W78-00721) (Sims-ISWS)
W78-00735

UNIFORMITY AMONG WEATHER MODIFICATION LAWS,
Arizona Univ., Tucson. School of Law.
R. J. Davis.
Journal of the Irrigation and Drainage Division, Proceeding of ASCE, Volume 102, No IR3, p 285-294, September 1976. 1 tab, 11 ref. OWRT A-064-ARIZ(3).

Descriptors: *Weather modification, *Cloud seeding, Precipitation(Atmospheric), Rainfall, *Water law, Legislation, Legal aspects.
Identifiers: *Water modification loss.

Advocates of weather modification would do well to consider the advantages of uniformity and of diversity in laws relating to cloud seeding. They should support state legislation that promotes uniformity where it is useful and retains diversity where it is rational to do so. When additional federal legislation is considered, the weather modification community should press for provisions that permit retention of diversity among states where it is advantageous. Neither Procrustes nor Balkalnization should prevail. (See also W76-10809 and W76-00923) (Skogerboe-Colorado State)
W78-00745

THE DROUGHT,
Geological Survey, Reston, VA. Water Resources Div.
T. J. Buchanan, and B. K. Gilbert.
Water Spectrum, Vol 9, No 2, p 6-12, Summer 1977.

Descriptors: *Droughts, *United States, *Water shortage, *Environmental effects, *Rationing(Water), Surface waters, Groundwater resources, Agroclimatology, Hydroelectric power, Recreation, Water supply, Water conservation, Water management(Applied).

Water supply problems are legion but the most severe so far in the United States during 1977 are in the northern half of California. In that area, Water rationing with both mandatory and voluntary restrictions is being implemented in many communities. In some areas of Oregon, there have been industrial layoffs because of water cutbacks, and similar circumstances are anticipated in other stricken areas. Agriculture has been seriously affected throughout the current drought. In the Northwest, which relies on hydropower for 80 percent of its electricity, reservoir content is well below normal; the snow pack is extremely deficient; and, consequently, the outlook for power production this summer is very bleak. In many places, there has been insufficient water in the streams for spawning by various species of fish; in other areas streams have dried up, killing the entire fish population. Recreational opportunities have also been curtailed. In addition to voluntary conservation measures and rationing, efforts are underway in many areas to tap new supplies and redevelop old ones. Thousands of wells have been drilled and a multitude of existing wells are being deepened in an attempt to provide relief to domestic, municipal, industrial and agricultural users. To assist the affected areas, President Carter has proposed a comprehensive drought-assistance package that asks for $594 million in loans and $250 million in grant monies. (Woodard-USGS)
W78-00807

RELATION BETWEEN EARTHQUAKES, WEATHER, AND SOIL TILT,
Geological Survey, Reston, VA. Geologic Div.
For primary bibliographic entry see Field 7B.
W78-00823

THE OCCURRENCE OF DROUGHT AND ITS PROBABILITIES IN THE BAIXADA FLUMINENSE, RIO DE JANEIRO, (IN PORTUGESE),
Instituto de Pesquisa Agropecuaria do Centro-Sul, Mato Grosso (Brazil).
For primary bibliographic entry see Field 2A.
W78-00843

2C. Snow, Ice, and Frost

FUTURE SEA-LEVEL CHANGES DUE TO WEST ANTARCTIC ICE SHEET FLUCTUATIONS,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Cooperative Inst. for Research in Environmental Science, Boulder, CO.
J. A. Clark, and C. S. Lingle.
Nature, Vol 269, No 5625, p 206-209, September 15, 1977. 4 fig, 13 ref. NSF DES74-13047-A01, NSF EAR74-13047-A02.

Descriptors: *Forecasting, *Sea level, *Model studies, *Glaciology, *Antarctic, Glaciohydrology, Mathematical models, Melt water, Equations, Geophysics, Variability, Water levels.
Identifiers: *West Antarctic ice sheet, Ice thinning, Global sea level changes.

Global sea level changes which would result from an instantaneous uniorm thinning of the possibly unstable West Antarctic ice sheet were calculted and found to be nonuniform. Sea level changes corresponding to future changes in the West Antarctic ice sheet will be affected by (1) changes in gravitationsal attraction exerted by the ice sheet on the surrounding ocean, (2) the Earth's immediate elastic response to changed ice and water

loads, and (3) the Earth's long-term response due to viscous flow within the mantle. At locations distant from the ice sheet (Hawaii, New York, the North Sea), immediate submergence would be followed by gradual emergence. At New Zealand, immediate submergence would be followed by gradual additional submergence, then slow emergence would begin after 2,500 yr. At locations close to the ice sheet (Cape Horn, the Ross Ice Shelf), the sea level would fall for 1,100 yr, then rapid submergence would start resulting in a net sea level rise after 10,000 yr equal to about 92% of the average global rise. (Humphreys-ISWS)
W78-00518

WATER CONDITIONS IN CALIFORNIA, BASIC DATA SUPPLEMENT.
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 2B.
W78-00545

LIDAR OBSERVATIONS OF HIGH PLAINS THUNDERSTORM PRECIPITATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W78-00687

PREDICTION OF ARCTIC ICE CONDITIONS FOR OPERATIONS,
Washington Univ., Seattle. Arctic Ice Dynamics Joint Experiment Office.
For primary bibliographic entry see Field 5G.
W78-00860

SEA ICE THICKNESS PROFILING AND UNDER-ICE OIL ENTRAPMENT,
Cold Regions Research and Engineering Lab., Fairbanks, AK.
For primary bibliographic entry see Field 5G.
W78-00861

2D. Evaporation and Transpiration

EFFECT OF TRANSPIRATION OF SOIL WATER AVAILABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
M. E. Ginzburg.
Vestn Mosk Univ Ser Vi Biol Pochvoved 30(1), p 81-86, 1975.

Descriptors: *Transpiration, *Soil water, Soil moisture, *Moisture content, Plant growth.
Identifiers: *Soil moisture pressure.

The level of potential transpiration greatly influences the dependence of relative transpiration on soil moisture pressure. In estimating the soil water availability to plants by soil moisture pressure, the meteorological conditions must be considered.--Copyright 1976, Biological Abstracts, Inc.
W78-00506

DEPENDENCE OF TRANSPIRATION AND DIFFUSION PRESSURE IN PLANTS ON SOIL MOISTURE CONTENT AND POTENTIAL, (IN BULGARIAN),
Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Hydrotechnics and Ameliorations.
S. Koleva.
Fiziol Rast (SOFIA) 1(2), p 63-72, 1974.

Descriptors: *Transpiration, *Diffusion, Plant growth, *Soil moisture, *Moisture content, Corn(Field), Temperature.

The dependence of plant (corn) transpiration and diffusion pressure deficit (DPD) on the soil moisture content and potential is discussed. Higher temperature leads to a reduced rate of transpiration in the case of higher soil moisture content, especially at lower moisture potential. At equal temperature conditions the more compact soil reduces the rate of transpiration in case of higher moisture content. Soil moisture critical for the transpiration rate ranges in accordance with the meteorological and soil conditions of the investigation within the limits of 70-100% of the maximum field water capacity or within the limits of 0.3-3.5 atm. The DPD of the plants did not surpass 4 atm. of water potential within the mentioned limits at soil density 1.34g/cm. When the soil density was 1.5g/cm2 and DPD of the soil solution was about 2 atm., the DPD of the plants reached 5-6 atm., i.e., more compact soil makes difficult the plant water supply at higher soil moisture, respectively at lower moisture pressure.--Copyright 1976, Biological Abstracts, Inc.
W78-00515

A COMPARATIVE STUDY OF THE EFFECTS OF ALBEDO CHANGE ON DROUGHT IN SEMI-ARID REGIONS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W78-00686

SIGNIFICANCE OF VEGETATION IN INTERPRETING THERMAL RADIATION FROM A TERRESTRIAL SURFACE,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 7B.
W78-00694

PHOTOGRAPHIC ASSESSMENT OF DECIDUOUS FOREST RADIATION REGIMES,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00725

BEAM ENRICHMENT OF DIFFUSE RADIATION IN A DECIDUOUS FOREST,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00735

CONTRIBUTIONS TO THE STUDY OF WATER BALANCE ELEMENTS IN THE REDDISH-BROWN SOIL AREA OF BANEASA-BUCHAREST, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
X. L. Tran, C. I. Florescu, and A. Canarache.
An Inst Stud Cercet Pedol. 40, p 115-126, 1972.

Descriptors: *Water balance, Soils, Soil types, *Corn(Field), Mulches, Infiltration, Transpiration, Irrigation, Evaporation, *Moisture content, *Soil moisture.
Identifiers: *Romania(Baneasa-Bucharest), Reddish-brown soils.

The results of an experiment carried out in 1970-1971 in a field planted to corn are described. Observations on moisture content of soil (up to 1.5 m deep) were made twice monthly throughout the vegetation period. The experimental design included cultivated, uncultivated and straw-mulched treatments, as well as treatments covered with plastic foil, and was devised so as to allow the estimation of the 3 elements composing the total water consumption, i.e., evaporation, transpiration and infiltration, by comparing the water consumption in the different treatments. Although irrigation was effective, at a total consumption of 440-560 mm water about 40% are lost by infiltration due to the lack of uniformity in rainfall distribution during the vegetation period, a fact emphasizing the need of reevaluating the measures for a highly effective use of water. Water consumption by evaporation (about 20%) plus transpiration (about 40%) ranged 300-380 mm and was comparable to the total consumption recorded in areas with similar temperature relationships but with a rainfall regime not permitting losses by infiltration.--Copyright 1975, Biological Abstracts, Inc.
W78-00776

REGULATIVE ROLE OF TRANSPIRATION IN TEMPERATURE REGIME OF DRY FRUITS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
A. A. Prokof'ev, B. A. Rybalova, and K. M. Kats.
Fiziol Rast. 21(1), p 108-112, 1974.

Descriptors: *Transpiration, Fruits, Fruit crops, *Temperature, Regulation, Air temperature, Humidity.

The temperature and transpiration of the fruits determined in oil-bearing poppy. The temperature of atmospheric air differed from that within the fruit. In young fruits (up to the 12th day after flowering) with intensive transpiration the temperature within the capsule is lower than the temperature of atmospheric air. In more mature fruits (12-25 days after flowering) with weak transpiration the temperature within the capsule is higher than that of atmospheric air. Incubation of the fruits in humid chambers decreased their transpiration and sharply increased the temperature within the fruits. Intensification of transpiration (by decreasing humidity of surrounding air or by increasing intensity of illumination) reduces the temperature within the fruit. Transpiration of the dry fruits is presumed to play an important role in regulation of the temperature regime within the fruits.--Copyright 1975, Biological Abstracts, Inc.
W78-00841

2E. Streamflow and Runoff

PRESERVATION OF CORRELATION IN GENERATED HYDROLOGIC SAMPLES THROUGH TWO-STATION MODELS,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. T. Kottegoda, and V. Yevjevich.
Journal of Hydrology, Vol. 33, No. 1/2, p 99-121, March 1977. 6 fig, 6 tab, 19 ref. ENG-74-17396,GK-31529x2.

Descriptors: *Time series analysis, *Statistical methods, *Stochastic processes, *Persistence, *Distribution patterns, Data processing, Hydrology, Streamflow, Simulation analysis, *Correlation analysis, Model studies.
Identifiers: *Auto-regressive models, *Data generation, Bivariate models.

The validity of two-station generation models for preserving serial and cross-correlations was investigated by generating 200 samples of annual flows for each of ten river gaging stations. The four models tested were developed by Fiering, Kahan-Lawrence, Yevjevich, and Matalas. Results show biases and variances in estimated autocorrelation and cross-correlation coefficients of generated series, either of historic sample sizes or of samples of size 200. The four models basically are equivalent in their results, leading to the conclusion that the model should be used which is the simplest to apply and has the best physical justification for the series analyzed and modeled. The basic autocorrelation in annual flow series is the result of water retention in the basins. Estimates of the serial correlation coefficients are biased downward, even in the case of a more complex, multivariate model. (Singh-ISWS)

W78-00531

HYDROLOGICAL SYSTEM RELIABILITY AT THE CONFLUENCE OF RIVERS,
Water Resources Centre, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W78-00637

A TEST FOR DISTINGUISHING BETWEEN EXTREME VALUE DISTRIBUTIONS,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
W. E. Bardsley.
Journal of Hydrology, Vol. 34, No. 3/4, p 377-381, August 1977. 2 fig, 1 tab, 9 ref.

Descriptors: *Flood frequency, *Analytical techniques, *Distribution patterns, Statistical methods, Methodology, Flood peak, Hydrology, Data processing, Foreign research, Mathematical studies.
Identifiers: *Extreme value distribution, Null hypothesis, Upper bound.

Extreme value distributions were used for estimating probabilities of flood events. The distributions wer Type I, Type II, and Type III: The Type III distribution possesses an upper bound, but the others do not. The correct choice of distribution is important for flood probability studies as the 3 types may differ considerably in their right tails. The choice of distribution was made on the statistical analyses of the available data. A test was postulated where the null hypothesis is the Type-I distribution and the alternative is 1 of the other extreme value distributions. Power curves were given for sample sizes of 50 and 100. (Singh-ISWS)
W78-00681

WATER CONDITIONS AND FLOOD EVENTS IN CALIFORNIA, WATER YEAR 1975-76.
California State Dept. of Water Resources, Sacramento.
Bulletin No. 202-76, July 1977. 86 p, 32 fig, 6 tab, 2 append.

Descriptors: *Water resources, *Floods, *Precipitation(Atmospheric), *California, Rainfall, Snowpacks, Runoff, Reservoir storage, Hydrographs, Streamflow, Rivers, Reservoir operation, Reservoirs, Droughts, Weather, Distribution patterns, Hurricanes, Storms, Water supply, Water transfer, Flash floods, Disasters, Peak discharge, Meteorology, Climatology, Hydrology.

Water year 1975-76 was the third driest year of this century in California. The weather scene was dominated by a persistent high pressure ridge in the atmosphere off the California coast. The blocking high displaced the storm track northward of its usual winter path over California, leaving most of the State deficient in precipitation, runoff, and reservoir storage, and almost devoid of flood events. Ironically, the year also brought the first tropical storm in 30 years to the State. During the water year (October 1, 1975 - September 30, 1976), 28 counties were declared drought disaster areas, and 4 counties were declared flood disaster areas; 3 counties were affected by both disasters. This bulletin included descriptions of weather patterns preceding and during significant storm periods; information on precipitation, snow pack, unimpaired runoff, and reservoir storage; and hydrographs of stream stages and reservoir operations, weir overflow graphs, and tabulation of peak streamflow and stages. (Sims-ISWS)
W78-00718

POSSIBLE FAILURE OF THE LOW-SILL CONTROL STRUCTURE AT OLD RIVER, LOUISIANA, ECONOMIC AND PHYSICAL CONSEQUENCES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
J. S. Horne.
Louisiana Water Resources Research Institute Bulletin No. GT-5, July 1976. 64 p, 16 fig, 28 ref, append.

Descriptors: *Mississippi River, *Louisiana, *Dam failure, Control structures, Diversion structures, Floods, Flood control, Floodways, Flood damage, River regulation, Risks, Disasters, Water quality, Navigation.
Identifiers: *Disaster planning, *Atchafalaya River(La).

During the record flood of 1973, scouring partially undermined the low-sill control structure at Old River, Louisiana, a gated dam built to regulate permanently the diversion of water into the Atchafalaya River. Failure of the structure, which could occur during a similar flood period, would allow continuously increasing discharge into the Atchafalaya, with serious consequences for south Louisiana. Surface transportation across the Atchafalaya Basin could be curtailed, if not halted, because any of the 5 highway and 4 railroad bridges spanning the main channel could be washed out. Navigation conditions in both the Mississippi and Atchafalaya Rivers would be altered. The flooding of communities in the basin and overtopping of the East and West Basin Protection Levees would be probable. During low water periods, the quality of Mississippi River water downstream from the structure would deteriorate because of salt water intrusion. Hydrocarbon production within the basin would be halted during flood periods and hampered year round by the higher normal stages of the Atchafalaya. The daily transmission of 8.4 billion cubic feet of natural gas and 1.55 million barrels of petroleum products for interstate use, as well as 4 billion cubic feet of natural gas for intrastate chemical industries and power stations, could be halted due to pipeline ruptures during flood periods. Because the increased discharge and backwater flooding of the Atchafalaya River would permanently inundate at least 30,000 more acres, the recreational and commercial value of the lower basin would diminish. Recommended action to reduce the effects of such a failure are the: development of alternate water supplies for industries and municipalities downstream from Old River; rerouting of existing hydrocarbon and electric transmission systems around the basin; controlling of channel erosion to protect bridges; and studying the feasibility of a replacement control structure. (Lee-ISWS)
W78-00719

ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL-FLOW STREAMS IN MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
S. W. Wandle, Jr.
Water-Resources Investigations 77-39 (open-file report), 1977. 26 p, 6 fig, 5 tab, 18 ref.

Descriptors: *Peak discharge, *Floods, *Flood frequency, *Massachusetts, *Streams, Natural flow, Streamflow, Gaging stations, Flow rates, Regional analysis, Forecasting, Regression analysis, Equations, Drainage area, Channel morphology, Precipitation(Atmospheric), Water storage, Evaluation.

The magnitude and frequency of floods on natural-flow streams in Massachusetts, with drainage areas between 0.25 square mile and 497 square miles, may be estimated from drainage area, main channel slope, a precipitation index, and a storage factor. Multiple-regression techniques were used to define the relationship between basin and climatic characteristics, and flood peaks for 113 gaging stations. Flood-frequency and magnitude data at the gaging stations were computed using the guidelines recommended by the U.S. Water Resources Council. It was found that flood peaks of rural, unregulated Massachusetts streams can best be defined by dividing the State into an EASTERN MASSACHUSETTS and a WESTERN MASSACHUSETTS flood-frequency region. The regression equations relate peak discharges with 0.5, 0.2, 0.1, 0.04, 0.02, 0.01, 0.005, and 0.002 exceedance probabilities to basin and climatic parameters. Standard errors of estimate ranged from 42 to 70 percent for the eastern river basins and from 32 to 68 percent for the western river basins. The defined estimating relations do not apply to streams where the flood flows are significantly affected by regulation where the usable man-made storage is over 4.5 million cubic feet per square mile, or by diversions or urbanization, or where the basin indices are outside a specified range. Also, these equations should not be used for basins in eastern Plymouth County, or Barnstable, Dukes, or Nantucket Counties where the available data are insufficient to determine the influence of high infiltration and storage capacities of drainage basins on flood flows. (Woodard-USGS)
W78-00812

PROGRESS REPORT ON STUDY OF MAGNITUDE AND FREQUENCY OF FLOODS ON SMALL DRAINAGE AREAS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00816.

2F. Groundwater

NORTHERN KALAHARI GROUNDWATERS: HYDROLOGIC, ISOTOPIC AND CHEMICAL STUDIES AT ORAPA, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
E. Mazor, B. Th. Verhagen, J. P. F. Sellschop, M. T. Jones, and N. E. Robins.
Journal of Hydrology, Vol. 34, No. 3/4, p 203-234, August 1977. 14 fig, 9 tab, 16 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Aquifers, *Africa, *On-site investigations, Groundwater, Water quality, On-site tests, Well data, Isotope studies, Cations, Water yields, Foreign research, Tritium, Groundwater recharge, Artesian aquifers, Pumping, Water levels, Natural recharge, Stable isotopes, Carbon radioisotopes.
Identifiers: *Orapa(Botswana).

Most students of the Kalahari thirstland have been in agreement that any groundwater encountered should be fossil as no rain recharge could occur in the vast sand-covered regions at present. The conclusion was challenged in the present study, during which intensive observations were made over 2 years on 27 boreholes and several shallow wells, situated in the sand-covered area of Orapa, in the northern Kalahari. Three aquifers are of importance in the region: a phreatic aquifer in the sandy Kalahari beds, a heterogeneous aquifer in the underlying highly jointed basalt, and a confined aquifer in the deeper-lying Cave sandstone. Rest level observations suggested that the phreatic Kalahari beds aquifer and the confined Cave sandstone aquifer are interconnected by occasional joints and solution zones in the intermediate basalt. The chemical composition of the various waters is in good agreement with the hydrological model. Tritium and 14C measurements showed clearly that the phreatic aquifer is recharged constantly by rain water. The confined Cave sandstone aquifer, on the other hand, is devoid of tritium and devoid of, or low in, 14C, indicating that the aquifer is not leaking, or it is leaking very slowly and water exchange with the upper aquifers is negligible. It is felt that intensive abstractions

from the aquifer may provide space for active recharge. Stable.isotopes determinations rule out any recharge from pans, lakes, or the river system in the north. Recharge occurs by direct rain infiltration, without any intermediate evaporation. (Humphreys-ISWS)
W78-00521

ANALYTIC SOLUTION FOR DRAWDOWN IN AN UNCONFINED-CONFINED RECTANGULAR AQUIFER,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
Y. K. Chan, N. Mullineux, and J. R. Reed.
Journal of Hydrology, Vol. 34, No. 3/4, p 287-296, August 1977. 3 fig, 2 ref, 1 append.

Descriptors: *Drawdown, *Aquifers, *Mathematical models, *Equations, *Rainfall, Water wells, Pumping, Confined water, *Groundwater, Aquifer characteristics.
Identifiers: *Analytic solutions, *Unconfined-confined aquifers, Rectangular aquifers.

Analytical solutions for the drawdowns due to pumping from a rectangular, unconfined-confined aquifer subject to rainfall on the unconfined part were given. A solution with general rainfall and with time counted from the start of abstraction was shown to involve more extensive computation than is usually warranted. The amount of computation can be very considerably reduced by considering the rainfall to be periodic (either x-dependent or uniform) and by seeking the eventual periodic drawdown. Since the problem is linear, the drawdown due to a number of abstraction wells in the confined aquifer is merely the sum of the drawdowns due to each individually. (Visocky-ISWS)
W78-00522

OBSERVATION WELL RESPONSE TIME AND ITS EFFECT UPON AQUIFER TEST RESULTS,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 4B.
W78-00523

SIMILARITY SOLUTIONS FOR CONVECTION OF GROUNDWATER ADJACENT TO HORIZONTAL IMPERMEABLE SURFACES WITH AXISYMMETRIC TEMPERATURE DISTRIBUTION,
Hawaii Univ., Honolulu. Dept. of Mechanical Engineering.
P. Cheng, and W. C. Chau.
Water Resources Research, Vol. 13, No. 4, p 768-772, August 1977. 8 fig, 2 tab, 12 ref. NSF GI-38319, ERDA E(04-3)-1093.

Descriptors: *Groundwater movement, *Convection, *Water temperature, *Model studies, Mathematical models, Porous media, Groundwater, Heat transfer, Temperature, Heat flow, Heated water, Velocity, Permeability.
Identifiers: Groundwater convection, Free convection, *Heat dispersion, Thermal diffusivity.

The axisymmetric buoyancy-induced groundwater flow adjacent to horizontal impermeable surfaces, wall temperature being a power function of radius, was discussed in this paper. With the boundary layer simplifications, the governing nonlinear partial differential equations can be transformed into a coupled pair of nonlinear ordinary differential equations with two-point boundary conditions that can be integrated numerically by established techniques. Simple algebraic expressions for boundary layer thickness and heat transfer rate were obtained. Applications to free convective flow in a liquid-dominated geothermal system at high Rayleigh numbers were discussed. (Sims-ISWS)
W78-00532

MACROSCOPIC DISPERSION IN POROUS MEDIA: THE CONTROLLING FACTORS,
Alberta Univ., Edmonton. Dept. of Geology.
F. W. Schwartz.
Water Resources Research, Vol. 13, No. 4, p 743-752, August 1977. 7 fig, 10 ref, 1 append.

Descriptors: *Dispersion, *Porous media, *Model studies, Mathematical models, Hydraulic conductivity, Permeability, Porosity, Pores, Soil water, Soil water movement, Soils, Soil science, Groundwater, *Groundwater movement, Subsurface flow.
Identifiers: *Macroscopic dispersion.

One of the most important limitations to the application of modeling techniques for the analysis of mass transfer in groundwater systems is the difficulty in characterizing the dispersive character of natural systems. Although large quantities of experimental data exist for laboratory scale experiments, the handful of measurements which have been obtained from regional systems suggest that dispersion produced by large-scale porous medium nonidealities is considerably more important. The effects of macroscopic dispersion were simulated for uniform heterogeneous porous media under conditions of one-dimensional flow. The idealized media considered for detailed analysis consisted of low-permeability inclusions within a higher-permeability medium. When the inclusions are not arranged rather homogeneously within the region, a unique dispersivity value for the medium cannot be defined, and dispersivity changes as a function of space. The magnitude of dispersion is controlled by the contrast in hydraulic conductivity between the inclusions and the remainder of the medium, the number of inclusions, and the mode of aggregation. Generally, dispersivity was found to decrease as the conductivity contrast decreases and the structure of the medium is regularized. It will be possible to estimate the dispersivity of a medium by using stochastic analysis. Hypothetical porous media with characteristics similar to those of some actual medium will yield a range of dispersivity values. The basic data for the technique will be detailed statistical analysis of the mode of porous medium aggregation and the conductivity contrasts within the medium. (Sims-ISWS)
W78-00541

EVALUATION OF THE STORAGE OF DIFFUSE SOURCES OF SALINITY IN THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W78-00550

STUDIES OF SAPROLITE AND ITS RELATION TO THE MIGRATION AND OCCURRENCE OF GROUNDWATER IN CRYSTALLINE ROCKS,
Georgia Inst. of Tech., Atlanta Environmental Resources Center.
For primary bibliographic entry see Field 2G.
W78-00564

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: APPLICATION OF LINEAR SYSTEMS ANALYSIS TO GROUND WATER EVALUATION STUDIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
C. T. Bathala, A. Ramachandra Rao, and J. A. Spooner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 886, Price codes: A07 in paper copy, A01 in microfiche. Technical Report No 91, February 1977. 128 p, 52 fig, 40 tab, 57 ref, 2 append. OWRT C-6106(5213)(2).

Descriptors: *Storage coefficient, *Transmissivity, *Water resources development, *Groundwater movement, Water tables, *Aquifers, Surface-groundwater relationships, Subsurface flow, Water storage, Groundwater reservoirs, Aquifer characteristics, Groundwater resources, City planning, Systems analysis.
Identifiers: *Linear Systems Analysis.

A generalized linear model is used to analyze groundwater flow in a stream-well-aquifer system. A procedure is developed to predict aquifer response by considering the cause and effect relationships of the groundwater flow system. In this procedure, historical records of pumping rates, groundwater levels and stream stages, and estimated storage coefficients are used as inputs. The utility of this procedure for analysis of regional aquifer systems is demonstrated by using both field and hypothetical data and satisfactory results are obtained. The procedure developed does not require predetermined transmissivity and storage coefficient values. The procedure is less subjective and appears to be more reliable than the type curve method for determination of the aquifer transmissivity and the storage coefficient from pumping test data. The causal relationships between precipitation, river stages and groundwater level were investigated by using the tests based on regression theory and the likelihood approach. Stochastic models for groundwater levels are developed after incorporating these causal relationships. This procedure was found to yield better stochastic models for groundwater levels.
W78-00570

MATHEMATICAL MODEL OF ULUOVA PLAIN, TURKEY - A TRAINING AND MANAGEMENT TOOL,
Belgrad Univ. (Yugoslavia).
For primary bibliographic entry see Field 2A.
W78-00692

TRANSIENT SPHERICAL FLOW TO A CAVITY WELL OF FINITE DIAMETER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
C. S. Jaiswal, H. S. Chauhan, and B. P. Ghildyal.
Ground Water, Vol. 15, No. 5, p 372-376, September-October 1977. 4 fig, 3 tab, 12 ref.

Descriptors: *Flow, *Groundwater movement, *Wells, Transmissivity, Storage coefficient, Aquifers, Hydrology, Groundwater, Mathematical studies, Analysis.
Identifiers: *Nonpenetrating wells, Aquifer depth ratio, Small duration test, Transient spherical flow.

The system of flow into a nonpenetrating well with hemispherical bottom of finite radius in a finite deep artesian aquifer of infinite radial extent was analyzed. The solution was obtained in terms of error function. A method was suggested for determination of transmissivity, storage coefficient, and depth of aquifer from pump test data of such wells discharging at constant rate. For small values of radial distance to aquifer depth ratio and for small duration test, only a few were required in the present solution as compared to the solution of Hantush developed for such wells. (Lee-ISWS)
W78-00693

REVIEW OF C.E. JACOB'S DOUBLET WELL,
For primary bibliographic entry see Field 8B.
W78-00720

MAPS SHOWING GROUND-WATER CONDITIONS IN THE NORTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.

W78-00802

MAPS SHOWING GROUND-WATER CONDITIONS IN THE MONUMENT VALLEY AND NORTHERN PART OF THE BLACK MESA AREAS, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00803

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE BLACK MESA AREA, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00804

JARRETTSVILLE QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00805

BEL AIR QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00806

GROUND-WATER INVESTIGATION AT THE ALLUVIAL FAN OF THE SOUTH FORK EAGLE RIVER, ANCHORAGE, ALASKA - RESULTS OF TEST DRILLING, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00810

GROUND-WATER RESOURCES OF THE ALLUVIAL AQUIFERS IN NORTHEASTERN LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00811

CHEMICAL, ISOTOPIC, AND GAS COMPOSITIONS OF SELECTED THERMAL SPRINGS IN ARIZONA, NEW MEXICO, AND UTAH,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00815

RELATION BETWEEN EARTHQUAKES, WEATHER, AND SOIL TILT,
Geological Survey, Reston, VA. Geologic Div.
For primary bibliographic entry see Field 7B.
W78-00823

2G. Water In Soils

DEPENDENCE OF TRANSPIRATION AND DIFFUSION PRESSURE IN PLANTS ON SOIL MOISTURE CONTENT AND POTENTIAL, (IN BULGARIAN),
Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Hydrotechnics and Ameliorations.
For primary bibliographic entry see Field 2D.
W78-00515

AN EXPERIMENT IN RECLAIMING THE FLOODPLAIN LAND, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
T. V. Afanas'Eva, and B. V. Sheremet.
Vestn Mosk Univ. Sek Vi Biol Pochvoved 30(1), p 87-98, 1975.

Descriptors: *Flood plains, Land reclamation, *Soil reclamation, Vegetation.
Identifiers: *USSR(Ob flood plain), Tomsk region.

Work was carried out on the territory of the Ob floodplain in the southern part of the Tomsk region (USSR). A scheme of soil reclamation groups is proposed and recommendations on rational land use are given. The importance of forming the group on the basis of correlation of their soil components, vegetable cover and relief is emphasized. --Copyright 1976, Biological Abstracts, Inc.
W78-00519

NITRATE-NITROGEN AND CHLORIDE MOVEMENT THROUGH UNDISTURBED FIELD SOIL,
Alabama A and M Univ., Normal.
For primary bibliographic entry see Field 5B.
W78-00520

A POROUS CUP SOIL-WATER SAMPLER WITH VOLUME CONTROL,
Newfoundland Forest Research Centre, St. John's.
T. L. Chow.
Soil Science, Vol. 124, No. 3, p 173-176, 1977. 2 fig, 4 ref.

Descriptors: *Soil water, *Water sampling, *Instrumentation, Equipment, Design, Volume, Mercury, Negative pressure, Soil moisture meters, Sampling.
Identifiers: *Porous cup, *Ceramic, *Vacuum.

The design, construction, and application of an inexpensive, mercury-pressure control device, designed for use in combination with the constant vacuum, porous cup, soil-solution sampler, were given. The unit has the ability to shut off the constant pressure source when a predetermined volume of water has been collected. The newly designed assembly inherits all the advantages of the original design, and it eliminates the contamination resulting from overfilling of sample bottles and the influence of soil volume. (Visocky-ISWS)
W78-00529

A COMPARISON OF EXACT AND NUMERICAL SOLUTIONS OF THE DIFFUSION EQUATION NEAR SINGULARITIES,
Universite Scientifique et Medicale de Grenoble (France). Inst. de Mecanique.
M. Vauclin, R. Haverkamp, J. Touma, G. Vachaud, and J. -Y. Parlange.
Soil Science, Vol. 124, No. 3, p 181-185, 1977. 5 fig, 8 ref.

Descriptors: *Soil water movement, *Diffusion, *Equations, *Mathematical models, Numerical analysis, Mathematical studies, Mathematics, Model studies, Soil water, Flow.
Identifiers: Singularities.

Discontinuous boundary or initial conditions introduce singularities in the solution of the diffusion equation. Numerical techniques cannot describe such singularities exactly. Hence, it is important to be able to evaluate a priori the error of the numerical approximation near singularities. It was proposed that an exact solution with both spatial and temporal singularities can be used to assess the precision of the numerical approach. The assessment carried out for a particular case can be used to give an indication of the validity of the numerical technique for more general problems when no exact solution is available. (Visocky-ISWS)

W78-00530

EXTENSION OF THE SIMILARITY HYPOTHESIS USED FOR MODELING THE SOIL WATER CHARACTERISTICS,
Colorado State Univ., Fort Collins. Engineering Research Center.
Y. Mualem.
Water Resources Research, Vol. 13, No. 4, p 773-780, August 1977. 13 fig, 14 ref. NSF ENG76-11542.

Descriptors: *Soil water, *Hysteresis, *Soil moisture, *Model studies, Mathematical models, Soils, Wetting, Drying, Curves, Soil physics, Soil physic properties, Soil science.

Two independent domains models were derived by using an extended similarity hypothesis, according to which the pore water distribution function is interpreted to be f(r,rho) = h(r)h(rho). When the hypothesis was applied to the Neel diagram and the Mualem diagram, it yielded 2 different models which permit prediction of the hysteretical relationship from only 1 branch of the main hysteresis loop. The models yield an extremely simple formula for the relationship between the boundary drying and wetting curves. Moreover, a universal nondimensional hysteresis was derived for all soils. Comparison with experiments showed that the model which used the Neel diagram fails to reproduce a reasonable shape of the hysteresis curves. However, much better results were achieved by the second model, which used the Mualem diagram. In some cases the predicted curves were in very good agreement with the observed ones. For soils in which blockage against air entry plays a significant role, the model is less efficient as a predictive tool. It yields poor results in the region of high water content, while the predicted curves are very close to the measured ones in the range of low water content. (Sims-ISWS)
W78-00533

INFILTRATION UNDER A PULSED WATER APPLICATION: 1. THE NATURE OF THE FLOW SYSTEM,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering; and Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
B. Zur, and D. Savaldi.
Soil Science, Vol. 124, No. 3, p 127-134, September 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Soil moisture, *Infiltration, *Rates of application, Laboratory tests, Model studies, Mathematical models, Irrigation, Depth, Soil water, *Soil water movement, Soil science.
Identifiers: *Pulsed water application.

The induced periodic changes in the volumetric soil water content, theta, at the various soil depths and the analogy of the soil water regime during infiltration under a pulsed water application to a wave propagation phenomenon was formulated and experimentally tested. The time changes in theta at a number of depths in soil columns receiving water under 2 pulsation regimes were well represented by a Fourier series. The computed amplitudes of the theta time changes were damped exponentially with depth, and the computed phase shifts increased linearly with depth, as expected by theory. A similar behavior was observed with the experimentally determined amplitudes. Under the higher instantaneous application rate and the time-averaged application rate, R sub av, values, however, no damping of the amplitude was observed at a soil depth range of 0.5-3.5 cm. Representative damping depths of 4-5 cm and 9-11 cm were obtained for the soil columns receiving water at R sub av values of 1.0 mm/hr and 5.0 mm/hr, respectively, for a period of 60 min. When periodic water pulses are applied at the soil surface, the induced time fluctuations in theta and q are exponentially damped with depth. Below the damping depth, the water pulses applied at the soil

surface are stretched almost evenly throughout the period. As a result, theta is constant with time and depth at a value determined by R sub av. (Sims-ISWS)
W78-00535

SOIL AIR PRESSURE UNDER SUCCESSIVE BORDER IRRIGATIONS AND SIMULATED RAIN,
Agricultural Research Service, St. Paul, MN.
D. R. Linden, R. M. Dixon, and J. C. Guitjens.
Soil Science, Vol. 124, No. 3, p 135-139, September 1977. 3 fig, 8 ref.

Descriptors: *Infiltration, *Irrigation, *Soil pressure, *Pressure head, On-site investigations, Soil physics, Soil water, Soil water movement, Pressure, Air, Air-earth interfaces, Agriculture, Soil science, Irrigation.

Soil air pressure and surface water head were measured at a single field site during eight irrigations of alfalfa during the 1972 growing season. Soil air pressure, h sub a, and surface water head, h sub w, were presented as functions of elapsed irrigation time to illustrate the short-term and seasonal variation of the parameters. It was shown that h sub a varies directly with h sub w, and that the head imbalance, h sub a - h sub w, increased at a decreasing rate during each irrigation, until it reached a plateau ranging between 4 and 7 cm, and, thereafter, it remained nearly constant until headgate closure. Small differences in h sub a - h sub w between irrigations may have had a significant effect on infiltration because total field application decreased as h sub a - h sub w increased. Soil air pressure increased under simulated rain when ponding began where airflow was restricted by an impermeable barrier at a 20-cm depth. The air pressure increase had little apparent effect on infiltration. Soil air pressure created and maintained from the onset of infiltration reduced infiltration by about 20%. (Sims-ISWS)
W78-00536

HYDROPHYSICAL REGIME OF FOREST SOILS DEPENDING ON FOREST CULTIVATION PRACTICES, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralny Botanichny Sad.
K. M. Yewsiyevich, and H. U. Myerkul'.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk 2, p 55-58, 1975.

Descriptors: *Forest soils, *Cultivation, *Fertilizers, Soil texture, *Soil density, *Moisture content, *Porosity, *Saturated soils, Forest management, Pine trees, *Soil moisture.
Identifiers: Cowberry.

The effect of cultivation and organic and mineral fertilizers on the water content and physical properties of coarse-textured soils of cowberry-pine forests was studied. The favorable effect was reflected in a decrease of soil bulk density and the increase of its porosity, moisture capacity and degree of saturation.--Copyright 1976, Biological Abstracts, Inc.
W78-00540

MACROSCOPIC DISPERSION IN POROUS MEDIA: THE CONTROLLING FACTORS,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-00541

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VII - AN INVESTIGATION OF THE VERTICAL AND HORIZONTAL HYDRAULIC CONDUCTIVITIES OF DENSE BASE COURSE AGGREGATES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W78-00544

STUDIES OF SAPROLITE AND ITS RELATION TO THE MIGRATION AND OCCURRENCE OF GROUNDWATER IN CRYSTALLINE ROCKS,
Georgia Inst. of Tech., Atlanta Environmental Resources Center.
J. H. Howard, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 993, Price codes: A02 in paper copy, A01 in microfiche. ERC Report 0473, (1977). 20 p, 1 fig, 13 tab. OWRT B-010-GA(2). 14-01-0001-1488.

Descriptors: Groundwater, Infiltration, *Permeability, Soil profiles, *Saprolites, Groundwater movement, *Weathering, Residual soils, *Crystalline rocks, Georgia, Soil horizons, Kaolinite, Iron oxides, Aluminum, Silicon, Silicates, Granites.
Identifiers: *Soil permeability, *Georgia Piedmont.

Geochemical, mineralogical, and textural studies of weathering mantles of crystalline rocks of the Georgia Piedmont show that a low-permeability horizon, which develops during the weathering of some rock types and which impedes infiltration of water from the surface, is formed by the accumulation of kaolinite and oxides of iron, aluminum, and silicon. Three types of hardpan were found, but only one is extensive in its impedance of water infiltration. This is a dense layer, often several feet thick and composed of accumulations of hematite, kaolinite, and probably silica, which forms in the weathering mantle of granitic and gnessic rocks. It may be possible to disrupt this low-permeability layer by application of organic reducing agents, thus increasing water infiltration for recharge of the underlying water table. The geologic terrane is of greatest importance in the development of the low-permeability horizons, which develop on rocks of fairly uniform structure and texture: plutonic granites and granite gneisses. Low permeability zones do not develop on dense fine grained rocks or metamorphic rocks with inclined foliation. Favorable well sites can be selected on the basis of a knowledge of the areal geology, so that areas with likelihood of hardpan development, and thus low water infiltration, can be avoided.
W78-00564

EFFECTS OF SLUDGE APPLICATIONS ON SOIL WATER AND VEGETATION IN A NORTHERN HARDWOOD FOREST IN NEW ENGLAND,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-00567

CHANGES IN PORE-SIZE DISTRIBUTION CAUSED BY SOIL PACKING THROUGH PRESSURE, (IN SLOVENIAN),
Ljublijana, Univ. (Yugoslavia). Faculty of Biotechnology.
T. Stupica.
Zb Bioteh Fak Univ Ljublj Kmetijstvo 23, p 35-56. 1974.

Descriptors: Soils, *Soil pressure, *Distribution, *Soil moisture.
Identifiers: *Pore size(Soils), *Soil packing.

Soil is exposed to heavy pressure by heavy combines and cultivation machines. The difference of soil packing is due to the difference in moisture and weight of the soil as well as the pressure applied to it. Three types of soil were studied with regard to soil packing by changing soil moisture from pF 1.5 to 2.7 and pressure from 0.5 to 2.0 kp/cm2. The study of pore-size-distribution change, carried out on field samples of the same types of soil taken from wheeltraits after the harvest, revealed the smallest changes on sandy soil and the greatest ones on heavy clay soil. Along with these changes in samples from wheeltraits an increase of bound (hygroscopic) water was recorded.--Copyright 1976, Biological Abstracts, Inc.
W78-00622

DRAINAGE FLUX IN PERMEABLE SOIL UNDERLAIN BY A COARSE-TEXTURED LAYER,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
B. E. Clothier, D. R. Scotter, and J. P. Kerr.
Soil Science Society of America Journal, Vol 41, No 4, p 671-676, July-August 1977. 9 fig, 13 ref.

Descriptors: *Hysteresis, *Lysimeters, *Model studies, Tensiometers, Drainage, Hydraulics, Soil science, Equations, Mathematical studies, Water storage, Water balance, Hydraulic conductivity.
Identifiers: *Neutron probe, Pressure potential, Drainage flux.

Drainage from a permeable soil underlain by a coarse-textured layer was investigated. Simplified theory was used to develop a model relating the drainage flux at the base of the soil to the water storage in the soil. Despite significant hysteresis in the water retentivity curve of the overlying soil and in the hydraulic conductivity-pressure potential relationship of the coarse layer, hysteresis had little effect on the storage-flux relation. The model successfully simulated field drainage as measured by a lysimeter and field profile water storage as found by neutron moisture probe measurements. The decline in the drainage flux after the profile has been wetted depends on the depth and retentivity of the soil and the hydraulic conductivity of the underlying coarse layer. To use the model, only simple field measurements to find the storage-flux relationship are needed. (Lee-ISWS)
W78-00675

KINETICS OF SALT RELEASE FROM A SALINE SOIL,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
J. J. Jurinak, J. C. Whitmore, and R. J. Wagenet.
Soil Science Society of America Journal, Vol 41, No 4, p 721-724, July - August 1977. 5 fig, 8 ref. USDI/BLM 52500-CT5-16.

Descriptors: *Saline soils, *Utah, *Water quality, *Soil chemical properties, *Leaching, *Salinity, Diffusion, Analytical techniques, Percolation, Soil moisture, Soil water, Soil water movement, Physical properties, Properties, Saline water, *Kinetics, *Salts.
Identifiers: *Mineral dissolution(Soils), *Salt release, Soluble soil minerals, Diffuse sources of salinity, Non-point sources of salinity.

The kinetics of salt release from simulated saline sediments was studied to ascertain the potential of sediments as a diffuse source of salinity. Two rate equations were derived, both based on the premise that dissolution is a diffusion controlled process. The equations were ln(1-C/C sub s) = -kt and C = k't(1/2), where c is the concentration at any point in the bulk solution, c sub s is the equilibrium concentration of the soluble soil minerals, t is time, k is the first-order rate constant, and k' a proportionality constant. Kinetic data were obtained from a saline typic torriorthent soil derived from Mancos shale in the Price river Basin, Utah. During the initial 72 hours of reaction, dissolution can be described by three diffusion controlled reactions. Increasing particle size decreased the rate of reaction. Both derived equations were equally effective in describing salt release. (Henley-ISWS)
W78-00676

EFFECT OF SOIL STRENGTH ON SOIL DETACHMENT DUE TO RAINDROP IMPACT,
Minnesota Univ., St. Paul.
R. M. Cruse, and W. E. Larson.
Soil Science Society of America Journal, Vol 41, No 4, p 777-781, July-August 1977. 7 fig, 3 tab, 18 ref.

Descriptors: *Raindrops, *Soil strength, *Impact(Rainfall), Erosion, Shear strength, Sheet erosion, Bulk density, Soils, Mathematical studies, Equations.
Identifiers: *Soil detachment, Soil splash, Polyvinyl alcohol, Matric potential.

Soil strength was altered in 3 different ways to test the hypothesis that soil splash from raindrop impact is related to soil strength parameters. Bulk density changes were used to alter direct solid particle-to-particle contact; changes in matric potential were used to change contact relationships between solid particles and liquid films; and additions of polyvinyl alcohol (PVA) provided a direct bonding mechanism between solid particles. The amount of soil detached by a single simulated 4.8-mm raindrop faling from a height of 177 cm was correlated closely with the shearing strength as measred by a triaxial compression test. (Lee-ISWS)
W78-00677

CHISELING INFLUENCES ON SOIL HYDRAULIC PROPERTIES,
Agricultural Research Service, Pendleton, OR. Columbia Plateau Conservation Research Center.
R. R. Allmaras, R. W. Rickman, L. G. Ekin, and B. A. Kimball.
Soil Science Society of America Journal, Vol 41, No 4, p 796-803, July-August 1977. 7 fig, 2 tab, 26 ref.

Descriptors: *Chiselling, *Oregon, *Washington, *Soil water, *Infiltration, *Hydraulic conductivity, Cultivation, Soil properties, Silts, Loam, Cation exchange, Clays, Organic matter, On-site investigations, Bulk density, Depth, Moisture content, Drainage, Evaporation, Hydraulic properties.
Identifiers: Soil water desorption.

Hydraulic conductivity (K) and soil water desorption characteristic (SWDC) were field measured in the 120-cm soil profile of a Walla Walla (Mesic type Haploxeroll) silt loam before and after chiseling 43-cm deep. The test Walla Walla soil is layered. Chiseling affected both the SWDC and K in the upper 30 cm, especially at 10 and 20-cm depths, but had no influence on the measurements at increased, especially in the -50 to -300 mbar range. Failure of chiseling to improve water relations in the mild duripan extending from 30 to 45 cm suggests the need for addition of plant residue or chemical amendments into the chisel slots. Water contents and hydraulic heads during drainage showed that chiseling could reduce evaporation by reducing water content and diffusivity. Overall soil profile hydraulic resistances showed relative average K up to 15 times greater as a resuult of chiseling 43 cm deep, but nearly similar accelerated internal drainages were projected for simulated chiseling to 25-cm depth vs. chiseling to 43 cm. (Visocky-ISWS)
W78-00678

COMPARISON OF METHODS OF CALIBRATION OF A NEUTRON PROBE BY GRAVIMETRY OR NEUTRON-CAPTURE MODEL,
Grenoble-1 Univ. (France). Inst. de Mecanique.
G. Vachaud, J. M. Royer, and J. D. Cooper.
Journal of Hydrology, Vol 34, No 3/4, p 343-356, August 1977. 3 fig, 1 tab, 21 ref.

Descriptors: *Soil moisture meters, *Soil water, *Calibrations, *Analytical techniques, *Nuclear moisture meters, Instrumentation, Chemical properties, Nuclear meters, Gravimetry, Soil analysis, Mathematical studies, Soil properties, Soil moisture, Gravimetric analysis, Soil tests, Moisture content, Methodology.
Identifiers: *Neutron probe, *Neutron-capture technique, *Gravimetric calibration technique, Calibration curves.

Presented was a systematic analysis of 2 methods used for determining calibration curves of neutron probes. The uncertainties resulting from the use of the gravimetric method, with a linear correlation between count rates and water content of soil samples, were considered first. Particular care was given to the determination of errors in the values of water content and count rates and to the difficulties arising from the choice of the correlation technique. The neutron-calibration curve of the soil also was obtained with a technique based on the determination of neutron thermal absorption and diffusion constants. The importance of errors associated with the method was also analyzed. Different field examples then were presented. It appears that the neutron-capture technique should be particularly well suited for determining the calibration curve of clay soils or heterogeneous materials for which the gravimetric calibration technique cannot be applied with confidence. On the other hand, it also was shown that for a soil with a very well-defined gravimetric calibration curve, the neutron-capture technique gives results still at least as good as with the former method. (Henley-ISWS)
W78-00679

COLORIMETRIC METHOD OF DETERMINATION OF AMIBEN IN AIR, WATER AND SOIL,
Kiev Inst. for the Advanced Training of Physicians (USSR).
For primary bibliographic entry see Field 5A.
W78-00700

STEADY INFILTRATION FROM A DITCH: THEORY AND EXPERIMENT,
Karadeniz Teknik Univ., Trabzon (Turkey). Dept. of Civil Engineering and Architecture.
For primary bibliographic entry see Field 4A.
W78-00708

ANALYSIS OF THE SATURATED-UNSATURATED HYDRAULIC CONDUCTIVITY IN A MIXED SODIUM-CALCIUM SOIL SYSTEM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
D. Russo, and E. Bresler.
Soil Science Society of America Journal, Vol. 41, No. 4, p 706-710, July-August 1977. 4 fig, 23 ref.

Descriptors: *Hydraulic conductivity, *Ions, *Sodium, *Calcium, Soils, Soil water movement, Montmorillonite, Pore pressure, Pores, Porosity, Soil properties, Model studies, Mathematical models, Soil science.
Identifiers: Soil solution concentration, Tactoids, Pore size distribution.

A model was developed to diagnose the effects of Na/sq rt of Ca ratios and soil solution concentrations on the hydraulic conductivity for an unsaturated soil. The model takes into account the porous nature and the electrical properties of the soil. Interactions between ions in the exchange phase and in the liquid phase were expressed quantitatively by the diffuse double-layer theory. Experimental data on the effect of soil solution and soil water pressure on clay platelet orgainzation and structure were considered in the model. A test was made on the sensitivity of the model to variations in the various input parameters. The model was found to be sensitive to the relationship between the number of platelets per clay particle and the ESP of the soil. The diagnostic model was compared with experimental data for 3 soils of different texture. The model approximates the hydraulic conductivity function for many practical combinations of Na/sq rt of Ca ratios and soil solution concentrations for the ranges of soil water content in which most of the water flow occurs. (Sims-ISWS)
W78-00709

EFFECT OF MIXED NA-CA SOLUTIONS ON THE HYDRAULIC PROPERTIES OF UNSATURATED SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
D. Russo, and E. Bresler.
Soil Science Society of America Journal, Vol. 41, No. 4, p 713-717, July-August 1977. 6 fig, 1 tab, 20 ref.

Descriptors: *Sodium, *Calcium, *Soil properties, *Hydraulic properties, Soil water, Unsaturated flow, Loam, Soils, Ion exchange, Diffusivity, Hydraulic conductivity, Moisture content, Laboratory tests, Retention.
Identifiers: Diffuse layer theory, Soil columns.

The effects of mixed Na-Ca solutions on soil water diffusivity and unsaturated hydraulic conductivity were tested for a loamy soil from Gilat, Israel. Soil water diffusivity functions, D(theta), were determined by the horizontal infiltration method. Unsaturated hydraulic conductivity functions, K(theta), were determined both directly (by vertical infiltration for suction heads of 0-50 cm H2O) and indirectly (from diffusivity functions and soil water retention curves). Prior to determinations, soil samples were equilibrated with solutions containing a given concentration and composition of Ca and Na. The results showed that D(theta) and K(theta) are independent of solution concentrations in a Ca-saturated system. In mixed Na-Ca systems, hydraulic conductivity and soil water diffusivity functions are highly dependent on the composition and concentration of the soil solution, in addition to their dependence on soil water content, theta. For any given theta, both K(theta) and D(theta) decrease as either soil solution concentration decreases or the sodium fraction in the soil solution increases. The negative effect of a combination of high Na-to-Ca ratio and low soil solution concentration on K(theta) is related directly to the degree of water saturation of the soil. Low values of theta can compensate for the negative effects of high Na-to-Ca ratio and low solution concentration. (Visocky-ISWS)
W78-00710

DISPERSION ANALYSIS OF THE EFFECT OF ECOLOGICAL CONDITIONS ON THE VARIABILITY OF THE WATER CONTENT IN MEADOW PLANT LEAVES, (IN RUSSIAN),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2I.
W78-00744

VALIDITY OF DARCY'S LAW DURING THE HORIZONTAL INFILTRATION IN A CLAY SOIL THAT IS NOT FULLY SATURATED BY WATER, (IN DUTCH),
H. Verplancke, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. 39(1), p 134-147, 1974.

Descriptors: *Darcys law, *Infiltration, *Clays, Soils, *Soil water movement, Diffusion.
Identifiers: Diffusion coefficient.

The basic hypotheses used in the theoretical solution of problems concerning the infiltration of water in a dry clay were verified, particularly the generalized law of Darcy. A method of analysis to derive the diffusion coefficient from the evolution of water profiles was thus developed.--Copyright 1975, Biological Abstracts, Inc.
W78-00759

THE WATER REGIME OF SANDS AND SANDY SOILS ON THE RIGHT SIDE OF THE CALMATUI RIVER, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
G. Sandu.
An Inst Stud Cercet Pedol. 40, p 99-114, 1972.

Descriptors: *Sands, Chernozems, Sampling, Soil physical properties, Soil chemical properties, *Soil water movement, Soil profiles, *Soil moisture, *Moisture content, Rainfall.
Identifiers: *Romania(Calmatui River).

The water regime of the slightly humic dune sand, slightly humic slope sand and interduen chernozem-like soil at Rusetu-Margineanca (Romania) was studied. The soil (15 cm-5 m deep) was sampled twice monthly (on 1st and 15th days). The physical hydrologic and chemical characteristics of the sand and sandy soils which play an important role in water movement and accumulation in the profile are described. The water regime was analyzed in close connection with the wetting sources, particularly with rainfall, condensation water and humidity in the capillary fringe (for interdune chernozem-like soil). The analytical moisture data are presented in the form of chronoisoplets.--Copyright 1975, Biological Abstracts, Inc.
W78-00775

RELATION BETWEEN EARTHQUAKES, WEATHER, AND SOIL TILT,
Geological Survey, Reston, VA. Geologic Div.
For primary bibliographic entry see Field 7B.
W78-00823

2H. Lakes

COMPUTATIONAL HYDRAULICS: AN ALTERNATIVE VIEW,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 5B.
W78-00524

THE THERMAL STRUCTURE OF SMALL LAKES: THE INFLUENCE OF A MODIFIED WIND SPEED,
Salford Univ. (England). Dept. of Civil Engineering.
B. Henderson-Sellers.
Water Resources Research, Vol. 13, No. 4, p 791-793, August 1977. 7 fig, 9 ref.

Descriptors: *Lakes, *Thermal stratification, *Water temperature, *Model studies, Mathematical models, Winds, Effects, Foreign countries, Reservoirs, Foreign research, Shallow waters, Stratification, Temperature, Thermal properties, Limnology.
Identifiers: *Farmoor Reservoir(England).

The thermal structure of a lake is determined primarily by the wind shear, which induces turbulence in the lake. In the case of a lake of small areal extent, numerical models employing observed or climatological functions for the wind speed give unacceptable results. It was shown that if the wind speed is modified by a function of the lake surface area, then the annual stratification of a small lake can be described realistically. The techniques was illustrated for the case of Farmoor Reservoir in England. (Sims-ISWS)
W78-00534

PRECIPITATION (RADAR) PROJECT OF THE IFYGL LAKE METEOROLOGY PROGRAM,
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 2B.
W78-00546

HYDROLOGIC MODELING OF THE DEVILS LAKE BASIN WATERSHEDS,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 4D.
W78-00569

INLAND LAKE PROTECTION IN NORTHERN MICHIGAN (NORTHERN MICHIGAN ENVIRONMENTAL RESEARCH PROGRAM EDUCATIONAL SERIES: PUBLICATION NO. 1),
Michigan Univ., Ann Arbor, Biological Station.
For primary bibliographic entry see Field 6G.
W78-00716

MICRO- AND MESOBENTHOS OF THE DNIEPER IN THE AREA OF THE FUTURE KANEV WATER STORAGE BASIN, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
V. V. Gurvich.
Gidrobiol ZZh. 10(4), p 24-29, 1974.

Descriptors: *Benthos, *Microorganisms, Copepods, Crustaceans, Nematods, Diptera.
Identifiers: Harpacticoida, Oligochaeta, Ostracoda, *Testacea, *USSR(Kanev water storage basin), *Dnieper River.

In the Dnieper (USSR) area under study there were found: Testacea (Rhizopoda), 44 spp.; Nematoda, 26 spp.; Oligochaeta, 17 spp.; Cladocera, 15 spp.; Copepoda, 8 spp.; Harpacticoida, 3 spp.; Ostracoda, 2 spp. and Chironomidae larvae (the 2nd-3rd stages of development); 22 spp. The species composition and quantitative development of micro- and mesobenthos are dependent on the sediment character. Rhizopoda dominate in the microbenthos; Oligochaeta and Cladocera in the mesobenthos. For the 1st 3-4 yr of existence of the water storage basin the benthos microfauna will be diverse and ecologically heterogeneous. After 6-19 yr, micro- and mesobenthos will be represented by a small number of pelophilic and psammopelophilic cenoses.--Copyright 1975, Biological Abstracts, Inc.
W78-00748

THOU SHALT NOT FILL PUBLIC WATERS WITHOUT PUBLIC PERMISSION - WASHINGTON'S LAKE CHELAN DECISION,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-00788

CLASSIFICATION OF THE HYDROLOGIC SETTINGS OF LAKES IN THE NORTH CENTRAL UNITED STATES,
Geological Survey, Denver, CO. Water Resources Div.
T. C. Winter.
Water Resources Research, Vol 13, No 4, p 753-767, August 1977. 6 fig, 3 tab, 38 ref.

Descriptors: *Lakes, *Classification, *Hydrology, *Water balance, *Mapping, Statistical methods, Precipitation(Atmospheric), Evaporation, Water quality, Inflow, Surface waters, Groundwater, Discharge(Water), Flow characteristics, Drainage area, Runoff.
Identifiers: *North-central United States, *Lake hydrology.

This study is a first attempt to identify and map the areal distribution of independent variables that can be used in developing a general hydrologic classification of lakes. Lake hydrology consists of the study of the interchange of a lake with atmospheric water, surface water, and groundwater. Data on the hydrologic settings of 150 randomly selected lakes in the north central United States were analyzed by principal component analysis. In this study the original variables that load high on each of the principal components (the calculated statistical axes) are statistically independent and within each component are clearly related to each other. Precipitation-evaporation balance (atmospheric water) and the water quality variables have high factor loadings on the first principal component. Highest loadings on the second principal component are for streamflow in and out of the lakes. Principal components 3 and 4 are characterized by geologic and groundwater flow characteristics. The drainage basin area/lake area ratio, representing overland runoff, has the highest loading on the fifth principal component. The stability of the principal components was tested by randomly splitting the data and comparing a principal component analysis of each subsample. This showed the first two principal components to be the most stable. The components described by the groundwater variables are less stable. (Woodard-USGS)
W78-00808

DIATOM ALGAE OF PELAGIC AND COASTAL ZONES, BENTHONIC AND SILT LAYERS OF LAKES OF THE NARACHANSK GROUP IN THE BELORUSSIAN SSR, (IN RUSSIAN),
Belorussian State Univ., Minsk (USSR).
T. M. Mikheeva, and K. G. Khursevich.
Bot Zh (Leningra) 59(11), p 1657-1666, 1974.

Descriptors: *Algae, *Diatoms, Lakes, Coasts, Silts, Aquatic plants, Aquatic animals.
Identifiers: Asterionella-formosa, Belorussian-SSR, Cyclotella-comta, Cymbella-ventricosa, Fragilaria-crotonensis, Melosira-ambigua, Melosira-granulata, Tabellaria-fenestrata, *USSR(Narachansk lakes).

The results of quantitative studies (1968-71) on diatoms of pelagic areas, coastal zones, benthonic and silt layers in the lakes of the Narachansk group, Belorussia (USSR) are discussed. The seasons of maximum abundance diatoms were different in various waters. The species were predominantly freshwater species in all areas studied. The dominant species were Cyclotella comta, Asterionella formosa, Tabellariaa fenestrata, Cymbella ventricosa, Fragilaria crotonensis, Melosira granulata and M. ambigua. Many diatoms such as M. ambigua were indifferent to pH. A significant percentage (29.5-38.4%) of the diatom flora such as M. granlata and C. comta were alkaliphilic.
W78-00844

A REVIEW OF STUDIES ON THE BIOLOGICAL PRODUCTIVITY OF BENTHIC ANIMALS IN FRESHWATER RESERVOIRS OF THE SOVIET UNION (SOME INTERNATIONAL BIOLOGICAL PROGRAM RESULTS), (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Inst.
A. F. Alimov.
Izv Akad SSSR Ser Biol. 1, p 94-103, 1975.

Descriptors: *Benthic fauna, *Productivity, Reviews, Biomass, Benthos, Seasonal, *Reservoirs, Aquatic animals.
Identifiers: *USSR(International Biological Programs).

Investigations were made into the biological productivity of benthic animals in the USSR following the IBP (International Biological Program) program. A broad (from N-S) biomass (B) increase and benthos production (P) in reservoirs were observed. Seasonal and long term variations of the biomass of benthic animals, their food, the values of the P/B coefficient in reservoirs of different trophic states and geographical positions are discussed. The energy balance of benthic animals, the biocenosis and the entire benthic system in various reservoirs are discussed.--Copyright 1975, Biological Abstracts, Inc.
W78-00845

THE MEDUSA CRASPEDACUSTA SOWERBYI LANKESTER (LIMNOMEDUSAE) IN LAKE SIRIO (IVREA, TORINO), (IN ITALIAN),
G. Badino, and E. Lodi.
Boll Pesca Piscic Indrobiol. 27(2), p 293-296, 1972.

Descriptors: Lakes, Growth rates.

Identifiers: *Craspedacusta-sowerbyi, Medusae, Torino, *Monomyctic lakes, *Lake Sirio(Italy).

C. sowerbyi (Limnomedusae) from Sirio Lake (Ivrea, Italy), shows an explosive growth of medusae, from early Aug. until the end of Oct. This phenomenon does not recur every year. Sirio Lake, which is monomyctic, with an overturn in Feb. and March, is not significantly polluted. All the specimens collected during 1970-72 were females.--Copyright 1975, Biological Abstracts, Inc.
W78-00846

SANTO PARMENSE LAKE (NORTHERN APENNINES): PHYSIOGRAPHY AND DYNAMICS OF THE MESOPLANKTONIC POPULATION, (IN ITALIAN),
Parma Univ. (Italy). Lab. di Ecologia.
A. Moroni, I. Ferrari, and O. Rossi.
Boll Pesca Piscic Idrobiol. 28(1), p 5-44, 1973.

Descriptors: Lakes, *Zooplankton, Sampling, *Distribution, *Seasonal, *Vertical stratification, *Succession, Daphnia, Geomorphology.
Identifiers: Asplanchna-priodonta, Daphnia-longispina, Eudiaptomus-intermedius, Kellicottia-longispina, Keratella-cochlearis, *Santo-parmense Lake(Italy).

Santo Parmense Lake lies at 1507 m above sea level in the high Parma Valley (North Apennines, Italy). The pelagic zooplankton consists principally of: Eudiaptomus intermedius (Copepoda, Calanoida), Daphnia longispina (Cladocera), Asplanchna priodonta, Kellicottia longispina and Keratella cochlearis (Rotifera). The life cycle of E. intermedius, which is a univoltine species, was analyzed. The density data of the zooplankton collected at different stations and layers in Santo Lake were processed statistically to study space-time distribution and seasonal succession. A slight space heterogeneity of the zooplankton was observed but the density trend is substantially homogenous. Zooplankton diversity is characterized by a minimum in April and May; in July and Aug. diversity appears stratified in the vertical with its highest indices in the most superficial layer and its lowest indices in the deepest layer. In Sept.-Oct. diversity tends to reach uniformly high values in the whole water column.--Copyright 1975, Biological Abstracts, Inc.
W78-00847

HYDROECOLOGICAL AND ZOOLOGICAL EXAMINATIONS IN THE PONDWEED FIELDS OF LAKE FERTO, (IN HUNGARIAN),
Eotvos Lorand Univ., Budapest (Hungary). Inst. for Systematic Zoology.
S. Andrikovics.
Allattani Kozl. 60(1-4), p 39-50, 1973.

Descriptors: Lakes, *Aquatic weeds, *Aquatic plants, Water temperature, Biology, *Water chemistry, Ions, Conductivity, Oxygen, Absorption, *Plant growth, Diptera.
Identifiers: Caenis horaria, Ceratophyllum demersum, Chloeon dipterum, Cyrnus flavidus, Erythromma najas, Glossiphonia heteroclita, Helobdella stagnalis, *Hungary(Lake Ferto), Ischnura pumilio, Litricularia vulgaris, Lymatia coleoptera, Micronecta pusilla, Myriophyllum spicatum, Myriophyllum verticillatum, Najas sp, Naucoris cimicoides, Pisciola geometra, Potamogeton pectinatus, Sigara striata, Thermomyzon tessulatum, *Pondweeds.

Ecological and zoological studies were conducted in stands of the pondweed species frequent in the Hungarian part of Lake Ferto (Potamogeton pectinatus, Myriophyllum spicatum, Myriophyllum verticillatum, Uticularia vulgaris, Ceratophyllum demersum). The hydroecological and zoological differences among powdered fields of various species composition and location during a typical summer period were investigated. The pondweed fields of Lake Ferto were classified into open-water pondweed fields, stands of clearings encircles by reedy stretches, and fields around mouths of inflowing waters. The humus content of deposit varied from 5.00-5.51%. The open-water pondweed fields had uniformly, lower water temperature, low conductivity, lower hydrogen carbonate and lower Na+ concentration, than the pondweed stands of the clearings enclosed by reedy parts, and the macrofauna was poorer. The correlated estimates of the single taxonomic units are illustrated. The richest macrofauna was found in the M. spicatum stands bordering on the reed fields: Micronecta pusilla, species of the subfamily Orthocladiinae (Chironomidae), Ischnura pumilio and the larvae of Erythromma najas. The organic content of the deposits varied from 6.06-6.82%. The most important hydrochemical characteristics of the open-water pondweed fields were, higher water temperature, higher conductivity, higher O2 consumption, higher hydrogen carbonate and silicate ion concentration. Macrofauna were richer both in species and number of individuals than in the open-water pondweed fields.--Copyright 1975, Biological Abstracts, Inc.
W78-00872

2I. Water In Plants

WATER REGIME OF PLANT CONTROLLED BY VARIOUS FACTORS ACTING ON ITS ROOT SYSTEM, (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Inst., Leningrad (USSR).
S. I. Meleshchenko.
Fiziol Rast (Mosc) 21(6), p 1201-1206, 1974.

Descriptors: *Root systems, Correlation analysis, *Beans, *Nutrients, *Carbon dioxide, Plant physiology, Model studies, Regulation, *Plant growth.

The correlation between parameters of water exchange in the self-oscillatory regime and the action of physical factors of normal intensity was studied with the root system of an intact plant (bean). A temperature decrease of the nutrient solution within the range 25-20C increased the amplitude and period of self-oscillations and as their manifestation. Higher CO2 content in the nutrient solution decreased the rate of the self-oscillatory process in the same way as low hydrostatic pressure. The evidence is discussed from the viewpoint of a closed model for regulation of physiological processes in the plant.--Copyright 1976, Biological Abstracts, Inc.
W78-00504

WATER AND ENERGY CONSERVATION THROUGH EFFICIENT IRRIGATION MANAGEMENT,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 3F.
W78-00566

THE CONCEPT OF HYDRATURE AND ITS MEANING FOR THE WATER BALANCE OF PLANTS, (IN GERMAN),
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Abt. Okohysiologisches Veg.
K. Kreeb.
Ber Dtsch Bot Ges 87(3), p 577-580, 1974.

Descriptors: *Water balance, *Plant physiology, Ecology, Equations, Osmotic pressure, *Indicators.
Identifiers: *Hydrature(Plants).

The definition of hydrature based on thermodynamics is given and the osmotic equation discussed. Osmotic potential and water potential are compared with regard to their validity as physiological and ecophysiological indicators.--Copyright 1976, Biological Abstracts, Inc.
W78-00653

DISPERSION ANALYSIS OF THE EFFECT OF ECOLOGICAL CONDITIONS ON THE VARIABILITY OF THE WATER CONTENT IN MEADOW PLANT LEAVES, (IN RUSSIAN),
Leningrad State Univ. (USSR).
L. N. Alekseenko.
Bot Zh (Leningr). 59(7), p 996-1002, 1974.

Descriptors: *Dispersion, Ecology, *Leaves, *Moisture content, Plant growth, *Soil moisture, Grasslands, Climates, Plant groupings.

The effect of soil moisture (3-4 gradations, in a single factor complex), the effects of soil moisture and plant vegetation phase (4-6 periods, in a 2 factor complex) and the additional effect of weather conditions of various years (2 gradations, in a 3 factor complex) on the resultant index were evaluated. Plants (37 spp.) were studied from 5 associations: Trifolietum phleumoso-geraniosum; Mixtoherbetum graminosotrifoliosum; Deschampsietum gigrofitica herbosum; Deschampsietum carcosum inflatae; and Caricetum inflatae deschampsiosum. Soil moisture had a large effect on the water content of leaves with a relatively stable water regime; its effect was not high in species with highly variable leaf water content, but in a dry year its effect noticeably increased. The effect of plant vegetation phase on the resultant index was small in long-flowering species, but it also increased in a dry year. Under normal water conditions the effect of soil moisture on leaf water content and its variability was slightly higher than the effect of vegetation phase, and the total effect of the 2 factors was noticeably higher in a dry year. The effect of weather conditions on leaf moisture was greater in species with a mobile water regime than in those with a more stable one.--Copyright 1975, Biological Abstracts, Inc.
W78-00744

32P, 22N AND 99MTC IN EXPERIMENTS CONCERNING WATER TRANSPORT IN THE AERIAL ROOTS OF VANDA TRICOLOR LINDL, (IN GERMAN),
Giessen Univ. (West Germany). Lehrstuhl Botank (II).
N. F. Haas.
Z Pflanzenphysiol 75(5), p 427-435, 1975.

Descriptors: *Root systems, *Radioisotopes, *Tracers, Plant physiology, Phosphorus, Sodium, Electron microscopy.
Identifiers: *Aerial roots(Plants), Phosphorus-32, Sodium-22, Technetium-99M, *Vanda-tricolor, *Water transport(Plants).

In order to investigate transport of H2O within aerial roots of V. tricolor Lindl., 32P, 22N and 99mTc were applied to both air-dry and H2O-soaked roots. Active transport of H2O carrying the nuclide takes place in direction from stem and leaves with an average speed of about 3 cm/h in air-dry, but of about 6 cm/h in H2O-soaked aerial roots. No active transport was detected in the direction of the root tips. Scanning electron micrographs show the fine structure of cell walls of both velamen and passage cells of the exodermis. The latter show very fine pores of a diameter not exceeding 0.8 microns.--Copyright 1976, Biological Abstracts, Inc.
W78-00858

2J. Erosion and Sedimentation

PHOSPHATE/SEDIMENT INTERACTION IN TOLO AND LONG HARBOURS, HONG KONG AND ITS ROLE IN ESTUARINE PHOSPHORUS AVAILABILITY,
Fisheries Research Station, Aberdeen (Hong Kong).

For primary bibliographic entry see Field 5B.
W78-00516

PREDICTION OF MERCURY DISTRIBUTION IN RIVER SEDIMENTS,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00517

ARMORING PROCESS IN DEGRADING STREAMS,
Mosul Univ. (Iraq). Dept. of Civil Engineering.
R. J. Garde, K. A-S Ali, and S. Diette.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY9, p 1091-1095, September 1977. 4 fig, 2 ref, 1 append.

Descriptors: *Degradation(Stream), *Laboratory tests, *Stream erosion, Sediment transport, Graded, Running waters, Measurement, Alluvial channels, Movement, Sampling, Hydraulic models, Testing.
Identifiers: *Armoring process(Sediments).

Whenever the amount of sediment coming into a given reach of an alluvial stream is less than its sediment transport capacity, there is a general lowering of the stream bed-a process known as degradation. The most common occurrence of degradation is downstream of a large capacity reservoir on an alluvial stream. Experiments were conducted in a tilting flume provided with a false bottom. In the central portion a recess was provided, which was filled with sand of given characteristics. The recess was then covered, and uniform flow was established in the flume. The cover over the recess was then removed, and at definite time intervals the surface layer was sampled. The experimental investigation indicated that the major coarsening of the surface layer in a degrading stream takes place in a relatively short period of time; thereafter the coarsening process is extremely slow. The present set of data used for analysis was within a narrow range of geometric standard deviation of the bed material, and therefore there is a need for further experimentation. (Humphreys-ISWS)
W78-00527

SUBROUTINE FOR SETTLING VELOCITIES OF SPHERES,
Water Resources Engineers, Inc., Walnut Creek, CA.
M. B. Sonnen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY9, p 1097-1101, September 1977. 2 fig, 4 ref, 1 append.

Descriptors: *Computer programs, *Settling velocity, *Mathematical models, Programs, Velocity, Drag, Equations, Stokes law, Reynolds number.
Identifiers: Spheres, Terminal velocity.

Numerous engineering studies require the settling velocity of particles in quiescent water. The problem is complicated by having to determine the Reynolds number-drag coefficient relationship for the particle size, density, and viscosity conditions that pertain. If the relationship is in the 'transition range' between purely viscous resistance and eddying resistance (Reynolds number between roughtly 0.5 and 3,000, respectively), a nettling, if not difficult, trial-and-error solution ensues. Reported herein was a computer program subroutine which determines the settling velocity of any spherical particle, for any of the 3 ranges of Reynolds number and drag coefficient. The program was presented as a subroutine since its purpose is so singular, and because normally it would be used in a program designed to make many other computations. Very minimal alterations could convert it to a stand-alone program to read the necessary data, to perform its specific duty, and to print the results. (Humphreys-ISWS)
W78-00528

NITRIFICATION AND DENITRIFICATION IN MARINE SEDIMENTS FROM PUGET SOUND,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00537

THE SULFUR CYCLE OF A COASTAL MARINE SEDIMENT (LIMFJORDEN, DENMARK),
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
For primary bibliographic entry see Field 5B.
W78-00538

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 1. MASS TRANSFER PROPERTIES AND SILICA DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environnnement.
For primary bibliographic entry see Field 5B.
W78-00542

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 2. NITROGEN DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environment.
For primary bibliographic entry see Field 5B.
W78-00543

EVALUATION OF THE STORAGE OF DIFFUSE SOURCES OF SALINITY IN THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
J. B. Laronne, and S. A. Schumm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 606, Price codes: A07 in paper copy, A01 in microfiche. Colorado Environmental Resources Center Fort Collins, Completion Report Series No. 79, September 1977. 111 p, 17 fig, 12 tab, 54 ref, append. OWRT B-121-COLO(2), 14-31-0001-5061.

Descriptors: *Salinity, *Colorado River Basin, Evaluation, *Alluvium, *Shales, Sedimentary rocks, Salts, Equilibrium, *Geochemistry, *Dissolved solids, *Sediment discharge, Sediment transport, Suspended solids, Utah, Colorado, Deposition(Sediments).
Identifiers: *Upper Colorado River Basin, *Mancos Shale(Colo-Utah).

The objectives were to determine the salt content of Mancos Shale and associated alluvium and the release mechanisms of salt from these deposits. When mixed with distilled water, the time necessary to approach equilibrium decreased with an increase of salt content and with a decrease of sediment concentration, and the time span required for equilibrium ranged from a few minutes to several days. The chemical quality of the aqueous mixtures was of the Ca 2+-Mg2+-Na1+-SO42-HCO31- type. Sodium and magnesium hydrated sulfates appeared to dissolve faster than gypsum of calcite and the relative abundance of Na1+, Mg2+ and SO42- decreased with increased dilution. There is a large inherent variability in the salt content of sampled sediments. Soluble mineral content of Mancos Shale from hillslopes (2 percent) is significantly larger than that of terrace alluvium (0.62-0.29 percent) and bed materials (0.93-0.81 percent) of North Miller and West Salt Creeks respectively. The most saline deposits (10 percent) are efflorescent bed crusts. Terrace and bed materials in narrow valleys where shallow alluvium overlies shale are highly saline (1.6 percent) and show an increase in salt content with depth. The results also show that major areas of diffuse sources of salts are also the major sediment contributors in the Upper Colorado River Basin.
W78-00550

BAYES DESIGN OF A RESERVOIR UNDER RANDOM SEDIMENT YIELD,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, F. Szidarovszky, and S. Yakowitz.
Water Resources Research, Vol. 13, No. 4, p 713-719, August 1977. 4 fig, 2 tab, 35 ref. OWRT B-043-ARIZ(14a), NSF GF-38183.

Descriptors: *Reservoirs, *Reservoir design, *Sedimentation, *Model studies, Mathematical models, Runoff, Erosion, Sediments, Precipitation(Atmospheric), Rainfall, Reservoir silting, Reservoir storage, Sediment yield, Statistical models, Design, Decision making.
Identifiers: *Bayesian methods.

The design of a reservoir subject to long-range sediment accumulation stemming from the sum of a random number of random sedimentation events was investigated. The event-based simulation method, which was applied to a case study in southern Arizona, involves generating synthetic sequences of Poisson inputs into the modified universal soil loss equation. The stochastic inputs result from a fitted bivariate distribution of runoff-producing precipitation events (representing the amount and duration of such precipitation) and an independent fitted exponential distribution of interarrival time between events. The simulated sequences of sediment yield events thus obtained were used to calculate accumulated sediment yield and cost of a given design for each sequence. The optimum design and corresponding Bayes risk were evaluated in four cases: (1) under natural uncertainty, (2) under natural uncertainty and uncertainty in the bivariate rainfall distribution parameters, (3) under natural uncertainty and uncertainty in the Poisson counting distribution parameter, and (4) under all 3 types of uncertainty. The effect of rainfall record length was ascertained by further computer experiments, but only a partial Bayesian analysis was provided because of the complexity created by a three-dimensional parameter uncertainty. The optimum reservoir capacity and corresponding Bayes risk were shown to increase substantially (up to 20 and 90%, respectively) as more uncertainties are incorporated into the model. (Sims-ISWS)
W78-00618

EFFECT OF SOIL STRENGTH ON SOIL DETACHMENT DUE TO RAINDROP IMPACT,
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 2G.
W78-00677

SEDIMENT TRANSPORT FROM A RURAL CATCHMENT IN NEW SOUTH WALES,
Newcastle Univ. (Australia). Dept. of Geography.
R. J. Loughran.
Journal of Hydrology, Vol. 34, No. 3/4, p 357-375, August 1977. 7 fig, 6 tab, 18 ref.

Descriptors: *Sediment transport, *Distribution patterns, *Sedimentation rates, *Sampling, Wet seasons, Hydrographs, Sediment yield, Mathematical studies, Data collections, Foreign countries, Foreign research, Seasonal, *Australia.
Identifiers: *Congewai Creek(New South Wales), Depth-integrated sampling.

Both depth-integrated and single-stage suspended sediment sampling was carried out on the Congewai Creek in New South Wales, Australia, over a two-year, non-contiguous period. The samples were divided seasonally into rising, falling, and stationary stage groups. Sediment load was obtained from the hourly hydrograph by 2 methods: (1) concentration vs time graphs, and (2) seasonal regression lines. Considerable differences in load were obtained with the 2 methods for each year,

but the totals for the 2-year period were within 8% of each other. It was found that 99% of the 2-year load was yielded in the first 6 calendar months. Out of the 20 flood rises recorded in 2 years, 18 occurred during January through June. The average annual sediment yield was computed as 28 tons per square kilometer. (Singh-ISWS)
W78-00680

QUALITY OF WATER DISCHARGED FROM THREE SMALL AGRONOMIC WATERSHEDS IN THE MAUMEE RIVER BASIN,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00688

SOLUBLE AND SEDIMENT NITROGEN LOSSES AS RELATED TO LAND USE AND TYPE OF SOIL IN EASTERN CANADA,
Macdonald Coll., Ste Anne de Bellevue (Quebec). Dept. of Renewable Resources.
For primary bibliographic entry see Field 5B.
W78-00689

EFFECTS OF VARYING DISCHARGE REGIMES ON BED-FORM SEDIMENTARY STRUCTURES IN MODERN RIVERS,
Keele Univ. (England). Dept. of Geology.
C. M. Jones.
Geology, Vol. 5, No. 9, p 567-570, September 1977. 2 fig, 29 ref.

Descriptors: *Sediment transport, *Rivers, *River beds, Discharge(Water), Sand waves, Erosion, Geomorphology, Fluvial sediment, Geology, Hydrology.
Identifiers: *Stream regimes, Sedimentary structures, Bed-form, Bed-form response.

The discharge regimes that occur in modern rivers vary with climate. Where there are large sand waves in a river, these show different responses to flow changes of different speeds and magnitudes. A rapid fall of discharge leaves bed forms stranded in the river, with flow around the front eroding the slip faces. With a slower rate of fall, smaller superimposed sand waver produce groups of convex-upward erosion surfaces within tabular cross-bedded sets. With a very slow fall and pronounced low-stage reworking, the sand waves are largely dissected. (Lee-ISWS)
W78-00696

GEOMORPHOLOGY, SHALLOW SUBBOTTOM STRUCTURE, AND SEDIMENTS OF THE ATLANTIC INNER CONTINENTAL SHELF OFF LONG ISLAND, NEW YORK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-00704

RECONNAISSANCE OF WATER QUALITY IN THE DUCHESNE RIVER BASIN AND SOME ADJACENT DRAINAGE AREAS, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-00820

SIMULATION OF VELOCITY DISTRIBUTION AND MASS TRANSFER,
Geological Survey, Denver, CO. Water Resources Div.
C. F. Nordin.
In: Stochastic Approaches to Water Resources, Volume II: Edited and published by Hsieh Wen Shen, Colorado State University, Fort Collins, Colorado, p 22-1 - 22-22, 1976. 12 fig, 41 ref.

Descriptors: *Model studies, *Sediment transport, *Particle size, *Bed load, *Open channel flow, Analytical techniques, Simulation analysis, Turbulent flow, Fluid mechanics, Equations, Evaluation.
Identifiers: *Velocity distribution.

Various random walk models are presented and used to describe one-dimensional transport processes in open-channel flows of both dissolved or suspended particles and bed load particles. These models generally assume that the particle steps are uncorrelated or that the correlation function of the particle velocity is of simple form, so they provide excellent approximations to the theoretical asymptotic distributions and are well-suited to simulation techniques. However there are some discrepancies between empirical observations and the theories, and to simulate particle behavior for short times, it may be necessary to introduce correlated processes or time-varying parameters into the existing models. (See also W77-10439) (Woodard-USGS)
W78-00825

ALLUVIAL CHANNEL BEDFORMS,
Geological Survey, Denver, CO. Water Resources Div.
C. F. Nordin.
In: Stochastic Approaches to Water Resources, Volume II: Edited and published by Hsieh Wen Shen, Colorado State University, Fort Collins, Colorado, p 24-1 - 24-28, 1976. 20 fig, 25 ref.

Descriptors: *Alluvial channels, *Streambeds, *Channel morphology, *Sands, *Bottom sediments, Forecasting, Sediment distribution, Theoretical analysis, Evaluation.

The bed configurations formed in alluvial streams with beds of fine sand are illustrated and described briefly, and some of the empirical and theoretical relations for predicting the occurrence of the various bed configurations are reviewed. With increasing flow velocities, for a constant flow depth and a fine sand, the major bed configurations are ripples, dunes, a stable flat bed, and antidunes. For coarse sands, ripples do not form, and the dune bed configuration may be followed immediately by antidunes. In addition to these small-scale features, a very regular pattern of large alternate bars forms in uniform wide channels. The general flow conditions for the occurrence of the various bedforms can be predicted from empirical relations. The empirical and theoretical relations give an indication of the conditions under which the various bed configurations form, but these relations say very little about the properties of the bedforms. Although stochastic models of bed configurations are as yet rather crude, it is suggested that the application of the theory of stochastic processes to the description and prediction of the occurrence of bedforms will provide important contributions to further understanding of these phenomena. (See also W77-10439) (Woodard-USGS)
W78-00826

2K. Chemical Processes

REACTIONS OF ORGANOMERCURY (I) COMPOUNDS WITH LIGANDS CONTAINED IN NATURAL WATER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-00502

NORTHERN KALAHARI GROUNDWATERS: HYDROLOGIC, ISOTOPIC AND CHEMICAL STUDIES AT ORAPA, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W78-00521

COMPUTATIONAL HYDRAULICS: AN ALTERNATIVE VIEW,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 5B.
W78-00524

EVALUATION OF THE STORAGE OF DIFFUSE SOURCES OF SALINITY IN THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W78-00550

KINETICS OF SALT RELEASE FROM A SALINE SOIL,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 2G.
W78-00676

COLORIMETRIC METHOD OF DETERMINATION OF AMIBEN IN AIR, WATER AND SOIL,
Kiev Inst. for the Advanced Training of Physicians (USSR).
For primary bibliographic entry see Field 5A.
W78-00700

POLYCYCLIC AROMATICS IN SURFACE AND GROUND WATER,
For primary bibliographic entry see Field 5A.
W78-00702

COMPUTER PROGRAM FOR CALCULATING PRESSURE-BROADENED RAMAN SPECTRA FOR MOLECULAR NITROGEN AND OXYGEN,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
C. Fralick.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-37473, Price codes: A03 in paper copy, A01 in microfiche. NASA/TM X-3427, October 1976. 29 p, 11 fig, 16 ref, 4 append.

Descriptors: *Computer programs, *Spectroscopy, *Nitrogen, *Oxygen, *Mathematical studies, Pressure, Measurement, Instrumentation, Analytical techniques, Mathematics, Temperature, Molecular structure.
Identifiers: *Raman spectroscopy, *Molecular rotation, Pressure broadening, *Molecular nitrogen, Molecular oxygen.

A computer program was given for calculating the rotational Raman spectrum for molecular nitrogen and oxygen. Provision was made for pressure broadening. Several sample calculations at various pressures were shown. The relative heights of some of the lines were affected by pressure broadening. (Henley-ISWS)
W78-00703

ANALYSIS OF THE SATURATED-UNSATURATED HYDRAULIC CONDUCTIVITY IN A MIXED SODIUM-CALCIUM SOIL SYSTEM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W78-00709

EFFECT OF MIXED NA-CA SOLUTIONS ON THE HYDRAULIC PROPERTIES OF UNSATURATED SOILS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W78-00710

THE NATURE AND BEHAVIOR OF GASES IN NATURAL WATERS,
Geological Survey of Canada, Ottawa (Ontario). Resource Geophysics and Geochemistry Div.
W. Dyck, and I. R. Jonasson.
Water Research, Vol. 11, No. 8, p 705-711, 1977. 5 fig, 2 tab, 7 ref.

Descriptors: *Gases, *Water analysis, *Canada, Analytical techniques, *Water chemistry, Water properties, Mass spectrometry, Instrumentation, Chemistry, Argon, Carbon dioxide, Helium, Hydrogen, Methane, Nitrogen, Oxygen, Hydrogen sulfide, Geochemistry, Groundwater.
Identifiers: *Natural waters, *Dissolved gases, *Mineral exploration, Mass spectrometer method.

During the past 2 years tests were carried out to determine the nature and behavior of dissolved gases in natural waters from a variety of different environments. The environments tested included surface stream and lake waters, groundwaters from wells and springs, and drill hole waters from uranium and copper deposits. Close to 800 water samples were analyzed to date for the following gases: H2, He, CH4, Ne, N2, O2, H2S, Ar, CO2, and Rn. The first 9 were determined using a mass spectrometric method with an average sampling and analytical precision of about 20%. Rn was determined with similar precision using silver-activated ZnS counters. The gases of interest from the viewpoint of biochemical and geochemical activity were found to be H2, He, CH4, O2, H2S, CO2, and Rn. Ne, N2, and Ar revealedd no clearly recognizable patterns of dispersion. The composition of the dissolved gases from the sampled environments varied over a wide range. Generally speaking, the occurrence of specific gases in specific environments usually could be interpreted in terms of the known geochemistry of the environment. The presence of He anomalies was most difficult to explain. Its chemical inertness and related high geochemical mobility permit He to travel great distances from its source. He and Rn always were present in all environments tested. Gases in surface waters contained, as a rule, only equilibrium amounts of He. In waters near U deposits, a positive correlation between He and Rn was observed. (Henley-ISWS)
W78-00712

CHEMISTRY OF SULFUR IN THE ATMOSPHERE,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5A.
W78-00738

GROUND-WATER INVESTIGATION AT THE ALLUVIAL FAN OF THE SOUTH FORK EAGLE RIVER, ANCHORAGE, ALASKA - RESULTS OF TEST DRILLING, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00810

CHEMICAL, ISOTOPIC, AND GAS COMPOSITIONS OF SELECTED THERMAL SPRINGS IN ARIZONA, NEW MEXICO, AND UTAH,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00815

RECONNAISSANCE OF WATER QUALITY IN THE DUCHESNE RIVER BASIN AND SOME ADJACENT DRAINAGE AREAS, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-00820

2L. Estuaries

ECOLOGICAL-FAUNISTIC INVESTIGATIONS ON THE MEIOBENTHOS OF THE SAALER BODDEN, GDR, BALTIC SEA, (IN GERMAN),
J. Beschnidt, and B. Noack.
Int Rev Gesamten Hydrobiol 61(1), p 89-104, 1976.

Descriptors: *Benthos, Ecology, Biomass, Brackish water, Diptera, Copepods, Nematoda, Sea water.
Identifiers: *Baltic Sea, Halacarida, Harpacticoida, Meid, Oligochaeta, Ostracoda, *Saaler Bodden(E Germany).

The meiofauna of the Saaler Bodden was investigated from Sept. 1969-April 1970. The Saaler Bodden is that part of a brackish water system which is situated farthest from the Baltic Sea. In the southern part fresh water may be found; in the northern part, the salinity rises to a maximum of 5-6%. A short review is given of the hydrographical and biological peculiarities of the Saaler Bodden followed by remarks as to the qualitative and quantitative distribution of the meiofauna. Abundance and biomass are determined for Nematoda, Oligochaeta, Ostracoda, Copepoda, Harpacticoida, Halacrida and Chironomid larvae. Oligochaeta and Ostracoda are dealt with in detail. The ecological requirements of the different species are discussed in this connection and their role in the balance of matter of this water body is pointed out.–Copyright 1976, Biological Abstracts, Inc.
W78-00501

PHOSPHATE/SEDIMENT INTERACTION IN TOLO AND LONG HARBOURS, HONG KONG AND ITS ROLE IN ESTUARINE PHOSPHORUS AVAILABILITY,
Fisheries Research Station, Aberdeen (Hong Kong).
For primary bibliographic entry see Field 5B.
W78-00516

FUTURE SEA-LEVEL CHANGES DUE TO WEST ANTARCTIC ICE SHEET FLUCTUATIONS,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Cooperative Inst. for Research in Environmental Science, Boulder, CO.
For primary bibliographic entry see Field 2C.
W78-00518

PREDICTING ESTUARINE SALINITY FROM RIVER INFLOWS,
California Univ., Berkeley. Dept. of Civil Engineering.
J. A. Harder.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY8, Proceedings Paper 13152, p 877-888, August 1977. 6 fig, 9 ref, 2 append.

Descriptors: *California, *Mathematical models, *Salinity, *Tidal effects, *Hydrograph analysis, Estuaries, Hydrologic data, Analysis, Forecasting, Hydrographs, Numerical analysis, Streamflow.
Identifiers: *Non-linear systems, *Freshwater inflow, *San Francisco Bay(Calif).

An analysis system was described that enables the second-order and higher nonlinear interactive effects to be estimated in the relationship between the input and output of nonlinear systems. No data are required, in principle, other than an input and output time history over a sufficient period. The method was compared with the functional approach of Weiner, and it was shown to have advantages in practical application. An application to the prediction of salinity in estuaries from river inflows was described. An error analysis for the prediction of salinity at Benicia, California, showed that systematic errors in the data and the influence of unaccounted-for variables contribute the bulk of the error in making the predictions and that the error attributable to the analysis leading to the construction of the predictor contributes a smaller error, which is estimated to be on the order of 8% in the application. (Adams-ISWS)
W78-00526

NITRIFICATION AND DENITRIFICATION IN MARINE SEDIMENTS FROM PUGET SOUND,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00537

THE SULFUR CYCLE OF A COASTAL MARINE SEDIMENT (LIMFJORDEN, DENMARK),
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
For primary bibliographic entry see Field 5B.
W78-00538

THE FLAX POND ECOSYSTEM STUDY: EXCHANGES OF CARBON IN WATER BETWEEN A SALT MARSH AND LONG ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5B.
W78-00539

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 1. MASS TRANSFER PROPERTIES AND SILICA DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environnnement.
For primary bibliographic entry see Field 5B.
W78-00542

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 2. NITROGEN DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environment.
For primary bibliographic entry see Field 5B.
W78-00543

ON THE DISTRIBUTION OF NITRATE NITROGEN IN THE PACIFIC OCEAN,
Meteorological Coll., Kashiwa, Chiba Pref., (Japan).
T. Sagi.
Papers in Meteorology and Geophysics, Vol. 28, No. 1, p 29-39, March 1977. 7 fig, 1 tab, 12 ref.

Descriptors: *Nitrates, *Pacific Ocean, *Sampling, *Chemical analysis, Oceans, On-site investigations, Chemicals, Automation, Analytical techniques, Data processing, *Distribution patterns, Temperature, Water temperature, Salinity, Nutrients, Dissolved oxygen, Oceanography, *Path of pollutants, Water pollution sources.
Identifiers: *Nitrate-nitrogen.

The desirable conditions for the operation of the Auto-Analyzer system were confirmed for the determination of nitrate in seawater. Based on nitrate data obtained up to the present, some characteristics were described with respect to the horizontal distributions on the isobaths and the vertical distributions along several meridians. (Sims-ISWS)
W78-00547

THE DISTRIBUTION OF DIATOMS IN MISSISSIPPI SALT MARSHES,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-00555

HYDROLOGIC AND BIOLOGIC CHARACTERISTICS OF NATURAL CHANNELS IN COASTAL MARSH OF MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-00568

STUDIES ON THE OIL POLLUTION OF SEDIMENTS IN THE SETO INLAND SEA,
Hiroshima Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W78-00571

FATE AND EFFECTS OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS AND ECOSYSTEMS.
For primary bibliographic entry see Field 5C.
W78-00572

LONG TERM BIOLOGICAL EFFECTS OF BUNKER C OIL IN THE INTERTIDAL ZONE,
New Brunswick Univ., St. John. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-00597

BIOLOGICAL SURVEY OF INTERTIDAL AREAS IN THE STRAITS OF MAGELLEN IN JANUARY, 1975, FIVE MONTHS AFTER THE METULA OIL SPILL,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5B.
W78-00598

CHEMICAL CARCINOGENS IN THE MARINE ENVIRONMENT BENZO(A)PYRENE IN ECONOMICALLY IMPORTANT BIVALVE MOLLUSKS FROM OREGON ESTUARIES,
Oregon State Univ., Corvallis. Dept. of General Science.
For primary bibliographic entry see Field 5B.
W78-00615

DISTRIBUTION OF PETROLEUM HYDROCARBONS IN WESTERNPORT BAY (AUSTRALIA): RESULTS OF CHRONIC LOW LEVEL INPUTS,
Victoria Ministry for Conservation, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W78-00617

A SIMPLIFIED MODEL OF SALT WATER ENCROACHMENT IN AN AQUIFER (UN MODELE SIMPLIFIE POUR LA SIMULATION DES NAPPES AVEC INTRUSION SALINE),
Bureau de Recherches Geologiques et Minieres, Orleans (France).
M. Bonnet, and J-P. Sauty.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, p 45-56, 1975. 7 fig, 1 ref.

Descriptors: *Aquifers, *Saline water intrusion, *Simulation analysis, *Mathematical models, Saline water-freshwater interfaces, Wells, Equations, Optimization, Linear programming, Systems analysis.
Identifiers: *Coastal aquifers, Hydrodispersive models, Prediction, Dupuit assumption, Finite difference formulation, Classic one-phase model.

The modeling of coastal aquifers with salt water encroachment and, especially, simulation of the influence of an extensive exploitation by wells present delicate problems. To accurately account for all physical phenomena existing in the saline zone and the interface between it and the fresh water aquifer, one must set up hydrodispersive models which appear very complicated and necessitate a fine discretization in space and time. This demands much computer time since in real cases one must make long-term predictions for large areas of influence. To overcome this difficulty, an approach is proposed which rests upon the two most usually admitted assumptions as a first approximation: the two phases (fresh and salt water) are supposed immiscible and their interface is without any dispersion. The Dupuit assumption is verified for both salt and fresh water flows. Upon this basis it is possible to set up a finite difference formulation totally implicit in time which is stable for a node spacing of usual size and which admits time steps of reasonable extension. This model was used in connection with a classic one-phase model and a linear programming optimization model to determine the best well pattern in a coastal aquifer located along the north Moroccan Atlantic coast: presented are the different steps taken for successive application of these models and conclusions on the measures to be taken for the exploitation of such an aquifer. (See also W77-10419) (Bell-Cornell)
W78-00638

COASTAL ZONE LEGAL REFERENCES, 1976.
State Univ. of New York at Buffalo, Amherst. Sea Grant Law Center.
For primary bibliographic entry see Field 6E.
W78-00657

DEEP WATER RENEWAL OF LOCH ETIVE: A THREE BASIN SCOTTISH FJORD,
Dunstaffnage Marine Research Lab., Oban (Scotland).
A. Edwards, and D. J. Edelsten.
Estuarine and Coastal Marine Science, Vol. 5, No. 5, p 575-595, September 1977. 11 fig, 1 tab, 17 ref.

Descriptors: *Fjords, *Water circulation, *Surveys, *Mathematical models, Salinity, Water quality, On-site investigations, Currents(Water), Tidal waters, Estuaries, Hypolimnion, Surface waters, Surface runoff, Mixing, Overflow, Dissolved oxygen, Water temperature, Entrainment, Stagnant water, Foreign research, Foreign countries.
Identifiers: *Loch Etiv(Scotland).

Loch Etive is a fjord with 3 basins. Innermost bottom water stagnates for months or years, with slowly changing temperature and salinity, falling deep oxygen concentration, and with a secondary pycnocline below sill depth. A bottom water renewal was described and shown to be caused by low freshwater runoff. The renewal is a series of overflows of sill water during spring flood tides. During overflow, dense fluid forms a turbulent plume whose observed behavior is similar to that expected from theory: an entrainment constant of 0.013 is found on a bottom slope of 6 deg. Observations of salinity in the sill region show that the flushing time there is 4 weeks and that this is the response time of the renewal mechanism to changes in runoff. A model of the non-linear dependence of renewal upon runoff was made and used to hindcast during 1964-1975. The hindcast was verified and showed that renewal is aperiodic, with a mean repetition time of 1 1/3 years. (Humphreys-ISWS)
W78-00683

TIME AND SPACE VARIATION IN THE SURFICIAL SEDIMENTS OF THE NEW YORK BIGHT APEX,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
W. L. Stubblefield, R. W. Permenter, and D. J. P. Swift.
Estuarine and Coastal Marine Science, Vol. 5, No. 5, p 597-607, September 1977. 7 fig, 8 plate, 14 ref.

Descriptors: *Sediments, *Distribution patterns, *Continental shelf, *New York, *Coasts, Spatial distribution, Temporal distribution, Annual, Waste disposal, Tidal waters, On-site tests, On-site investigations, Surveys, Sampling, Instrumentation, Spoil banks, Sewage disposal, Oceans, Sounding, Sonar.
Identifiers: *New York Bight, Surficial sediments, Ocean dumping.

Sidescan sonar records, grab samples, and bottom photographs were collected along 2 transects in the New York Bight apex, on a quarterly basis for 6 quarters. Sampling was designed to determine the natural variability of bottom deposits in time and space and the effects of ocean dumping on the patterns. The Hudson Shelf Valley and the christianensen Basin at its head are floored by fine muddy sand and mud, while the high areas on either side are covered by medium grained sand. Bottom sands on the seaward side are relatively uniform. On the New Jersey side, and near the Long Island coast, sand ribbon-like patterns with spacings of 10-200 m appear. Separate dumpsites for sewage sludge, dredge spoil, cellar dirt, and acid waste occur within the area. The distribution of grain sizes and bedform patterns are stable over time, indicating that the bottom is in a state of textural near-equilibrium with the hydraulic climate. The effects of ocean dumping are most obvious in the vicinity of the dredge spoil dumpsite, which has shoaled 15 m within the last years. Here an aureole of anomalously fine sediment is spreading over a bottom locally composed of artificial rubble. Cholera Band, the area where the highly mobile sewage sludge is dumped, is floored by sand; no permanent sludge deposits form. The bottom muds of the adjacent Christianensen Basin, however, may be contaminated with this material. (Humphreys-ISWS)
W78-00684

RECENT CARBONATE SEDIMENTATION [illegible] CONNEMARA, WESTERN IRELAND,
Reading Univ. (England). Sedimentology Research Lab.
A. Gunatilaka.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 609-629, September 1977. 6 fig, 2 tab, 35 ref.

Descriptors: *Geomorphology, *Coasts, *Bays, *Sedimentation, *Carbonate rocks, Sediments, Facies(Sedimentary), Mineralogy, Carbonates, On-site investigations, Tidal waters, Currents(Water), Sampling, Testing procedures, Detritus, Marine plants, Sands, Gravels, Magnesium, Strontium, Geochemistry, Foreign research, Foreign countries.
Identifiers: *Connemara(Ireland).

An extensive area of biogenic carbonate sedimentation characterize the Atlantic seaboard of Western Ireland. In accounting for the distribution of the sediments, perhaps the most significant factor is the orientation of the coastal and submarine morphology in association with a 230 deg wind vector that provides the main energy input into the sedimentary system. Four major sedimentary facies were recognized in the study area, each having a particular constituent composition and texture. The interaction of the energy flow with the coastal geomorphology results in the coarser sediments being confined to the more exposed parts of the embayments, while the finer sediments accumulate in the sheltered areas. The apparently simple relationships among grain size, particle composition, sorting, and the degree of sheltering from the energy flow indicate that the biogenic components are all hydrodynamically sorted and that the sediment assemblages reflect the degree of local environmental energy. In Connemara, skeletal breakdown is controlled primarily by biological processes. Superimposed on this is a secondary process of mechanical disintegration. If Connemara is assumed to be representative of temperate water carbonates, then there appears to be a fundamental difference in the mineralological

and geochemical compositions of warm and temperate water carbonate regions. The two regions should be distinguished on the basis of their respective carbonate secreting organisms. (Humphreys-ISWS)
W78-00685

GEOMORPHOLOGY, SHALLOW SUBBOTTOM STRUCTURE, AND SEDIMENTS OF THE ATLANTIC INNER CONTINENTAL SHELF OFF LONG ISLAND, NEW YORK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-00704

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANTS.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol. 42, No. 83, p 22036-53, April 29, 1977.

Descriptors: *Grants, *Shore protection, *Regulation, *Planning, *Coasts, Administrative agencies, Administrative decisions, Non-structural alternatives, Administration, Coastal marshes, Coastal plains, State governments, State jurisdictions, Oceanography, Oceans, Shores, Environmental control, Environment, Environmental effects, Erosion, Energy.
Identifiers: Coastal zones, Coastal zone management, Coastal management programs, *Coastal Zone Management Act of 1972, *National Oceanic and Atmospheric Administration.

The National Oceanic and Atmospheric Administration (NOAA) has amended its regulations pertaining to coastal zone management program development grants. A management program must include public shorefront access planning by taking into account existing facilities and future demand for visual and physical access while emphasizing the recreational needs of urban residents. Revised regulations also require planning for management of the impact from energy facilities located in coastal zone areas. Several approaches are suggested. States are required to articulate policies pertaining to shoreline erosion including preferences for structural or non-structural controls if any are desired. Guidelines and procedures employed in receiving, reviewing and providing preliminary approval for state coastal management programs and grant awards are set forth. The purposes of preliminary approval grants are to assist a state in insuring implementation of a fully developed program design and to provide for initial implementation of approved management elements. A summary of the major comments received about the regulations and the response by NOAA to the comments is included. (Mulligan-Florida).
W78-00777

FOUR MONOGRAPHS FOR THE GENERAL READER (WORLD OCEANS, LAW OF THE OCEANS, INSTITUTIONAL ARRANGEMENTS FOR THE LAW OF THE SEA, WORK OF THE THIRD UNITED NATIONS LAW OF THE SEA),
Miami Univ., FL. School of Law.
For primary bibliographic entry see Field 6E.
W78-00778

MARINE SCIENTIFIC RESEARCH AND THE LAW OF THE SEA CONFERENCE: SOME PROPOSED AMENDMENTS TO THE REVISED TEXT,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 6E.
W78-00779

THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA: THE 1976 NEW YORK SESSIONS,
Bureau of Oceans and International Environmental and Scientific Affairs, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-00784

OCEANOGRAPHY AND THE LAW OF THE SEA,
Portugese, State Secretariat for Fisheries, Lisbon.
For primary bibliographic entry see Field 6E.
W78-00787

THE PROPOSED OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1976: AN INADEQUATE GUIDE TO OUTER CONTINENTAL SHELF DEVELOPMENT,
Harvard Law School, Cambridge, MA.
For primary bibliographic entry see Field 6E.
W78-00800

PROBLEMS OF COASTAL MANAGEMENT,
Florida Dept. of Natural Resources, Tallahassee. Bureau of Beaches and Shores.
For primary bibliographic entry see Field 6E.
W78-00801

OCEANS '77 CONFERENCE RECORD.
Institute of Electrical and Electronics Engineers, Inc., New York.; and Marine Technology Society, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00827

1974 FLOATING BREAKWATERS CONFERENCE PAPERS.
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 8B.
W78-00840

THEORETICAL ANALYSIS OF FLOATING BREAKWATER PERFORMANCE,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W78-00842

GENERAL CHARACTERISTICS OF ESTUARIES, (IN SPANISH),
J. Martinell Callico.
Inmersion Cienc 8/9, p 7-14, 1975.

Descriptors: *Estuaries, *Aquatic insects, Mollusks, *Invertebrates, *Estuarine environment, *Aquatic animals, Marine animals.
Identifiers: Oligochaetes, *Paleographic analysis.

Studies of the present fauna of estuaries show that the number of species and their interrelations are smaller than in other sedimentary media. A detailed paleographic analysis may explain the original environments. Of the various components of the estuary facies, the freshwater specimens are least represented in these formations. Among the invertebrates the main freshwater components are the larvae of insects, oligochetes and a few mollusk pulmonates. In the lower part of an estuary the fauna is predominantly marine and is made up of species that live in the nearby marine areas. Those shore species accustomed to daily environmental changes are most likely to colonize an estuary. The flora is halophitic and scant; there are no xerophitic plants. The flora gets richer where the soil is firm.--Copyright 1976, Biological Abstracts, Inc.
W78-00848

EVALUATION OF GEOLOGIC HAZARDS IN OCS PETROLEUM LEASE AREAS, SOUTHERN CALIFORNIA CONTINENTAL BORDERLAND,
For primary bibliographic entry see Field 5G.
W78-00870

AN EVALUATION OF LOUISIANA SUPERPORT STUDIES AND IMPLICATIONS FOR COASTAL ZONE MANAGEMENT,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-00871

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

GROUND WATER IN THE LAJAS VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00822

3C. Use Of Water Of Impaired Quality

NITRATE-NITROGEN AND CHLORIDE MOVEMENT THROUGH UNDISTURBED FIELD SOIL,
Alabama A and M Univ., Normal.
For primary bibliographic entry see Field 5B.
W78-00520

KINETICS OF SALT RELEASE FROM A SALINE SOIL,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 2G.
W78-00676

3D. Conservation In Domestic and Municipal Use

THE IMPACT OF WATER SAVING DEVICE INSTALLATION PROGRAMS ON RESOURCE CONSERVATION,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sharpe, and P. W. Fletcher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 825, Price codes: A04 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources, University Park, Research Publication 98, July 1977. 44 p, 4 fig, 14 tab, 14 ref, 4 append. OWRT A-038-PA(2). 14-31-0001-4038.

Descriptors: Pennsylvania, *Water utilization, *Water conservation, Costs, Sewage disposal, Water consumption, *Cost comparisons, Water users, Maryland, District of Columbia.
Identifiers: *Washington Suburban Sanitary Commission, *Water saving devices, Shower flow controls, *Minimum water use fixtures, *Waste flow reduction, Holding tank systems, Elevated sand mound, *Cost savings, On-lot sewage disposal, Minimum water use.

The water saving programs of the Washington Suburban Sanitary Commission (WSSC) were evaluated and found to have been effective in reducing customer water use. The methods used by the WSSC were analyzed and changes were suggested where appropriate. A study of the effec-

tiveness of bathing shower flow controls in college dormitories showed savings in shower water use of up to 60 percent were possible with commercially available devices. Gross savings to The Pennsylvania State University for such a program were estimated to be $100,000 annually. A comparison of costs for on-lot sewage disposal facilities with and without minimum water use fixtures was made. Cost savings were shown for elevated sand mound and holding tank systems using minimum water use technology based on calculated wasteflow reductions. (Sink-Penn State)
W78-00563

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6A.
W78-00649

THE DROUGHT,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2B.
W78-00807

QUANTITY AND QUALITY OF URBAN STORM WATER IN SOUTHEAST FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
C. B. Sherwood, and H. C. Mattraw.
In: Modern Developments in Hydrometry, Volume II: Proceedings of the International Seminar held at the University of Padua, Italy, September 8-13, 1975; World Meteorological Organization Report (WMO No 427), p 94-108, 1976. 7 fig, 1 tab, 1 ref.

Descriptors: *Urban hydrology, *Storm runoff, *Storm drains, *Water yield, *Water quality, *Florida, Cities, Data collections, Rainfall, Runoff, Sampling, Chemical analysis, Bacteria.
Identifiers: *Pompano Beach(Fla), Fort Lauderdale(Fla).

Rainfall, runoff, and water quality were monitored in a residential area in southeast Florida starting in March 1974. Rainfall was measured at three points in the area and the resulting runoff was measured in a storm sewer. Water samples were automatically collected in the storm sewer at intervals of 144 seconds throughout the period of runoff. By September 1974, 19 of 104 rainfalls produced runoff great enough to trigger the water-sampling mechanism. The chemical quality of the storm-sewer runoff was highly variable. Precise relations between loads, concentrations, and runoff have not yet been established. In general, however, the highest concentrations of chemical constituents were found in runoff that occurs after long dry periods, and lowest concentrations in runoff that occurs during a period of frequent rainfall. Peak concentrations for individual storms--in milligrams per liter--ranged from 5.3 to 0.7 for nitrogen, 1.35 to 0.15 for phosphorus, and 290 to 15 for chemical oxygen demand. A 1.1-inch rainfall of 30 minutes duration on June 16 had a peak flow of 19 cubic feet per second and loads of 1.4 pounds of nitrogen, 0.5 pounds of phosphorus, and 15 pounds of chemical oxygen demand. Total coliform bacteria counts in some storms were as high as 1.8 million colonies per 100 milliliters of water. (Woodard-USGS)
W78-00824

3E. Conservation In Industry

THE POTENTIAL IMPACT OF COAL-ENERGY DEVELOPMENT ON AGRICULTURE LAND RESOURCES IN WYOMING'S POWDER RIVER BASIN,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-00505

WASTES FROM SMALL POULTRY DRESSING ESTABLISHMENTS,
Center for Disease Control, Atlanta, GA.
For primary bibliographic entry see Field 5A.
W78-00510

TANNERY WASTE MANAGEMENT,
Cincinnati Univ., Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-00512

PENNSYLVANIA WATER RESOURCES RESEARCH CENTER TECHNOLOGY TRANSFER PROGRAMS - A CASE STUDY,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4B.
W78-00565

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME I-SUMMARY REPORT,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 6G.
W78-00753

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME II-DETAILED ANALYSES AND SUPPORTING MATERIALS,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-00754

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME III-PRELIMINARY POLICY ANALYSIS,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-00755

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME IV-APPENDICES,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 6G.
W78-00756

3F. Conservation In Agriculture

WATER REGIME OF PLANT CONTROLLED BY VARIOUS FACTORS ACTING ON ITS ROOT SYSTEM, (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2I.
W78-00504

DEPENDENCE OF TRANSPIRATION AND DIFFUSION PRESSURE IN PLANTS ON SOIL MOISTURE CONTENT AND POTENTIAL, (IN BULGARIAN),
Academy of Agricultural Sciences, Sofia (Bulgaria). Inst. of Hydrotechnics and Ameliorations.
For primary bibliographic entry see Field 2D.
W78-00515

SOIL AIR PRESSURE UNDER SUCCESSIVE BORDER IRRIGATIONS AND SIMULATED RAIN,
Agricultural Research Service, St. Paul, MN.
For primary bibliographic entry see Field 2G.
W78-00536

WATER AND ENERGY CONSERVATION THROUGH EFFICIENT IRRIGATION MANAGEMENT,
Kansas Water Resources Research Inst., Manhattan.
L. R. Stone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 810, Price codes: A02 in paper copy, A01 in microfiche. KWRRI Contribution Number 190, August 1977. 16 p, 2 fig, 7 tab, 7 ref. OWRT A-069-KAN(3). 14-31-0001-5016.

Descriptors: *Grain sorghum, *Corn(Field), Water utilization, Water conservation, Energy, Soil profiles, *Irrigation efficiency, Use rates, Crop production, *Growth stages, Kansas, Water management(Applied).
Identifiers: Grain yield, *Irrigation timing.

In a 3-year study, an evaluation was made of corn (Zea mays L.) and grain sorghum (Sorghum bicolor (L) Moench) yield and water use efficiency as influenced by irrigation timing. The study was located at Tribune (mean annual rainfall of 17 inches) and Manhattan (mean annual rainfall of 33.5 inches) Kansas. Treatments consisted of no in-season irrigation, a single in-season irrigation at one of the three different growth stages, and irrigating at each of the three selected growth stages. Selected growth stages in corn were pre-tassel, silk emergence, and blister; in grain sorghum they were boot, half-bloom, and soft-dough. Each irrigation was 4 inches at Manhattan and 6 inches at Tribune. All Tribune plots received a pre-plant irrigation in April of each year. Water was applied to basin plots using gated pipe. With no in-season irrigation the 3-year mean grain sorghum yields were greater than corn yields at both Manhattan and Tribune. The largest 3-year mean yield for corn receiving a single in-season irrigation was obtained with irrigation during silk emergence at both Manhattan and Tribune. Grain sorghum yields from the single in-season irrigation treatments were similar and presented no single time that tended to be superior during the three study years. Corn responded well to the three in-season irrigations. The grain sorghum yield increase for plots receiving three in-season irrigations as opposed to those receiving only one in-season irrigation is insufficient to justify the two additional irrigations.
W78-00566

PULSE IRRIGATION--DESIGN FOR OPERATING SETS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. Karmeli, and G. Peri.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR1, p 33-41, March 1977. 1 fig, 3 tab, 1 ref.

Descriptors: *Irrigation efficiency, *Pumping, *Design, *Operations, Irrigation practices, Discharge(Water), Equations, Irrigation systems.
Identifiers: *Pulses, *Operating sets.

A process of design for operating sets with pulse irrigation has been developed. The process allows for an efficient operation and also adjusts the operating sets to the characteristics of the pulse as formulated in a previous work. The adjustment expresses itself mainly in the establishment of the number of stations operating with one pulsator and

in the various parameters of the pulse. The process allows for the design of a number of sets and stations when the total duration of irrigation and total number of valves in the field are given. The number of sets and stations per set must be established so as to have identical numbers of stations per set. The characteristics of the remaining stations will be different as the number is smaller and the duration time of operation is maximal. (Bell-Cornell)
W78-00631

SIGNIFICANCE OF VEGETATION IN INTERPRETING THERMAL RADIATION FROM A TERRESTRIAL SURFACE,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 7B.
W78-00694

SUGGESTED CRITERIA FOR IRRIGATION WATER INTAKES IN MISSOURI RIVER RESERVOIRS, SOUTH DAKOTA,
South Dakota State Univ. Brookings, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8I.
W78-00706

STATE LEGISLATIVE RESPONSE TO THE CENTRAL ARIZONA PROJECT,
Georgia Univ., Athens.
For primary bibliographic entry see Field 6E.
W78-00707

CONTRIBUTIONS TO THE STUDY OF WATER BALANCE ELEMENTS IN THE REDDISH-BROWN SOIL AREA OF BANEASA-BUCHAREST, (IN ROMANIAN),
Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).
For primary bibliographic entry see Field 2D.
W78-00776

THE DROUGHT,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2B.
W78-00807

REGULATIVE ROLE OF TRANSPIRATION IN TEMPERATURE REGIME OF DRY FRUITS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
For primary bibliographic entry see Field 2D.
W78-00841

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

AN EXPERIMENT IN RECLAIMING THE FLOODPLAIN LAND, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-00519

PRESERVATION OF CORRELATION IN GENERATED HYDROLOGIC SAMPLES THROUGH TWO-STATION MODELS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-00531

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VII - AN INVESTIGATION OF THE VERTICAL AND HORIZONTAL HYDRAULIC CONDUCTIVITIES OF DENSE BASE COURSE AGGREGATES,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W78-00544

THE VIRGIN RIVER BASIN STUDY: A REGIONAL APPROACH TO MULTIOBJECTIVE PLANNING FOR WATER AND RELATED RESOURCES,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-00551

EVALUATION OF STREAMSIDE BUFFERSTRIPS FOR PROTECTING AQUATIC ORGANISMS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 4C.
W78-00553

COSTS OF ERRORS IN DEFINING A COMMUNITY'S FLOOD PLAIN,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 6F.
W78-00558

BAYES DESIGN OF A RESERVOIR UNDER RANDOM SEDIMENT YIELD,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 2J.
W78-00618

MARKOVIAN PROGRAMMING FOR FLOW REGULATION,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
W. G. Strupczewski, R. J. Romanowicz, and R. J. Budzianowski.
Journal of Hydrological Sciences, Vol. 4, No. 1, p 1-16, 1977. 9 tab, 9 ref.

Descriptors: *River flow, *Reservoir operation, *Markov processes, *Linear programming, *Regulation, *Stochastic processes, Reservoir storage, Control, Probability, Reservoir releases, Inflow, Constraints, Water policy, Feasibility, Equations, Mathematical models, Systems analysis, Forecasting.

A discrete Markovian model has been defined mathematically for controlling a single storage reservoir supplied with a river flow, the model referring to an existing reservoir of a limited capacity. The stochastic character of reservoir inflows is considered by incorporation of random variables, so the problem of deriving optimal control of the reservoir is reduced to determination of the respective probability distributions for a linear model. The model variables are assumed to be discrete. The two-dimensional discrete random variable 'inflow--prediction' is called the state of the model; the transition from one state to another is determined by the transition probabilities, assuming that the random variables follow the lag-one Markov process. The loss(benefit)function determining periodical effects is the objective function of the optimization analysis. The model includes the possibility to consider the exogenic information regarding future inflows. The availability of information on the current inflow or a complete lack of this information constitute two extreme cases of the model. The linear programming model is developed wherein the decision variable is the total probability of occurrence of a certain release or storage volume. Due to the high dimensionality of the problem a dynamic model is also developed. The result is a two-level generalized reservoir model with the standard policy followed at the lower level and the unconstrained policy at the upper end. (Bell-Cornell)
W78-00621

RESERVOIR YIELD: AN IMPORTANT ENVIRONMENTAL PARAMETER,
Illinois State Environmental Protection Agency, Springfield.
L. M. Eisel.
Water Resources Bulletin, Vol. 13, No. 5, p 983-994, October 1977. 3 fig, 7 tab, 8 ref.

Descriptors: *Reservoir yield, *Reservoir storage, *Multiple-purpose reservoirs, *Simulation analysis, *Model studies, *Projects, *Water resources development, Planning, Rivers, Markov processes, Monthly, Streamflow, Estimating, Water policy, Systems analysis, California.
Identifiers: *Environmental values, *New Melones Reservoir(Cal), Stanislaus River(Cal), Disaggregation models, White water preservation, Environmental quality.

An analysis of the storage-yield relationship is utilized to help resolve conflicts between environmental values and water resources development in the New Melones Reservoir in northern California. The specific conflict exists between preservation of white water for recreational purposes and development of the site for a major multiple-purpose reservoir. A simulation model is developed to investigate the storage yield relationship; the model incorporates a lag-one Markovian flow generating model to produce annual flows which are, in turn, disaggregated into monthly flows by using a procedure developed by Valencia and Schaake in 1973. The generated monthly flows are then routed through a simple reservoir model. Results demonstrate that substantial increase in capacity of the New Melones Reservoir may produce generally modest gains in reliability; more importantly, however, the results show how relatively simple analysis could assist in quantifying trade-offs among environmental values and the products of traditional water resources development. (Bell-Cornell)
W78-00627

FEASIBILITY OF INTERBASIN WATER TRANSFER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, E. L. White, and S. P. Coelen.
Water Resources Bulletin, Vol. 13, No. 5, p 1021-1034, October 1977. 5 fig, 1 tab, 15 ref.

Descriptors: *Inter-basin transfer, *Water resources, *Alternative planning, *Feasibility studies, *Water supply, *Flood protection, *Cost comparisons, Regional analysis, Economic feasibility, Hydrologic aspects, Flood control, Low-flow augmentation, River basins, Water storage, Benefits, Costs, Equations, *Reservoirs.
Identifiers: Flood skimming.

Interbasin water transfer is one of the most controversial water resources planning topics. Local communities, particularly those from which the water is to be taken (donor regions), generate enough opposition to doom many projects to failure. The opposition often arises because planners have traditionally considered excess water a free commodity rather than a marketable resource. To make transfer schemes mutually acceptable to donor and recipient regions, visible benefits must be offered. Agreement must be made on an acceptable purchase price and/or on other benefits such as a substantial amount of low flow augmentation or possibly some degree of flood control on the donor source stream. The hydrologic and economic feasibility of water transfer from the

East Susquehanna River basin to the Delaware Reservoir System for supplemental supply to the New York City area has been investigated. Nine alternative schemes for diversions up to 400 cfs and compensations in the form of low flow augmentation and/or flood control were considered resulting in unit costs to the recipient region between $90 and $380/mg. If only the minimum state-mandated flow is released to the Susquehanna River, the savings to the water recipients would be sufficient to pay a purchase price of about $21/mg, which would be equivalent to a total amount of $420,000/year for an average export of 100 cfs. (Bell-Cornell)
W78-00628

PULSE IRRIGATION--DESIGN FOR OPERATING SETS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-00631

MODELS FOR OPTIMIZING THE MULTIPURPOSE OPERATION OF A RESERVOIR SYSTEM,
Texas Univ. at Austin. Center for Research in Water Resources.
L. R. Beard.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975, IAHS-AISH Publication No. 115, p 13-21, 1975. 1 fig, 6 tab.

Descriptors: *Multiple-purpose reservoirs, *Simulation analysis, *Operations research, *Flood control, *River basins, Recreation, Navigation, Optimization, Evaluation, Water supply, Low flow, Regulation, Reservoir storage, Reservoir releases, Benefits, Monthly, Computer programs, Hydrology, Flow.
Identifiers: *Arkansas River basin, Operating rules, Power generation, Benefit maximization.

Two comprehensive hydrological and water resource management models are used to optimize the operation of 16 reservoirs in the Arkansas River basin for flood control, power generation, recreation and navigation. The primary, system model simulates and evaluates the operation of a reservoir system on a monthly basis for water supply, low flow regulation, power generation and recreation, with storage and release constraints for flood control. The catchment model simulates and evaluates the operation on a short-time basis during flood periods of a water resource system for flood control. The study to improve system operation provides for minimum acceptable accomplishments for each purpose and then maximizes the overall system accomplishments for all purposes. The catchment model establishes the values of various amounts of empty space available for flood control at the start of each calendar month. These values and benefit functions for the other purposes are then used in the system model for optimizing operation rules. Results show that existing operation rules are very close to optimum, but because of the importance of the projects, the relatively minor improvements devised herein would produce very large benefits. (See also W77-10419) (Bell-Cornell)
W78-00634

HYDROLOGICAL SYSTEM RELIABILITY AT THE CONFLUENCE OF RIVERS,
Water Resources Centre, Budapest (Hungary).
. Bogardi, L. Duckstein, and F. Szidarovszky.
n: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IASH-AISH Publication No. 115, International Association of Hydrological Sciences, p 36-44, 1975. 7 fig, 1 tab, 7 ef.

Descriptors: *Hydrologic systems, *Rivers, *Flood protection, *Economic efficiency, *Backwater, Effects, Tributaries, Water levels, Reach(Streams), Estimating, River beds, Flood plains, Probability, Optimization, Decision making, Hydraulic models, Numerical analysis, Mathematical models, Equations, Systems analysis.
Identifiers: System reliability, Cost minimization, Linear regression model, Natural uncertainty, Parameter uncertainty, Levee systems, Central Hungary, Cost functions, Lossfunctions, Levee failure.

The protection of a system of hydrological structures under random load conditions is examined using flood protection at the confluence of a tributary and a main water body (river, lake, or sea) as an example. Given a sample pair (h(1), h(n)) of water levels at both ends of the investigated reach, the corresponding backwater curve is calculated. Estimation of friction parameters of the river bed and flood plain is performed by model calibration. A linear regression of water level at any given cross section on (h(1), h(n)) is used to calculate the reliability of the total system. A probabilistic systems approach insures that the dependence between the resistance of the various structures is taken into account. The model has been designed to include both natural uncertainty and sample or parameter uncertainty. Use of the model to optimize system reliability and the optimum development of the levee system along the confluence of a tributary and a main river in central Hungary is calculated. The model may be used ceteris paribus whenever the joint probability distribution function of (h(1), h(n)) is normal or lognormal. (See also W77-10419) (Bell-Cornell)
W78-00637

SIMULATION MODELS OF THE VELIKA MORAVA BASIN FOR DESIGN OF A MULTIPURPOSE RESERVOIR SYSTEM,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
B. Djordjevic, S. Jovanovic, S. Opricovic, and S. Simonovic.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, p 85-94, 1975. 9 fig, 2 ref.

Descriptors: *Multiple-purpose reservoirs, *Flood control, *Simulation analysis, *Computer models, *Flood routing, Planning, River basins, Design, Reservoir storage, Rainfall, Runoff, Hydrographs, Optimization, Equations, Flow, Systems analysis.

A system of multipurpose reservoirs has been planned for the Velika Morava basin (Yugoslavia) which will have sufficient spare capacity to enable the reservoirs to perform an important flood control function. In order to design the flood storage volumes required, programs were set up for two simulation models: (1) a model to generate floods in the Velika Morava basin from simulated precipitation in the catchment area; and (2) a model incorporating the 18 reservoirs for flood routing analysis. The optimalization problem was formulated as follows: design the reservoir system such that under optimal control, design flood waves will undergo routing in the free storage volumes such that at downstream monitoring points the maximum discharge rate will always remain less than a certain given value. The entire simulation procedure considered herein goes very quickly on a modern computer enabling one to examine a large number of alternative configurations, solve optimal design problems, examine system behavior for a large number of hypothetical unfavorable hydrological situations, and work out an optimal control strategy. (See also W77-10419) (Bell-Cornell)
W78-00639

THE CALCULATION OF WATER SHORTAGE INDICES BY USING INFORMATION ABOUT THE CONCOMITANCE OF WATER RESOURCES AND DEMANDS,
Research Inst. for Water Resources Development. Budapest (Hungary).
For primary bibliographic entry see Field 6D.
W78-00640

CHANCE CONSTRAINED MODEL OF WATER RESOURCES SYSTEMS,
Water Resources Development and Construction, Prague (Czechoslovakia).
Z. Kos.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September '75. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975, p 143-148. 1 tab, 15 ref.

Descriptors: *Water resources, *Reservoir operation, *Rivers, *Linear programming, *Multiple-purpose reservoirs, Simulation analysis, Optimization, Stochastic processes, Demand, Probability, Investment, Economic efficiency, Hydrologic aspects, Mathematical models, Systems analysis.
Identifiers: *Chance-constrained programming, *Odra River(Czechoslovakia).

In this article, the applications of chance-constrained programming to water resources systems in Czechoslovakia are reviewed, and the advantages and drawbacks of reservoir operation based on linear decision rules are described. An altered problem statement for linked reservoir systems resulting from omitting the linear decision rules in the model is shown relating stochastic demands and probabilistic evaluation of a water resources system to Czechoslovak standards. Discussed are the utilization of the chance-constrained model in a study of the water resources in the catchment of the Odra River and a comparison of the study results with those obtained using a simulation model. The linear objective function of the chance-constrained model was to minimize the total investment in new reservoir capacities operating in the water resources system with existing reservoirs. The comparison of the resulting probabilities with the simulation model shows no statistically significant differences. However, the chance-constrained model is simpler and the standard probabilities can be set as input of the model rather than seeking them as output as is done in the simulation model. (See also W77-10419) (Bell-Cornell)
W78-00641

GENERAL MARKOV MODEL FOR OPTIMAL CONTROL RESERVOIRS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
W. G. Strupczewski, R. J. Kiczko, and R. J. Budzianowski.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September '75. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975, p 222-230. 4 tab, 8 ref.

Descriptors: *Reservoirs, *Flood control, *Markov process, *Stochastic processes, *Linear programming, *Dynamic programming, Optimization, Inflow, Summer, Probability, Rivers, Reservoir storage, Water policy, Equations, Mathematical models, Systems analysis.
Identifiers: Maximization, Prediction.

Described is a general stochastic model of a single reservoir and its application for the optimal control of one of the Carpathian reservoirs during the summer flood season. The model makes use of the exogenic information about the nearest inflow. It

is assumed that the inflow and its prediction form a twoedimensional first-order Markov chain. The linear programming model and the dynamic programming model for solving the dual problem are described. By introducing a two-level control policy, there is no need to determine the feasible control region since that region may not exist for the discharge as a control for the finite reservoir when the distance between the inflow probability distribution boundaries is too big. Feasible controls are introduced into the periodic objective functions and into the reservoir balance equation. Analyzed is the influence of the two-level controls on the shape of the total expected return functions for the dynamic programming problem with the convex objective function. The objective function is the maximization of the expected storage level at the end of the flood season while keeping the risk of the flood below the permissible probability. A simple example illustrates the use of the two-level regulation for theoptimal control of reservoirs. (See also W77-10419) (Bell-Cornell)
W78-00642

MULTIPLE OBJECTIVE OPTIMIZATION MODEL FOR REAL-TIME OPERATION OF A WATER SUPPLY SYSTEM,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
P. E. Flatt, and C. D. D. Howard.
In: Large Engineering Systems: Proceedings of the International Symposium on Large Engineering Systems, University of Manitoba, Winnipeg, Canada, Aug. 9-12, 1976. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, p 214-223, 1977. 3 fig.

Descriptors: *Water supply development, *Linear programming, *Water allocation(Policy), *Economic efficiency, Optimization, Reservoirs, Rivers, Constraints, *Computer models, Municipal water, Industrial water, Simulation analysis, Reservoir releases, Decision making, Fish, Flow, Demands, Spawning, Operations research.
Identifiers: *Real-time operation, *Seattle(Washington), Multiple objectives, Benefit maximization.

Described are the details of a linear programming model and its current application to the real-time operation of Seattle's water supply system. Since 1973 the model has been used by the Seattle Water Department for the management of two water supply reservoirs and it is one of a hierarchy of models used for this purpose. The four monthly operational objectives considered by the model are: (1) Seattle's municipal and industrial demands; (2) hydro-electric power requirements; (3) fish flow requirements on the Cedar River; and (4) fish flow requirements of the Tolt River. Relative values for these elements of the objective function are defined at run-time; the importance of alternative sets of values to reservoir operations depends on the current state of the physical systems. Constraints reflect both physical considerations and operational aspects, including those considerations not explicitly modeled. The (LP) linear programming model is used in conjunction with a simulation model. The operating policy determined by the optimization model is simulated to estimate the probable outcome of the policy. The objective function is to maximize the value of allocated water to the specified demands. The model is practical and includes extensive data management capabilities; execution time is a few seconds on a CDC6500 computer. (Bell-Cornell)
W78-00645

HIERARCHICAL MULTIPLE OBJECTIVE ANALYSIS OF LAND AND WATER RESOURCE UTILIZATION FOR A SYSTEM OF LAKES,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
C. D. D. Howard, and U. Shamir.
In: Large Engineering Systems: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, Aug. 9-12, 1976. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, p 596-609, 1977. 2 fig, 1 tab.

Descriptors: *Water resources, *Land resources, *Lakes, *Water utilization, *Watershed management, *Linear programming, Analytical techniques, Constraints, Simulation analysis, Computer programs, Computer models, Decision making, Water balance, Optimization, Mathematical models, Systems analysis, Equations.
Identifiers: *Multiple objectives, *Hierarchical analysis, Data management, Report generation, Edmonton(Canada), Benefit measurement.

Described is an interrelated land and water resource management problem along with a set of computer and mathematical models which were developed for its analysis. A small system of several lakes near Edmonton, Canada, for which precipitation and evaporation are closely balanced and water quality is poor, was the subject of numerous studies and public hearings. The goal of the modeling effort was to provide a method for comparing sets of weighted objectives for the management of the watersheds. This was accomplished using a deterministics linear programming model having a sum of weighted objectives subject to various constraints. This model was supported by a simulation model and other models of physical processes. Data management and report generation were emphasized to facilitate utilization throughout a process of land and water use plan formulation. The models have not yet been extensively used. (Bell-Cornell)
W78-00646

OMNIBUS WATER RESOURCES DEVELOPMENT ACT OF 1976.
For primary bibliographic entry see Field 6E.
W78-00650

WESTWIDE STUDY (CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES).
Bureau of Reclamation, Washington, DC.
Journal of the American Water Works Association, Vol. 68, No. 3, p. 117-122, March 1976.

Descriptors: *Water shortage, *Water sources, *Water conservation, *Water yield improvement, *Water management(Applied), Water pollution, Water zoning, Legal aspects, Groundwater basins, Water supply development, Water utilization, Competing uses, Water reuse, Water supply, Planning, Bodies of water, Surface waters, Arid lands, Weather modification, Southwestern states, Human population, Growth rates, Energy, Water rights.

Man's activities have caused heavy depletion of the water supply in the eleven Western states. Most of the surface water in this area has been or will be consumed by the year 2000. However, ground water supplies have not been widely utilized because of inadequate information. Complicating the water problem is an expected population increase at a rate more than twice that of the rest of the nation. Because the West contains the most undeveloped energy resources, solving the problems of water quantity and quality is imperative. In addition, the need for water for small communities and Indian reservations must be met. As the waters of the West are committed, the potential for meeting water demands through conservation and reuse becomes more important. Increasing the water supply by changing the weather artificially is possible, but the legal aspects of precipitation management are very complex. Total water management, involving both water quantity and quality is necessary to meet the current and future demands. As western water is dedicated to use, total water management by state and federal agencies should be the goal. (See also W76-00716) (Maas-Florida)
W78-00663

DRAINAGE FLUX IN PERMEABLE SOIL UNDERLAIN BY A COARSE-TEXTURED LAYER,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-00675

CHISELING INFLUENCES ON SOIL HYDRAULIC PROPERTIES,
Agricultural Research Service, Pendleton, OR. Columbia Plateau Conservation Research Center.
For primary bibliographic entry see Field 2G.
W78-00678

A TEST FOR DISTINGUISHING BETWEEN EXTREME VALUE DISTRIBUTIONS,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-00681

A REGISTRATION UNIT FOR DRAIN OUTFLOW, GROUNDWATER DEPTH AND PRECIPITATION,
Institute for Land and Water Manage Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 7B.
W78-00682

LAND DRAINAGE IN ENGLAND AND WALES,
Ministry of Agriculture, Fisheries and Food, London (England).
G. Cole.
Journal of the Institution of Water Engineers, Vol. 30, No. 7, p 345-367, October 1976. 6 fig, 23 ref.

Descriptors: *Drainage, *Watersheds(Basins), *Organizations, Drainage programs, Flood control, History, Hydrology, Oceanography, Planning, Social aspects, Land management, Methodology, Planning, Tidal waters, Flood protection, Warning systems, Land subsidence, Engineering, Design, Foreign countries, Tile drains.
Identifiers: *England, *Wales, Water authorities.

The nature of land drainage and its history were outlined in this paper. The social and economic importance of land drainage were described and compared with the other functions of water authorities. The paper also: summarized developments in design, construction and maintenance since 1954; referred to the reasons for agricultural support and hence for the encouragement of land drainage; mentioned the unity of agricultural drainage and urban flood protection; set out objectives for the future and suggested how they might be achieved. (Humphreys-ISWS)
W78-00691

EFFECTS OF VARYING DISCHARGE REGIMES ON BED-FORM SEDIMENTARY STRUCTURES IN MODERN RIVERS,
Keele Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-00696

STEADY INFILTRATION FROM A DITCH: THEORY AND EXPERIMENT,
Karadeniz Teknik Univ., Trabzon (Turkey). Dept. of Civil Engineering and Architecture.
V. Batu.
Soil Science Society of America Journal, Vol. 41, No. 4, p 677-682, July-August 1977. 8 fig, 12 ref.

Descriptors: *Infiltration, *Ditches, *Model studies, *Laboratory tests, Mathematical models, Hydraulic conductivity, Flow, Steady flow, Soil water, Soil water movement, Moisture content, Distribution patterns, Soil physics, Soil science.
Identifiers: Soil water potential, Unsaturated soils, Water content distribution.

The two-dimensional, steady-state water flow equation, which is based on the assumption that the hydraulic conductivity is an exponential function of the soil water pressure, was solved for a ditch on the soil surface. The results included expressions describing the distributions of matric flux potential and water content. Measured water contents were compared with this mathematical model and with other models. (Sims-ISWS)
W78-00708

AERATION OF HYDRO RELEASES AT FT. PATRICK HENRY DAM,
Tennessee Valley Authority, Chattanooga. Water Quality and Ecology Branch.
For primary bibliographic entry see Field 5G.
W78-00711

HYDRODYNAMIC PRESSURE IN SEMICYLINDRICAL RESERVOIR,
Universidad Nacional Autonoma de Mexico, (Mexico). Inst. de Ingenieria.
For primary bibliographic entry see Field 8B.
W78-00714

UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 7B.
W78-00715

WATER CONDITIONS AND FLOOD EVENTS IN CALIFORNIA, WATER YEAR 1975-76.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2E.
W78-00718

EYEBROOK RESERVOIR SIPHON SPILLWAY - PAPER II,
For primary bibliographic entry see Field 8B.
W78-00743

NEW ENGLAND RIVER BASINS COMMISSION FINDINGS AND RECOMMENDATIONS ON THE CONNECTICUT RIVER BASIN COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-00746

AN ASSESSMENT METHODOLOGY FOR THE ENVIRONMENTAL IMPACT OF WATER RESOURCE PROJECTS,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 6G.
W78-00750

FLOOD PLAIN INFORMATION: COTTONWOOD CREEK, EL PASO COUNTY, COLORADO.
Army Engineer District, Albuquerque, NM.
Prepared for Pikes Peak Area Council of Governments, September 1976. 31 p, 4 fig, 25 plates, 4 tab.

Descriptors: *Colorado, *Flood data, *Peak discharge, *Flood plains, *Flood protection, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Floo frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plain zoning, Building codes, Land use, Planning, Zoning, Control structures, Levee, Standard Project Flood.
Identifiers: El Paso County(CO), *Cottonwood Creek(CO), Intermediate Regional Flood.

The study area includes Cottonwood Creek from its confluence with Monument Creek to a point one mile upstream from Black Forest Road, all of which lies in El Paso County, Colorado, north of Colorado Springs. The lower reaches of Cottonwood are heavily developed, and the development is moving upstream. Some flood protection measures have been taken, such as construction of a reataining wall and levees of sand and gravel. No stream gages exist on Cottonwood Creek and few other references exist. The maximum estimated discharge in the adjacent Templeton Gap Floodway Basin is 9,700 cubic feet per second (cfs). The main flood season is April through September and results from snowmelt, rainfall, or both. Floods from similar basins in the area have high peak flows, moderate volumes and short duration. In the stream reach from Monument Creek and Academy Boulevard, the Intermediate Regional Flood (IRF) is expected to discharge from 19,420 to 20,350 cfs while the Standard Project Flood (SPF) will discharge from 35,300 to 37,000 cfs. In the stream reach from Cowpoke Road to Black Forest Road, the IRF discharge will be from 5,000 to 7,650 cfs, while the SPF discharge will be from 9,100 to 13,900 cfs. The data contained in this study are intended as an aid in on-going flood control efforts and guidelines for flood plain management are presented. (Nessa-NC)
W78-00757

SPECIAL FLOOD HAZARD INFORMATION REPORT: CONGAREE RIVER, BROAD RIVER, AND SALUDA RIVER, RICHLAND AND LEXINGTON COUNTIES, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
Prepared for the Central Midlands Regional Planning Council, June 1974, 19 p, 42 plates, 7 tab.

Descriptors: *South Carolina, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flood duration, Stage-discharge relations, Flood plains, Flood protection, Flood plain zoning, Land use, Planning, Zoning.
Identifiers: Richland County(SC), Lexington County(SC), *Congaree River(SC), *Broad River(SC), *Saluda River(SC), 500-year flood, 100-year flood.

The study area includes the portions of Richland and Lexington Counties, South Carolina, that are subject to flooding from the Broad, Saluda, and Congaree Rivers. Flood plain uses vary from concentrated residential and commercial to heavily wooded swampland. Flood data were obtained from 5 U.S. Geological Survey (USGS) gaging stations, topographic maps and field surveys. Two reservoirs operated for hydropower generation provide temporary floodwater storage. The reservoirs are lowered to maximum operating pool levels as soon as possible after storm events. The main flood season occurs from late spring to early fall and is caused by heavy rainfall. The worst flood for which complete data are available occurred in October of 1929, cresting at 150.1 feet mean sea level (msl) on the Congaree River at Gervais Street, 164.7 feet msl on the Saluda at the USGS gage, and 171.0 feet msl at the Columbia Canal Diversion Dam. The 100-year flood is expected to crest at 156.5, 169.0, and 170.7 feet msl, respectively at the same locations, while the 500-year flood would crest at 169.3, 173.8, and 179.6 feet msl, respectively. This study is intended for use in developing a floodway zoning plan and in implementing existing subdivision regulations. (Nessa-NC)
W78-00758

FLOOD PLAIN INFORMATION: STONEY BRANCH AND TRIBUTARIES, ROCK HILL, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
Prepared for City of Rock Hill, SC. August 1974, 26 p, 11 fig, 14 plates, 8 tab.

Descriptors: *South Carolina, *Indirect flood measurement, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flood flow, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard project flood, Land use, Planning.
Identifiers: Rock Hill(SC), *Stoney Branch(SC), Intermediate Regional Flood.

The study area consists of the southwest portion of the City of Rock Hill and the adjacent area of York County which are subject to flooding from Stoney Branch and three of its unnamed tributaries. Some stretches of the flood plain are substantially developed while other stretches are relatively undeveloped. Streamflow records were unavailable for the study area. Discharge frequency relationships were based on regional data or records collected on similar streams from U.S. Geological Survey (USGS) gages. Newspaper files and topographic maps were also data sources. Major floods occur from June through September and are caused by tropical storms. Heavy local rains can cause flooding in the early spring and late fall. Little data exist to establish the severity of past floods. A recent severe flood occurred in August 1970, cresting at 536.6 feet mean sea level (msl) at College Downs. At the same location, the Intermediate Regional Flood would crest at 537.4 feet msl while the Standard Project Flood would crest at 540.2 feet msl. Several bridges and culverts create obstructions to floodflow. No flood control improvements exist in the study area. The data produced by this study are intended for use in developing flood plain management regulatory measures. (Nessa-NC)
W78-00760

FLOOD PLAIN INFORMATION: EAST RIVER AND TRIBUTARIES, CITY OF GREEN BAY AND BROWN COUNTY, WISCONSIN.
Army Engineer District, Chicago, IL.
Prepared for City of Green Bay and Brown County Regional Planning Commission, March 1972, 68 p, 24 fig, 32 plates, 15 tab.

Descriptors: *Wisconsin, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood stages, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Warning systems, Land use, Planning, Control structures, Dikes.
Identifiers: Green Bay(WI), *East River(WI), Brown County(WI), Baird Creek(WI), Bower Creek(WI), Intermediate Regional Flood.

The study area includes the East River, Bower Creek, and Baird Creek in the City of Green Bay and Brown County, Wisconsin. Extensive residential, commercial and industrial land uses occupy the East River and Baird Creek flood plains, while the Bower Creek flood plain is mostly in agricultural use. Flood data were obtained from two stream gages on the East River, newspaper files, historical documents, and field investigations. No reliable data on floods on Baird and Bower Creek were found. The main flood season occurs from April through June and results from rainfall, snowmelt, or both. Intense local thunderstorms may cause flooding at any time. The worst flood of record on the East River measured at the Grove Street gage occurred on Februaty 10, 1966, discharging 5,500 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) is expected to discharge 7,800 cfs, while the Standard Project Flood (SPF) will discharge 23,300 cfs. The IRF at the mouths of Baird and Bower Creeks would discharge 2,400 cfs and 4,000 cfs, respectively, while the SPF discharge at the same location would be 7,100 cfs and 12,100 cfs, respectively. Two bridges across the East River would be inudated by the SPF, as would several major roads. There are no major ob-

structions on Bower Creek, but several bridges present obstruction hazards on Baird Creek. Channel improvement would provide faster discharge of smaller floods. (Nessa-NC)
W78-00761

FLOOD PLAIN INFORMATION: MENOMINEE RIVER--GREEN BAY, MARINETTE COUNTY, WI, MENOMINEE COUNTY, MI, CITIES OF MARINETTE, WI--MENOMINEE, MI.
Army Engineer District, Chicago, IL.
Prepared for East Central Wisconsin Regional Planning Commission, January 1975, 35 p, 17 fig, 16 plates, 9 tab.

Descriptors: *Wisconsin, *Michigan, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Land use, Planning.
Identifiers: *Menominee River(WI and MI), Green Bay(WI), Marinette(WI), Menominee(MI), Marinette County(WI), 500-year flood, Intermediate Regional Flood, Meoniminee County(MI).

The study area includes the portions of Marinette County, Wisconsin, and Menominee County, Michigan, and the cities of Marinette, Wisconsin, and Menominee, Michigan subject to flooding from the Menominee River and its terminus, Green Bay, which is contiguous with Lake Michigan. The drainage area at the terminus is 4,070 square miles. Land uses along the waterways are residential, commercial, industrial, agricultural and recreational. Flood data were obtained from 6 gaging stations on the river and bay, newspaper files, historical documents, topographic maps and field surveys. Flooding occurs year round on the river, resulting from rain, snowmelt, or both. Flooding on the bay results from long term precipitation cycles, short term precipitation excesses, and seasonal precipitation patterns. The worst flood of record on the Menominee, measured at the McAllister gage, occurred on May 9, 1960, cresting at 650.0 feet mean sea level (msl). The worst flood of record on Green Bay at the mouth of the Menominee occurred on April 9, 1973, cresting at 584.20 feet msl. At this location, the Intermediate Regional Flood (IRF) will discharge 41,000 cubic feet per second (cfs) and crest at 584.40 msl, while the Standard Project Flood would discharge 79,000 cfs. At mile 3.61, the Menominee's IRF discharge would be 40,800 cfs, and the SPF discharge would be 78,700 cfs. (Nessa-NC)
W78-00762

FLOOD PLAIN INFORMATION: BEAVER CREEK AND TRIBUTARIES, VICINITY OF HUNTINGTON, TENNESSEE.
Army Engineer District, Memphis, TN.
Prepared for City of Huntington, TN, September 1971, 36 p, 7 fig, 17 plates, 11 tab.

Descriptors: *Tennessee, *Indirect flood measurement, *Flood data, *Peak discharge, Floods, Flooding, Flood flow, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood stages, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood.
Identifiers: Huntington(TN), *Beaver Creek(TN), Brier Creek(TN), Poison Branch(TN), Intermediate Regional Flood.

The study area involves Beaver Creek from mile 2.65 upstream to mile 9.00, Brier Creek from the mouth upstream to mile 1.33, and Poison Branch from the mouth upstream to the County Road bridge at mile 1.26, and includes the City of Huntington. Some developments exist in the flood plain. Present trends indicate that flood plain sites will be increasingly attractive to developers. Several bridges would be overtopped by the Intermediate Regional Flood (IRF). Flood data were obtained from local rainfall and runoff information, historical and current flood heights, and the U.S. Geological Survey (USGS) stream gage on Beaver Creek. Flooding has occurred from September through June and results from heavy general rainfall. The worst flood of record occurred on September 9, 1970, discharging 8,500 cubic feet per second (cfs) and cresting at 378.16 feet mean sea level (msl) at the Beaver Creek gage. This flood is equivalent to the Intermediate Regional Flood (IRF). The Standard Project Flood (SPF) is expected to discharge 16,500 cfs and would crest at 380.66 feet msl. Pertinent data regarding flood effects on the other streams in the study area are also provided. Substantial flood damages have occurred in the past. More extensive damages would result from the SPF. (Nessa-NC)
W78-00763

NORTH FORK OBION RIVER, HOOSIER CREEK, AND GROVE CREEK, UNION CITY, TENNESSEE.
Army Engineer District, Memphis, TN.
Prepared for City of Union City, TN, November 1968, 63 p, 9 fig, 21 plates, 16 tab.

Descriptors: *Tennessee, *Flood data, *Peak discharge, *Planning, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood.
Identifiers: Union City(TN), *Hoosier Creek(TN), *Grove Creek(TN), *North Fork Obion River(TN), Intermediate Regional Flood.

Union City, Tennessee, is located northwest of the North Fork Obion River and between Hoosier Creek on the west and Grove Creek on the east. Several tributaries to these creeks are also included in the study area. Residential, commercial, and industrial developments are found on the flood plains of all of the waterways studied. Flood data were obtained from U.S. Geological Survey (USGS) stream gages, newspaper files and historical records. The main flood season is winter and spring, although large floods caused by heavy local rains may occur any time, especially on the small streams. The largest flood of record on the North Fork Obion River, measured at the State Highway 22 bridge gage, occurred on January 22, 1937, and crested at 308.88 feet mean sea level (MSL) with a peak discharge of 49,200 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) is expected to discharge 58,000 cfs, while the Standard Project Flood would discharge 80,000 cfs. Historical and future flood profiles are also provided for the other streams in the study area. The data in this study are intended for use in developing nonstructural control measures such as flood plain zoning, and structural control measures where necessary. (Nessa-NC)
W78-00764

FLOOD PLAIN INFORMATION: SUGAR CREEK, LITTLE NIXON CREEK, AND TRIBUTARIES, VICINITY OF BROWNSVILLE, TENNESSEE.
Army Engineer District, Memphis, TN.
Prepared for City of Brownsville, TN, March 1975, 27 p, 17 fig, 18 plates, 5 tab.

Descriptors: *Tennessee, *Flood forecasting, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Design flood, Historic floods, Flood frequency, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood.
Identifiers: Brownville(TN), *Sugar Creek(TN), *Little Nixon Creek(TN), Sugar Creek Lateral(TN), Little Nixon Creek Lateral(TN), Buck's Creek(TN), Buck's Creek Lateral(TN), Intermediate Regional Flood.

The study area involves two small watersheds. One is drained by Sugar Creek and its tributary, Sugar Creek Lateral. The other watershed is drained by Little Nixon Creek and its tributaries, Little Nixon Creek Lateral, Buck's Creek, and Buck's Creek Lateral. Brownsville, Tennessee is bisected by the divide separating these two watersheds. Limited residential and commercial development has taken place on these flood plains. Flood data were obtained from newspaper files, 1971 aerial photographs, and field surveys. There are no stream gages in the study area. Flooding occurs at any time of year. Historical flood data were difficult to obtain. Local residents provided information on high water marks. At the mouth of Sugar Creek, the Intermediate Regional Flood (IRF) is expected to discharge 7,500 cubic feet per second (cfs) while the Standard Project Flood (SPF) is expected to discharge 15,000 cfs. At the downstream study area boundary, Little Nixon Creek would discharge 4,600 cfs in the IRF, and 9,200 cfs in the SPF. Most of the 32 bridges and culverts in the study area are obstructive to the IRF and SPF. This study will provide Brownsville with the data necessary to develop flood plain management regulartory measures. (Nessa-NC)
W78-00765

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, ASHLAND CITY, TENNESSEE.
Army Engineer District, Nashville, TN.
Prepared for Town of Ashland City, TN, April 1970, 29 p, 4 fig, 11 plates, 7 tab.

Descriptors: *Tennessee, *Flood forecasting, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Control structures, Reservoirs, Standard Project Flood.
Identifiers: Ashland City(TN), *Cumberland River(TN), Intermediate Regional Flood.

The study area involves an 11 mile reach of the Cumberland River, extending approximately 6 miles upstream and 5 miles downstream from Ashland City, Tennessee. There are some commercial, residential, and industrial developments on the flood plain. Flood data were obtained from stream gages that have been operated periodically at various locations in Ashland's general vicinity. A profile of the past and future flood situation was developed by combining the data recorded at these gages with future flood projections. The main flood season occurs from December through April, although summertime flooding can occur as a result of heavy general rains. The worst flood of record occurred on January 24, 1937, cresting at 406.4 feet mean sea level (MSL) at the Tennessee Highway 49 bridge in Ashland. At this location the January 1-2, 1927 flood crested at 406.0 feet. In the upper two miles of the study reach, the 1927 flood was higher than the 1937 flood. Four flood control reservoirs have been constructed in the study area since 1943. The Intermediate Regional Flood is expected to crest at 397.6 feet MSL at the Highway 49 bridge, while the Standard Project Flood would crest at 409.4 feet MSL, discharging 120,000 cfs and 180,000 cfs, respectively. (Nessa-NC)
W78-00766

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, CANEY FORK RIVER, CARTHAGE, TENNESSEE.
Army Engineer District, Nashville, TN.
Prepared for Carthage, TN, April 1967, 50 p, 5 fig, 12 plates, 3 tab.

Descriptors: *Tennessee, *Flood data, *Peak discharge, *Non-structural alternatives, *Land use, Floods, Flood flow, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Flood protection, Warning systems, Building codes, Planning, Zoning, Control structures, Levee,

Dikes, Floodwalls, Dams, Reservoirs, Channel improvement.
Identifiers: Carthage(TN), *Cumberland River(TN), *Caney Fork River(TN), Flood plain management, Subdivision regulations, Encroachment lines, Intermediate Regional Flood.

The study area involves 8 miles of the Cumberland River and 3.5 miles of the Caney Fork River, and includes the Town of Carthage, Tennessee. 3,325 acres of land in the study area are affected by the Standard Project Flood (SPF). Sixty-five percent of this land is devoted to agriculture. The floodplain lands devoted to agriculture in Carthage are rapidly being converted to urban uses. Flood data were obtained from U.S. Weather Bureau precipitation records, which are continuous from 1889; and stream gage records of the Weather Bureau dating from 1885; and from the U.S. Geological Survey (USGS) dating from 1922. The main flood season extends from early December through April and results from heavy general rains. The Cumberland's maximum recorded discharge of 210,000 cubic feet per second (cfs) at Carthage occurred on December 30, 1926, which is prior to construction of several upstream regulating reservoirs. The peak discharge since completion of the reservoirs is 104,000 cfs and occurred in March 1962. The discharge rates recorded for the 1926 and 1962 floods are the same as that expected for the SPF. The flood crested 1.5 feet lower in 1962 than in 1926 because of flood control measures. Additional structural and non-structural flood controls are described, and guidelines are presented for floodplain management. A selected bibliography is included. (Nessa-NC)
W78-00767

FLOOD PLAIN INFORMATION: SULPHUR FORK, SPRINGFIELD, TENNESSEE.
Army Engineer District, Nashville, TN.
Prepared for City of Springfield, Tennessee, August 1972. 29 p, 13 fig, 8 plates, 6 tab.

Descriptors: *Tennessee, *Flood data, *Flood stages, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood.
Identifiers: Springfield(TN), *Sulphur Fork(TN), Intermediate Regional Flood.

The study area involves 8.6 miles of Sulphur Fork, a tributary of the Red River, including the City of Springfield, Tennessee. A few small concentrations of residential and commercial developments and public works projects interrupt the agricultural use of the flood plain. Flood data were obtained from a U.S. Geological Survey (USGS) gage maintained since 1938, located downstream from the study area, newspaper files, and historical records. The main flood season occurs from December through April and is caused by heavy general rains. The worst known flood as measured at the gage downstream from the study area, occurred in June, 1934, cresting at 449.0 feet mean sea level (MSL). The flood's peak discharge is unknown. Another serious flood occurred on February 27, 1962, cresting at 447.1 feet MSL and discharging 13,700 cubic feet per second (cfs). The Intermediate Regional Flood (IRF) is expected to crest at 551.0 feet MSL and discharge 19,000 cfs upstream from the Springfield water works. At the same location, the Standard Project Flood will crest at 558.3 feet MSL and discharge 42,500 cfs. Six bridges form the principal obstructions to flood flows. There are no structural or non-structural flood control measures in or affecting the study area. (Nessa-NC)
W78-00768

FLOOD PLAIN INFORMATION: BLACK EARTH CREEK, DANE COUNTY, WI-VILLAGES OF MAZOMANIE, BLACK EARTH, AND CROSS PLAINS.
Army Engineer District, St. Paul, MN.
Prepared for Dane County Regional Planning Commission, November 1974, 26 p, 16 fig, 17 plates, 7 tab.

Descriptors: *Wisconsin, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Land use, Planning.
Identifiers: Dane County(WI), Black Earth(WI), Mazomanie(WI), Cross Plains(WI), *Black Earth Creek(WI), Intermediate Regional Flood.

The Black Earth Creek study area extends for 22 miles from the west Dane County, Wisconsin, line, through the villages of Mazomanie and Black Earth to 3 miles east of Cross Plains. Flood plain uses within the villages are primarily residential, commercial, and light industrial. Agricultural uses predominate outside the villages. Flood data were obtained from the stream gages maintained in Black Earth since 1954, newspaper files, historical records, topographic maps, aerial photographs and field surveys. Flooding occurs year round, although the main flood season is spring and summer, resulting from rainfall, snowmelt, or both. The worst flood recorded at the Black Earth gage occurred on July 3, 1954, cresting at 819.53 feet mean sea level (msl) and discharging 1,750 cubic feet per second (cfs). Other large floods have occurred in 1957, 1959 and 1960. At the same location, the Intermediate Regional Flood (IRF) is expected to crest at 822.0 feet msl and discharge 3,100 cfs, while the Standard Project Flood will crest at 825.9 feet msl and discharge 23,100 cfs. Twenty-two of the 29 bridges in the study area would be overtopped by the IRF. The data contained in this study are intended for use in developing the necessary flood plain management program, including regulatory measures. (Nessa-NC)
W78-00769

FLOOD PLAIN INFORMATION: NORTH NASHUA RIVER, FITCHBURG, AND LEOMINSTER, MASSACHUSETTS.
Army Engineer District, Waltham, MA.
April 1977, 33 p, 14 fig, 18 plates, 6 tab.

Descriptors: *Massachusetts, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Indirect flood measurement, Maximum probable flood, Flood forecasting, Design flood, Historic floods, Flood frequency, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, Control structures.
Identifiers: *North Nashua River(MA), Fitchburg(MA), Leominster(MA), Intermediate Regional Flood.

The study area includes the portions of Fitchburg and Leominster subject to flooding from the North Nashua River. Flood plain land uses are primarily industrial, with some commercial, residential and agricultural uses. Flood data were obtained from a U.S. Geological Survey (USGS) gage maintained since 1936 at Leominster and newspaper files. The main flood season is spring when snowmelt combines with rainfall, although heavy rains or hurricane activity may cause flooding at any time. The worst flood of record measured at the USGS gage occurred on March 18, 1936, discharging 16,300 cubic feet per second (cfs). At the same location, the 100-year or Intermediate Regional Flood (IRF) is expected to discharge 18,000 cfs, while the Standard Project Flood (SPF) will discharge 24,000 cfs. Twenty-two bridges and 1 culvert offer the principal obstructions to flood flows. The data contained in this report are intended for use in the development of appropriate structural and non-structural flood plain management plans. The study describes various regulatory measures that are available. Regulatory measures include: flood plain zoning, which stipulates the type of development permitted; subdivision ordinances, which control the way in which land is divided for development; building codes that set standards of construction; and health codes. (Nessa-NC)
W78-00770

CONNECTICUT RIVER BASIN SUPPLEMENTAL STUDY, NEW HAMPSHIRE, VERMONT, MASSACHUSETTS AND CONNECTICUT. THE RIVER'S REACH. PHASE I. SOME ENVIRONMENTAL AND FLOOD PLAIN MANAGEMENT IMPLICATIONS OF THE CHANGING ROLE OF AGRICULTURE,
Economic Research Service, Broomall, PA.
R. J. Glass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 802, Price codes: A02 in paper copy, A01 in microfiche. March 1974, 16 p, 6 tab, 4 fig. CRSS-NERBC1.6C, NERBC1.6C.

Descriptors: *Land use, *Environmental effects, *Agricultural watersheds, *Agriculture, Flooding, Succession, Productivity, Flood protection, Non-structural alternatives.
Identifiers: *Connecticut River Basin, *Flood plain management, *Environmental quality.

This study examines agricultural changes in the Connecticut River Basin, factors responsible for these changes, and the implications of the changes for flood plain management and environmental quality. The interrelated factors affecting the decline of agriculture and loss of agricultural land include changes in technology of agricultural production; interregional competition; competition for human resources; competition for land and other resources; and higher property taxes. Projections indicate a further decline in cropland and pasture acreage in the Basin, but not the level of production or value of some farm commodities, such as mild and eggs. The importance of agriculture for environmental quality and flood plain management is not reflected in its minor role in the Basin's economy. Agricultural lands located in flood plains provide for natural storage which reduce flood peaks in downstream areas, and forested areas have several advantages over agricultural lands. Cropland and pasture interspersed in the predominantly forested Basin improve both its visual quality and productivity for many species of wildlife. When agricultural pursuits are abondoned, farmlands tend to revert to forests. The timing of natural vegetative succession affects many aspects of the environment. Land use controls are capable of shaping a desirable pattern of Basin development. (Nessa-NC)
W78-00774

THOU SHALT NOT FILL PUBLIC WATERS WITHOUT PUBLIC PERMISSION - WASHINGTON'S LAKE CHELAN DECISION,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-00788

A BICENTENNIAL REFLECTION: STREAMGAUGING IN THE UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7A.
W78-00809

ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL-FLOW STREAMS IN MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-00812

WATER RESOURCES OF THE MAUNABO VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
D. G. Adolphson, M. A. Seijo, and T. M. Robison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 275, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-115, May 1977. 38 p, 18 fig, 3 tab, 12 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Puerto Rico, Hydrologic data, Aquifer characteristics, Alluvial aquifers, Bedrock, Hydrologic data, Water wells, Pumping, Water yield, Groundwater recharge, Streamflow, Low flow, Floodwater, Water supply, Water demand, Planning, Model studies.
Identifiers: *Maunabo Valley(P R).

The Maunabo Valley, in southestern Puerto Rico, consists of a 3.5-square-mile alluvial plain surrounded by hills of metavolcanic and igneous intrusive rocks. The principal source of ground water in the basin is a shallow unconfined aquifer in the valley alluvium. Continuous pumping of the shallow aquifer has induced the flow of saltwater and has caused the chloride concentration to increase from about 30 to 540 milligrams per liter in the lower part of the valley. A study from January 1971 to December 1974 indicated that the hydraulic conductivities of the aquifer materials, in the basin, are less than 1 foot per day for the metavolcanic and igneous rocks. Estimated conductivities range from 10 to 100 feet per day for the alluvium. The average transmissivity of the alluvial aquifer is estimated to be 4,000 feet squared per day and the average specific capacity is 20 gallons per minute per foot of drawdown. In December 1974, the alluvial aquifer contained an estimated 10,000 acre-feet of water in recoverable storage. The data suggest that water supplies to meet future needs could be supplemented by the construction of surface-water-control structures and additional wells. Analysis of a digital simulation model suggests that wells be located in the upper reaches of the alluvial aquifer where a sustained yield of 3,000 gallons per minute could be obtained. (Woodard-USGS)
W78-00813

PROGRESS REPORT ON STUDY OF MAGNITUDE AND FREQUENCY OF FLOODS ON SMALL DRAINAGE AREAS IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. C. Bridges.
Open-file report 77-478, June 1977. 22 p, 6 fig, 3 tab, 6 ref.

Descriptors: *Flood frequency, *Peak discharge, *Model studies, *Small watersheds, *Florida, Analytical techniques, Rainfall-runoff relationships, Gaging stations, Streamflow, Flow rates, Evaluation.
Identifiers: *Log-Pearson Type III distribution.

Long-term flood records for small basins, especially those basins of less than 10 square miles, are almost nonexistent in Florida. In July 1967 a program was begun to develop a data base to extend short-term flood-peak records for small basins by use of the U.S. Geological Survey rainfall/runoff model. Concurrent rainfall and runoff data, for a 5- to 7-year period, were used to calibrate a model for eight rainfall/runoff gaging stations. The standard error of estimate ranged from 25 to 50 percent. Twenty other rainfall/runoff stations are ready for calibration. The Caney Creek station was calibrated, and the annual peaks simulated for 1902-68 were used as input to develop a flood-frequency curve using a log-Pearson Type III distribution. (Woodard-USGS)
W78-00816

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1975.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00817

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1976.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00818

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00819

PROBABILISTIC SUBSTANTIATION OF LAND IMPROVEMENT REGULATION, (IN RUSSIAN),
Ts. E. Mirtskhulava.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina 3, p 42-44, 1975.

Descriptors: *Model studies, Stochastic processes, Groundwater, *Regulation, Probability, *Drainage, Forecasting, *Land reclamation.

A stochastic model was developed which provides the necessary decrease of groundwaters with a given reliability which ensures reliability of draining with a certain probability. A relation is given for correcting design dependences for predicting the distance between drains and a number of other parameters with consideration of the random character of the factors governing the drainage process.--Copyright 1976, Biological Abstracts, Inc.
W78-00851

4B. Groundwater Management

NORTHERN KALAHARI GROUNDWATERS: HYDROLOGIC, ISOTOPIC AND CHEMICAL STUDIES AT ORAPA, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W78-00521

ANALYTIC SOLUTION FOR DRAWDOWN IN AN UNCONFINED-CONFINED RECTANGULAR AQUIFER,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W78-00522

OBSERVATION WELL RESPONSE TIME AND ITS EFFECT UPON AQUIFER TEST RESULTS,
Institute of Geological Sciences, London (England).
J. H. Black, and K. L. Kipp, Jr.
Journal of Hydrology, Vol. 34, No. 3/4, p 297-306, August 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Observation wells, *Time lag, *Aquifer testing, *Pumping, Aquifer characteristics, Equations, Mathematical studies, Curves, Graphical analysis, Theis equation, Water levels, Water wells, Transmissivity, Storage coefficient, Drawdown, Hydraulic conductivity.
Identifiers: *Slug tests, *Type curves, Hydrostatic time lag.

The concept of observation-well response time was introduced in the context of aquifer pump tests. Previous work on hydrostatic time lag and slug tests was considered together with the precise way in which an observation well responds during an aquifer test. Using the concepts of Hvorslev, an equation was produced linking observation-well response time, a, and a dimensionless response-time factor beta. The Theis equation was modified by various values of beta to derive a set of type curves. The 2 parameters a and beta were related by a simple equation involving aquifer transmissivity. T, and storativity, S. Both a and beta can be obtained from an aquifer test, while a alone can be obtained independently from a slug test. An example was given showing the effect of beta upon aquifer test results, and the value of a calculated from the aquifer test analysis was corroborated by slug test results. The definition of beta was used to show in what circumstances it will be important and how its effect can be reduced to a minimum. The introduction of slug testing of observation wells as standard practice for all aquifer tests was suggested. (Visocky-ISWS)
W78-00523

PENNSYLVANIA WATER RESOURCES RESEARCH CENTER TECHNOLOGY TRANSFER PROGRAMS - A CASE STUDY,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sharpe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 841, Price codes: A02 in paper copy, A01 in microfiche.
Institute for Research on Land and Water Resources, University Park, Completion Report, September, 1977. 18 p, 3 tab. OWRT A-047-PA(1). 14-34-0001-6039.

Descriptors: *Pennsylvania, Fractures(Geologic), Water resources institute, Costs, Water supply, Technology, Water wells, Sites, Bedrock, Evaluation, Water resources development.
Identifiers: *Economic benefits, *Water development costs, *Fracture trace water well location, *Technology transfer, Industry location.

Water Resources Research Institutes or Centers do not often make dollar assessments of the benefits of their programs. Admittedly, such evaluations are to a degree self-servicing and require less than the normal modesty possessed by most such organizations. Without an active technology transfer program, estimates of accomplishment are likely to appear somewhat less than favorable, although individual researchers acting alone can account for significant results in technology transfer. This evaluation of the Penn State Water Center's technology transfer program indicates that it has been successful. The application of the fracture trace water well location method developed by Water Center researchers is an excellent example of technology transfer. A tremendous savings in water development costs has accrued to users of this technology. In addition, significant economic benefits have accrued to the Commonwealth of Pennsylvania from the location of new industry in areas where an adequate water supply was assured using this water well location technique. Estimated savings in water development costs for Pennsylvania alone in excess of $32,000,000. As more Pennsylvania communities employ this technique, the savings should greatly exceed this figure. (See also W75-08388, W74-03141; W74-01691; W72-10439; W72-02115; and W71-00201) (Sink-Penn State)
W78-00565

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: APPLICATION OF LINEAR SYSTEMS ANALYSIS TO GROUND WATER EVALUATION STUDIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W78-00570

AN ARCHETYPAL LINEAR PROGRAMMING MODEL FOR OPTIMAL INTERTEMPORAL ALLOCATION OF GROUNDWATER TO AGRICULTURAL ACTIVITIES,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. N. Weisz, and C. L. Towle, Jr.
Water Resources Bulletin, Vol. 13, No. 5, p 1035-1046, October 1977. 3 fig, 2 tab, 20 ref.

Descriptors: *Groundwater, *Water allocation(Policy), *Linear programming, *Economic efficiency, *Planning, Simulation analysis, Constraints, Aquifers, Discount rates, Equations, Mathematical models, Systems analysis, Optimization, Water utilization, Water supply.
Identifiers: *Agricultural use, *Benefit maximization.

In the past, researchers have applied a variety of analytical techniques for maximizing the present value of a stock resource: simulation, calculus of variations, stochastic dynamic programming, and optimal control theory. Presented herein is a more operational approach--linear programming. A simplified, broadly drawn example from Southwest agriculture is used for demonstrating the model structure and output; the method is based on a set of state transformation operations that prevent the additivity assumption of linear programming from being violated. The test case concerns a geologically isolated aquifer wholely managed by one entity (i.e., the farmer) who must maximize benefits over a two-year planning period. A comparison is made of the simulation run with that of optimization. The archetypal linear programming model for maximizing the present value of net benefits from a groundwater stock resource is proven over a range of realistic parameter values. It should find innumerable applications in the economic analysis of Southwest agricultural problems in areas where basin-wide management of a groundwater resource is appropriate. (Bell-Cornell)
W78-00629

SOME WATER RESOURCE SYSTEM STUDIES IN THE UK,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and D. A. Nutbrown.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, p 28-35, 1975. 1 fig, 4 ref.

Descriptors: *Water resources, *Systems analysis, *Mathematical models, *River regulation, *Conjuctive use, *Groundwater, *Surface waters, *Aquifers, Artificial recharge, Saline water intrusion, Fissures(Geologic), Optimization, Design, Operations, Computer models, Water supply, Pumping, Equations.
Identifiers: Intergranular flow, South Downs(United Kingdom), Vale of York(England).

Various case studies which utilize systems analysis for solving water resource system problems are presented. Aspects of these studies include problems associated with artificial recharge, the combined use of ground and surface waters, and saline intrusion. Particular emphasis is placed on the interaction of the ground and surface water components. Aquifers typified by both fissure and intergranular flow are involved in the studies. Described is the use of modeling techniques in the optimization of the design and operation of such systems. Considered is a digital model constructed to describe the transient effects of natural infiltration and abstraction on the movement of groundwater, to be used as a tool to assist with the long-term management of the Chalk aquifer of the South Downs, United Kingdom, the primary aim being to estimate the maximum yield of the aquifer. Described next is a digital groundwater model used in the design of a river regulation scheme in which groundwater abstracted from the Triassic sandstones aquifer in the Vale of York, England, is used in combination with the Yorkshire Ouse to provide a safe regulated yield. (See also W77-10419) (Bell-Cornell)
W78-00636

THE ROLE OF STATE LEGISLATION IN GROUND WATER MANAGEMENT,
Arizona Univ., Tucson. School of Law.
R. E. Clark.
Creighton Law Review, Vol 10, No 3, p 469-87, March 1977.

Descriptors: *Groundwater, *Legislation, *Prior appropriation, *State governments, *Administration, National Water Commission, Water rights, Permits, Planning, Regulation, Arizona, New Mexico, Administrative agencies, Well regulations, Conjunctive use, Water sources, Oklahoma, Southwest US.
Identifiers: *Groundwater management, Administrative regulations.

Legal control on the use of natural resources is usually a last resort to prevent catastrophe rather than part of a cohesive program. Determination of water rights is dependent largely on state law with some federal input resulting from federal installation and water quality standards. However, states should not overlook interstate and national problems causally linked with local ground water problems. The water law doctrines of the Western states are examined. These doctrines include absolute ownership allowing unlimited withdrawals, correlative rights which provide for modified allocation, and reasonable use which is similar to correlative rights. An affective ground water management plan must include recognition that: (1) water is unlike minerals in place; (2) surface and ground waters must be conjunctively managed; (3) well-licensing must consider aquifer depletion; (4) all wills must be registered; (5) there must be a permit system to protect existing uses; (6) the permit system must be flexible; (7) water quality requirements must be included in legislation; (8) an independent administrative authority must carry out the policy; (9) the policy making authority must be a broad constituency; and (10) control areas cannot be dominated by large users. Future legislation should recognize the interrelationships between resources. (Molloy-Florida)
W78-00658

CONGRESS RECEIVES COMPREHENSIVE GROUND WATER REPORT.
Water Well Journal, p. 42-43, August, 1977.

Descriptors: *Aquifers, *Aquifer systems, *Groundwater, *Aquifer management, Water conservation, Hydrologic data, Water resources development, Water supply, Water management(Applied), Water quality, Water sources, Water storage, Management, Groundwater recharge, Saline water intrusion, Sedimentation, Subsurface waters, Surface waters, Conjunctive use, Surface-groundwater relationship, Groundwater resources.
Identifiers: *Groundwater management, Administrative regulations.

A report on ground water, titled 'Ground Water--An Overview', prepared by the National Water Well Association, was presented to the President and Congress on June 21, 1977. The report stressed the importance of ground water supplies and the many problems facing the nation. In many instances ground water from aquifers is being used faster than it is being replenished. Soil subsidence and saltwater seepage into fresh ground water reservoirs are also occurring. Management of ground water resources has rested with state and local governments with the federal government acting as a technical advisor. However, ground water management has generally occurred only after a locality had been faced with supply problems. Optimal water management would include using and managing surface and ground water as a unit and planning the use of nontributary ground waters. However, a more comprehensive management program would require more data on the aquifer system and the quality and quantity of the water supply. In addition, policy questions must be answered concerning the extent of Federal participation in ground water management. (Kastner-Florida)
W78-00662

WESTWIDE STUDY (CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES).
Bureau of Reclamation, Washington, DC.
For primary bibliographic entry see Field 4A.
W78-00663

WATER AND LAND DEVELOPMENT--WELLS.
For primary bibliographic entry see Field 6E.
W78-00672

THE VELUWE ARTIFICIAL RECHARGE PLAN WATER QUALITY ASPECTS,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W78-00690

MATHEMATICAL MODEL OF ULUOVA PLAIN, TURKEY - A TRAINING AND MANAGEMENT TOOL,
Belgrad Univ. (Yugoslavia).
For primary bibliographic entry see Field 2A.
W78-00692

TRANSIENT SPHERICAL FLOW TO A CAVITY WELL OF FINITE DIAMETER,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-00693

POLYCYCLIC AROMATICS IN SURFACE AND GROUND WATER,
For primary bibliographic entry see Field 5A.
W78-00702

REVIEW OF C.E. JACOB'S DOUBLET WELL,
For primary bibliographic entry see Field 8B.
W78-00720

MAPS SHOWING GROUND-WATER CONDITIONS IN THE NORTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00802

MAPS SHOWING GROUND-WATER CONDITIONS IN THE MONUMENT VALLEY AND NORTHERN PART OF THE BLACK MESA AREAS, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00803

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE BLACK MESA AREA, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.

For primary bibliographic entry see Field 7C.
W78-00804

JARRETTSVILLE QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00805

BEL AIR QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00806

GROUND-WATER INVESTIGATION AT THE ALLUVIAL FAN OF THE SOUTH FORK EAGLE RIVER, ANCHORAGE, ALASKA - RESULTS OF TEST DRILLING, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
L. L. Dearborn.
Open-file report 77-493, 1977. 9 p, 2 fig, 1 plate, 1 tab, 5 ref.

Descriptors: *Test wells, *Drilling, *Artesian aquifers, *Water yield, *Alaska, Hydrogeology, Drillers logs, Pumping, Drawdown, Water levels, Groundwater recharge, Water quality.
Identifiers: *Anchorage area(Alaska), *Eagle River Valley.

In late 1976, at Anchorage, Alaska, a ground-water exploration well was drilled to a depth of 487 feet on the South Fork Eagle River fan near the confluence with the mainstream. The well penetrated four sand and gravel strata of low water-yielding capacity and extended 37 ft into metamorphic bedrock. Earth water-bearing stratum was pumped for several hours, and the best aquifer yield was found to be 1.7 gal/min/ft of drawdown. These test results support the conclusion, previously inferred from drilling data at a nearby test hole drilled in 1973, that there are no confined aquifers of large yield in the subsurface at this locality. (Woodard-USGS)
W78-00810

GROUND-WATER RESOURCES OF THE ALLUVIAL AQUIFERS IN NORTHEASTERN LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. T. Hurr, and P. A. Schneider, Jr.
Water-Resources Investigations 77-7 (open-file report), January 1977. 31 p, 5 fig, 6 plates, 7 tab, 13 ref.

Descriptors: *Groundwater resources, *Alluvial aquifers, *Water wells, *Water yield, *Water quality, *Colorado, Water users, Water supply, Municipal water, Domestic water, Irrigation water, Stock water, Groundwater recharge, Groundwater movement, Chemical analysis, Maps, Geology, Water table, Path of pollutants, Hydrographs.
Identifiers: Northeastern Larimer County(Colo), *Selenium.

Ground water is a source of municipal, domestic, stock, and irrigation supply for most of northeastern Larimer County, Colo. A study of the alluvial aquifers in the northeastern part of the county was conducted to determine volume of water in storage, rate and location of ground-water withdrawals, and chemical quality of the water with particular attention to dissolved solids, hardness, sulfate, and selenium. There are 251 large-capacity wells in the study area. Well yields range from about 80 gpm (gallons per minute) to a little over 1,800 gpm. Total volume of water in storage is about 133,000 acre-feet--32,000 acre-feet in the alluvium of Buckeye terrace and 101,000 acre-feet in the valley-fill aquifer associated with Boxelder Creek. Ground-water withdrawals for irrigation are about 25,000 acre-feet annually. The municipal wells pumped 210 acre-feet in 1974. The factors affecting ground-water quality are the quality of applied irrigation water, the amount of water lost to evapotranspiration during irrigation, and, to a lesser degree, solution of soluble material in the alluvium and in the bedrock at the base of the alluvium. Ground water at the north end of the Buckeye terrace contains only about 300 mg/liter dissolved solids. Recharge is from surface water containing less than 90 mg/liter dissolved solids. Concentrations of all constituents increase downgradient to the south due to solution and evaporative concentration. (Woodard-USGS)
W78-00811

WATER RESOURCES OF THE MAUNABO VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00813

DISTRIBUTION OF INJECTED WASTEWATER IN THE SALINE LAVA AQUIFER, WAILUKU-KAHULUI WASTEWATER TREATMENT FACILITY, KAHULUI, MAUI, HAWAII,
Geological Survey, Menlo Park, CA. Water Resources Div.; Geological Survey, Reston VA.; and Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00814

CHEMICAL, ISOTOPIC, AND GAS COMPOSITIONS OF SELECTED THERMAL SPRINGS IN ARIZONA, NEW MEXICO, AND UTAH,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. H. Mariner, T. S. Presser, and W. C. Evans.
Open-file report 77-654, August 1977. 42 p, 4 fig, 8 tab, 40 ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water chemistry, *Arizona, *New Mexico, *Utah, Thermal water, Water temperature, Chemical reactions, Chemical properties, Gases, Deuterium, Hydrogen ion concentration, Oxygen isotopes.
Identifiers: Geothermometers.

Twenty-seven thermal springs in Arizona, New Mexico, and Utah were sampled for detailed chemical and isotopic analysis. The springs issue sodium chloride, sodium bicarbonate, or sodium mixed-anion waters of near neutral (6.2) to alkaline (9.2) pH. High concentrations of fluoride, more than 8 milligrams per liter, occur in Arizona in waters from Gillard Hot Springs, Castle Hot Springs, and the unnamed spring of Eagle Creek, and in New Mexico from springs along the Gila River. Deuterium compositions of the thermal waters cover the same range as those expected for meteoric waters in the respective areas. The chemical compositions of the thermal waters indicate that Thermo Hot Springs in Utah and Gillard Hot Springs in Arizona represent hydrothermal systems which are at temperatures higher than 125 deg C. Estimates of subsurface temperature based on the quartz and Na-K-Ca geothermometer differ by up to 60 deg C for Monroe, Joseph, Red Hill, and Crater hot springs in Utah. Similar conflicting estimates of aquifer temperature occur for Verde Hot Springs, the springs near Clifton and Coolidge Dam, in Arizona; and the warm springs near San Ysidro, Radium Hot Springs, and San Francisco Hot Springs, in New Mexico. Such disparities could result from mixing, precipitation of calcium carbonate, or perhaps appreciable concentrations of magnesium. (Woodard-USGS)
W78-00815

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1975.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00817

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1976.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00818

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00819

ARTIFICIAL-RECHARGE TESTS IN UPPER BLACK SQUIRREL CREEK BASIN, JIMMY CAMP VALLEY, AND FOUNTAIN VALLEY, EL PASO COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
P. J. Emmons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 330, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-11, July 1977. 49 p, 17 fig, 8 tab, 52 ref.

Descriptors: *Artificial recharge, *Alluvial aquifers, *Recharge ponds, *Water spreading, *Water table, Water level fluctuations, Groundwater movement, Colorado.
Identifiers: El Paso County(Colo), Black Squirrel Creek, Jimmy Camp Creek, Fountain Creek.

Artificial-recharge tests were conducted in the alluvium in upper Black Squirrel Creek basin, the alluvium in Jimmy Camp Valley, and in the alluvium overlying the Widefield aquifer which is located in an ancestral channel in Fountain Valley, Colo. Nine artificial-recharge pits with areas of approximately 9,200 square feet each were excavated in the unsaturated zones above the three aquifers. Each artificial-recharge site was instrumented to measure inflow, stage fluctuations, and water-table fluctuations. Artificial-recharge tests of approximately 10 days' duration were conducted at each of the nine artificial-recharge sites and one extended test of approximately 30 days' duration was conducted in each of the three study areas. Periphyton growth, present in most of the artificial-recharge ponds, was insufficient to cause noticeable decline in the rate of infiltration. (Woodard-USGS)
W78-00821

GROUND WATER IN THE LAJAS VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
H. R. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 360, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-68, March 1977. 45 p, 16 fig, 4 tab, 28 ref.

Descriptors: *Groundwater resources, *Water quality, *Irrigation, *Saturated soils, *Puerto Rico, Evapotranspiration, Salinity, Aquifer characteristics, Water wells, Water yield, Alluvium, Limestones, Water level fluctuations, Model studies.
Identifiers: *Lajas Valley(PR).

Lajas Valley, an agricultural district in southwestern Puerto Rico, is plagued with salinity and waterlogging problems of the soils. Use of

brackish ground water, averaging 500 mg/liter dissolved solids, for irrigation compounded the problem until a surface-water irrigation-drainage system was constructed in 1955. Wells tapping the buried limestone aquifer in the northwest part of the valley will yield as much as 2,000 gallons per minute of brackish water. At peak development in the 1940's, 18 wells in the valley pumped about 23 mgd for irrigation. The average specific capacity of the wells for an 8-hour period was about 30 gallons per minute per foot of drawdown. Transmissivity of the limestone aquifer is about 4,000-5,000 square feet per day. Permeability is from solution holes and solution-enlarged fractures. Recharge to the limestone is principally by infiltration of rainfall and streamflow on the outcrop area of the limestone and the hydraulically connected alluvial fans on the northern side of the valley. Groundwater flow in the limestone aquifer is westward toward Bahia de Boqueron. Rainfall in the valley averages about 34 inches annually, decreasing toward the south coast. Pan evaporation of 76 inches a year gives an evapotranspiration potential of about 50 inches. Results from a digital-model analysis of the valley show that a network of discharge wells could alleviate waterlogging in the eastern artesian area. The upward hydraulic gradients would be reduced by pumping, thereby easing drainage requirements. (Woodard-USGS)
W78-00822

4C. Effects On Water Of Man's Non-Water Activities

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VII - AN INVESTIGATION OF THE VERTICAL AND HORIZONTAL HYDRAULIC CONDUCTIVITIES OF DENSE BASE COURSE AGGREGATES,
Maryland Univ., College Park. Dept. of Civil Engineering.
T. J. Moynahan, and Y. M. Sternberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 457, Price codes: A11 in paper copy, A01 in microfiche. Report AW074-073-046-7, July 1974. 239 p, 121 fig, 29 tab, 20 ref, 11 append. DOT AW074-073-046.

Descriptors: *Hydraulic conductivity, *Highways, *Drainage, *Laboratory tests, Permeability, Soils, Soil properties, Soil physical properties, Permeameters, Equipment, Soil water movement, Subsurface drainage, Darcys law, Mathematical models, Data processing, Civil engineering.
Identifiers: *Highway design, *Highway drainage.

The report described an experimental investigation designed to examine the effects on permeability of a dense graded base course aggregate when the gradation is varied within the allowable range set forth by the Maryland State Highway Administration. The graduations were chosen so that the amount of fines by weight passing the number 200 sieve was varied between 10 and 0%. The study showed that significant increases in hydraulic conductivity can be realized by shifting the gradation curve from the finest curve to the coarsest curve within the MSHA allowable range for material designated dense graded aggregate. The study also presented a device which measures both vertical and horizontal hydraulic conductivity of the same granular base course specimen. Practical application of horizontal hydraulic conductivity was discussed in reference to the Corps of Engineers' drainage requirement for base course materials. (Sims-ISWS)
W78-00544

EVALUATION OF STREAMSIDE BUFFERSTRIPS FOR PROTECTING AQUATIC ORGANISMS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
D. Erman, J. D. Newbold, and K. B. Roby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 605, Price codes: A04 in paper copy, A01 in microfiche. Contribution No. 165, California Water Resources Center, Davis, September 1977. 48 p, 54 ref, 3 append. (California Water Resources Center Project UCAL-WRC-W-411), OWRT-A-047-CAL(3).

Descriptors: *Aquatic microorganisms, *Benthos, *Invertebrates, Biological communities, Evaluation, *California, Streams, *Lumbering, Ecological distribution.
Identifiers: *Bufferstrips(Streams).

Sixty-two northern California streams were studied to evaluate the impact of invertebrate communities of logging with and without streamside bufferstrips. Benthic invertebrate communities of disturbed and undisturbed streams were compared by diversity index and ecological distance. Benthic invertebrate communities from streams logged without protective measures were significantly different from communities of unlogged (control) streams based on both diversity and ecological distance. Logging impacts were detected also in streams with buffer widths of less than approximately 30 meters. Streams with bufferstrips wider than 30 meters did not display logging impacts. There was a direct correlation between increases in an index of diversity and increases in buffer width, and hence probably the degree of stream protection increased with buffer widths up to 30 meters. Invertebrate communities of logged or distrubed streams had a lower diversity index and higher populations than of unlogged streams. Communities in localized disturbances were significantly different from control stream sections. The differences were qualitative (i.e., different taxa) and thus contrast with the differences noted in logged or narrow buffered streams. (Snyder-California, Davis)
W78-00553

SOME EFFECTS OF DUSTFALL ON URBAN STORMWATER QUALITY,
Enviro-Measure, Inc., Knoxville, TN.
For primary bibliographic entry see Field 5A.
W78-00697

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS,
Water Resources Engineers, Springfield, VA.
For primary bibliographic entry see Field 8B.
W78-00699

QUANTITY AND QUALITY OF URBAN STORM WATER IN SOUTHEAST FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 3D.
W78-00824

4D. Watershed Protection

A COMPARISON OF INTERORGANIZATIONAL RELATIONSHIPS WITHIN TWO CONTIGUOUS WATERSHED DISTRICTS,
Mississippi State Univ., Mississippi State. Dept. of Sociology.
For primary bibliographic entry see Field 6E.
W78-00559

A WATERSHED PLANNING AND MANAGEMENT SYSTEM: DESIGN AND SYNTHESIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems; and Virginia Polytechnic Inst. and State Univ., Blackburg. School of Forestry and Wildlife Resources.
R. H. Giles, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 761, Price codes: A07 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 102, September 1977. 133 p, 7 tab, 12 fig, 124 ref. OWRT A-064-VA(1).

Descriptors: *Planning, *Watershed management, *Optimization, Decision making, Ecosystems, Virginia, Design criteria, *Land use, Computer programs, Attitudes.
Identifiers: *South River Watershed(Va), *Urban watersheds.

This research develops a blueprint for a watershed management system, conceived for the South River Watershed in Virginia, that could be used in making decisions about the future development of any similar large urbanizing watershed. The investigation analyzes the problem of land-use planning and management, particularly the need for a system providing long-term rational management and allowing achievement of complex human goals and objectives. Twenty-two tenets of land-use management are cited as fundamental to the design and implementation of such a system, and major phenomena that have obscured or halted comprehensive management efforts in the past are analyzed. One part of this report discusses the 'taking issue' and how it relates to the proposed system. Existing institutions that influence land use are also analyzed. A 'watershed guidance center' is proposed. The study then describes an objective function that can be used as the basis for decisionmaking concerning a watershed. This expression is based on over 300 citizen-weighted objectives, each having a production function. Each production is expressed in net energy, for the total management system is energy-based and is related to probable change in physical and ecological systems. A computer program is described which would integrate citizens' expressions of preferred management goals. A modified form of goal programming is proposed as the solution algorithm. Many of the inputs necessary for operation of the total management system already are available in the 'State Information System,' also described in this report.
W78-00560

HYDROLOGIC MODELING OF THE DEVILS LAKE BASIN WATERSHEDS,
North Dakota Water Resources Research Inst., Fargo.
B. M. Parekh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 815, Price codes: A07 in paper copy, A01 in microfiche. Completion Report No WI-221-042-77, October 1976. 138 p, 30 fig, 23 tab, 13 ref. The Devils Lake Basin Study, Volume IV. Continuing Studies. OWRT A-048-NDAK(1). 14-34-0001-7072.

Descriptors: *Model studies, Watershed management, *Watersheds(Basins), Hydrologic aspects, *North Dakota, Simulation analysis, Lake basins, *Soil moisture, Hydrologic data, Planning, Data collections.
Identifiers: *Devils Lake Basin(N Dak).

Outlined is the progress made in developing a comprehensive hydrologic simulation model of the Devils Lake Basin (DLB) and its constituent watersheds. The simulation model being developed for the DLB is an explicit soil moisture accounting (ESMA) model that generates outputs on streamflow discharge and stage for any desired location of the basin channel network. For instance, in addition to assessing the hydrologic impact of proposed changes it can be programmed to provide reliable flood forecasts; it will also be capable of devising operational procedures of control structures to optimize the stability of the surface waters of the Devils Lake Basin. As a result such a model would be an effective tool in addressing the decision-making needs of planning and management. Accomplishments include the

completion of a comprehensive inventory and assessment of the existing hydrometeorologic data for a 25 year historic record period (1948-1972). Available information on the topographic and physiographic characteristics of the basin watersheds has been developed which has permitted a systematic consolidation of otherwise uncorrelated basin-wide data. Preliminary trials to simulate the hydrologic response of the entire basin land surface have been performed. Two major tasks remain: (1) Model calibration on the Big Coulee gage and on the lake level gages, especially on Devils Lake; and (2) Completion of long-term simulations to meet the planning requirements of the DLB study.
W78-00569

MULTIPURPOSE USE OF CATCHMENT MODELS FOR OPERATIONAL FORECASTING AND PLANNING STUDIES,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2A.
W78-00635

HIERARCHICAL MULTIPLE OBJECTIVE ANALYSIS OF LAND AND WATER RESOURCE UTILIZATION FOR A SYSTEM OF LAKES,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 4A.
W78-00646

SEDIMENT TRANSPORT FROM A RURAL CATCHMENT IN NEW SOUTH WALES,
Newcastle Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-00680

QUALITY OF WATER DISCHARGED FROM THREE SMALL AGRONOMIC WATERSHEDS IN THE MAUMEE RIVER BASIN,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-00688

SOLUBLE AND SEDIMENT NITROGEN LOSSES AS RELATED TO LAND USE AND TYPE OF SOIL IN EASTERN CANADA,
Macdonald Coll., Ste Anne de Bellevue (Quebec). Dept. of Renewable Resources.
For primary bibliographic entry see Field 5B.
W78-00689

NEW ENGLAND RIVER BASINS COMMISSION FINDINGS AND RECOMMENDATIONS ON THE CONNECTICUT RIVER BASIN COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-00746

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

REACTIONS OF ORGANOMERCURY (I) COMPOUNDS WITH LIGANDS CONTAINED IN NATURAL WATER SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Chemistry.
D. E. Tallman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 633, Price codes: A02 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-222-013-76, September 1977. 11 p, 2 fig, 10 ref. OWRT B-019-NDAK(1), 14-31-0001-3628.

Descriptors: *Mercury, *Chemical reactions, *Kinetics, Measurement, Ions, Chlorides, Electrolytes, Hydrogen ion concentration, Electrochemistry, Water analysis, Analytical techniques, Pollutant identification.
Identifiers: *Organomercury, *Chemical relaxation kinetics, *Methylmercury compounds, Ligands.

Chemical relaxation measurements have been carried out on solutions containing organomercury (I) (10 to the -3 power to 10 to the -5 power M), chloride ion (10 to the -4 power to 10 to the -2 power M) and inert electrolyte (0.15 M KNO3) throughout the pH range 7.0 to 9.5. The primary relaxation process is attributed to a ligand exchange reaction resulting in the formation of the organomercury chloride complex from the corresponding hydroxide complex. The concentration and pH dependence of the relaxation times suggests that a rather complex mechanism involving parallel reaction pathways may be operative in these systems. Small but discernible differences in the kinetic parameters for the methyl-, ethyl- and phenylmercury systems have been observed. The rate of replacement of OH- by Cl- decreases in the order Ch3->C2H5>C6H5-. These small differences are probably due to slight variations in the inductive effect of the organo substituent across the Hg.
W78-00502

WASTES FROM SMALL POULTRY DRESSING ESTABLISHMENTS,
Center for Disease Control, Atlanta, GA.
H. W. Wolf, and W. T. Woodring.
Sewage and Industrial Wastes, Vol. 25, No. 12, P 1429-1431, December, 1953. 4 tab, 3 ref.

Descriptors: *Food processing industry, *Poultry, *Water analysis, *Water utilization, Biochemical oxygen demand, Cost analysis, Waste identification.
Identifiers: *Poultry processing wastes.

The environmental sanitation training school of the Department of Public Health, Columbus, Georgia, conducted a survey of two poultry dressing establishments in central Georgia. Presented is an account of the water use and waste strength findings resulting from the survey. Descriptions of operation for both plants are given. Recommendations for reduction in strength and volume of liquid wastes are given. Profit by the sale of blood is discussed. (Prodehl-EPA, Corvallis)
W78-00510

RENDERING PLANT WASTE TREATMENT STUDIES,
North Carolina Univ. at Chapel Hill. School of Public Health.
M. L. Granstrom.
Sewage and Industrial Wastes, Vol. 23, No. 8, p 1012-1016, August 1951, 3 fig. Presented at 1950 Annual Meeting, North Carolina Sewage and Industrial Wastes, Assn; Durham, North Carolina; Nov 13-15, 1950.

Descriptors: *Chemical analysis, *Coagulation, *Waste water treatment, *Food processing industry, Chemical precipitation, Flocculation, Biochemical oxygen demand, Chlorine, Effects, Oil wastes.
Identifiers: *Rendering wastes, *Chemical coagulation, Grease, Color reduction.

The source of strong liquid wastes is the washing of tanks, barrels, and floors; the wastes become black, smelly, and septic due to partial decomposition from the time lag between slaughter and rendering process. This organic matter, in mostly a dissolved state, was studied. Chemical coagulation was the most economical waste treatment process for the typical rendering plant removed from a public sewer system. A rendering plant near Chapel Hill, N. C. was selected for study, where quantity of waste water is about 1,000 gallon per ton of animal food produced. Filter alum and chlorine were added to the clarifier. Each chemical performs two functions: the alum reacts to form floc and reduce the pH, the chlorine oxidizes the reduced material and coagulates the protein. A custom designed pipe guide system was used to distribute the chemicals. Laboratory investigations were made on the effect of varying alum and chlorine doses. Results included: reduction in BOD from 1500 - 3,800 ppm to 400 - 600 ppm; reduction in color; and improved clarification. (Prodehl-EPA, Corvallis)
W78-00513

NORTHERN KALAHARI GROUNDWATERS: HYDROLOGIC, ISOTOPIC AND CHEMICAL STUDIES AT ORAPA, BOTSWANA,
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W78-00521

EFFECTS OF SLUDGE APPLICATIONS ON SOIL WATER AND VEGETATION IN A NORTHERN HARDWOOD FOREST IN NEW ENGLAND,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-00567

HYDROLOGIC AND BIOLOGIC CHARACTERISTICS OF NATURAL CHANNELS IN COASTAL MARSH OF MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-00568

COMPARATIVE OIL TOXICITY AND COMPARATIVE ANIMAL SENSITIVITY,
National Marine Fisheries Service, Auke Bay, AL. Auke Bay Fisheries Lab.
S. D. Rice, J. W. Short, and J. F. Karinen.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 78-94, 1977. 1 fig, 3 tab, 48 ref.

Descriptors: *Toxicity, *Growth stages, *Oil spills, *Oil pollution, *Aromatic compounds, *Bioassay, *Water analysis, *Solubility, *Mortality, *Animal metabolism, Oil-water interfaces, *Dispersion, *Larvae, Organic compounds, Water pollution effects, Methodology, Reviews.
Identifiers: *Crude oil.

This review covered studies dealing with the ability of crude and refined oils to kill marine animals. Literature was summarized on the subjects of : (1) the behavior of oil in water; (2) the methodology problems associated with bioassay; (3) the comparative toxicity of oil water mixtures, oils and components of oils; and (4) the comparative sensitivity of different life stages and species. (See also W78-00572) (Katz)
W78-00580

RESPONSES TO SUBLETHAL LEVELS OF PETROLEUM HYDROCARBONS: ARE THEY SENSITIVE INDICATORS AND DO THEY CORRELATE WITH TISSUE CONCENTRATION,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
J. W. Anderson.

In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 95-114, 1977. 12 fig, 2 tab, 68 ref.

Descriptors: *Oil, *Oil pollution, *Toxicity, *Mortality, *Bioindicators, *Salinity, Animal physiology, *Growth stages, *Shrimp, *Respiration, Animal behavior, *Reproduction, Organic compounds, Chemical analysis, Analytical techniques, Laboratory tests, Lethal limit, Reviews.
Identifiers: Bioaccumulation, Tissue analysis, *Sublethal effects, *Naphthalene.

A review of recent literature on the sublethal effects of various hydrocarbon pollutants was presented. Numerous technical problems encountered in laboratory analyses were addressed. Considerable emphasis was placed on the difficulty of inter-study comparisons due to varying experimental designs. (See also W78-00572) (Katz)
W78-00581

THE EFFECTS OF PETROLEUM HYDROCARBON EXPOSURE ON THE STRUCTURE OF FISH TISSUES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
J. W. Hawkes.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 115-128, 1977. 15 fig, 1 tab, 36 ref.

Descriptors: *Oil, *Oil pollution, *Electron microscopy, Animal physiology, Animal behavior, *Animal metabolism, *Cytological studies, Animal pathology, *Toxicity, Fish physiology, Organic compounds, Analytical techniques, Path of pollutants, Lethal limit, Reviews.
Identifiers: *Crude oil, Tissue analysis, Teratogens, Gills, Sublethal effects, Histology.

Literature on the sublethal effects of petroleum hydrocarbons at cellular and subcellular levels in fish was reviewed. New data presented dealt with the effects of crude oil on several species of fish. The electron microscope was used extensively to demonstrate alterations in tissue structure due to the exposure to the water soluble fraction of crude oil. (See also W78-00572) (Katz)
W78-00582

THERMAL CONDUCTANCE OF IMMERSED PINNIPED AND SEA OTTER PELTS BEFORE AND AFTER OILING WITH PRUDHOE BAY CRUDE,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
G. L. Kooyman, R. W. Davis, and M. A. Castellini.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 151-157, 1977. 1 fig, 3 tab, 13 ref.

Descriptors: *Thermal conductivity, *Thermal insulation, *Heat transfer, *Otters, *Oil pollution, *Furbearers, *Heat balance, Animal physiology, Animal behavior, *Water temperature, Water pollution effects, Oil spills, Arctic, Alaska.
Identifiers: *Crude oil, Fur seal, Sea lion, Walrus, Thermoregulation.

Thermal conductance (C) of the sea otter and several species of pinniped pelts was determined during immersion, after oiling, and after cleaning. Most affected by oiling was the sea otter pup in which (C) was doubled. Least affected was the sea lion in which no change in (C) occurred. Washing slightly reduced (C) of the adult otter and fur seal. The results indicated that even a light oiling would have marked detrimental effects on the thermoregulatory abilities of otters and fur seal at sea. The thermal effects of oiling on other adult pinnipeds while at sea would be slight. (See also W78-00572) (Katz)
W78-00586

BIOAVAILABILITY OF SEDIMENT-SORBED NAPHTHALENES TO THE SIPUNCULID WORM, PHASCOLOSOMA AGASSIZII,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
J. W. Anderson, L. J. Moore, J. W. Blaylock, D. L. Woodruff, and S. L. Kiesser.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 276-285, 1977. 2 fig, 4 tab, 11 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Sediments, *Worms, *Bottom sediments, *Sediment-water interfaces, Aquatic animals, Organic compounds, Chemical analysis, Spectrophotometry, Pollutant identification.
Identifiers: *Crude oil, Bioaccumulation, Depuration, *Naphthalene, Tissue analysis, Sipunculid worms, Prudhoe Bay crude.

The peanut worm was exposed to petroleum hydrocarbons from Prudhoe Bay crude (PBC) oil. Uptake and release of naphthalene and alkylnaphthalenes were compared for worms exposed to hydrocarbons in solution, oil on the surface of sediments and oil mixed in sediment. Sipunculids exposed for 24 hr to a water-soluble fraction of PBC contained from 2 to 10 times the concentration of naphthalenes initially in the water. Depuration of naphthalenes was rapid when worms were transferred to clean water and/or sediment. After two weeks of depuration, both water- and sediment-exposed worms released napthalenes to background levels. From these results it does not appear that significant bioaccumulation of naphthalenes occurs from hydrocarbon fractions bound to sediment. (See also W78-00572) (Katz)
W78-00601

FACTORS AFFECTING THE RETENTION OF A PETROLEUM HYDROCARBON BY MARINE PLANKTONIC COPEPODS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
R. P. Harris, V. Berdugo, E. D. S. Corner, C. C. Kilvington, and S. C. M. O'Hara.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 286-304, 1977. 6 fig, 7 tab, 29 ref.

Descriptors: *Aromatic compounds, Oil, *Oil pollution, *Oil spills, *Tracers, *Radioactivity techniques, *Zooplankton, *Copepods, *Absorbtion, Animal physiology, *Animal metabolism, Retention, Organic compounds, Regression analysis.
Identifiers: *Naphthalene, Depuration, Bioaccumulation, Tissue analysis.

14C-1-Naphthalene was used as a model compound to study the retention of an aromatic hydrocarbon by marine planktonic copepods during 24-hour exposure experiments. Seven species were investigated, including representative estuarine, neritic and oceanic forms. Significant positive correlations were demonstrated between naphthalene retention and copepod size measure as dry weight and total lipid content; but a negative correlation was observed with temperature, and retention was diminished in animals starved for progressively longer periods. Amounts of the hydrocarbon absorbed on the surfaces of the animals appeared to be only a small fraction of the totals accumulated. (See also W78-00572) (Katz)
W78-00602

INTERLABORATORY CALIBRATION FOR THE ANALYSIS OF PETROLEUM LEVELS IN SEDIMENT,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
S. A. Wide, S. N. Chesler, B. H. Gump, H. S. Hertz, and W. E. May.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 345-350, 1977. 2 fig, 1 tab, 3 ref.

Descriptors: *Laboratory tests, *Gas chromatography, Oil, *Oil pollution, *Spectroscopy, *Chemical analysis, *Standards, *Analytical techniques, *Sediments, Calibration, Instrumentation, Research equipment, Variability, Quality control, Aromatic compounds, Intertidal areas.

The large number of environmental analysis to be performed in the future necessitates the existence of a common basis for comparing the data. Otherwise data obtained from different laboratories would be of limited usefulness. Furthermore, unless the data can be put on an equivalent basis, environmental standards can neither be set nor enforced. A sediment sample was split between two laboratories as an intercalibration exercise. The similarities and differences of the two results were discussed. (See also W78-00572) (Katz)
W78-00607

DETERMINATION OF THE LEEWAY OF OIL SLICKS,
Virginia Inst. of Marine Science, Gloucester Point.
C. L. Smith.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 351-362, 1977. 4 fig, 4 tab, 33 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, Winds, *Water circulation, *Currents(Water), Movement, *Weather data, *Wind velocity, *Aerial photography, Air-water interfaces, Mathematical studies, Forecasting.
Identifiers: *Crude oil, *Oil slicks, Leeway.

The leeway of oil slicks was determined as a function of wind velocity in the range of 5-25 knots to enable more precise forecasting of the trajectory of oil spills, and thus aid effective containment and cleanup operation. Leeway was calculated by measurement of the separation of oil slicks from a dyed patch of surface water at sea, using time-sequenced nadir aerial photography. Five oil types, Nos. 2, 4, and 6 fuel oils, and light and heavy crude oils, were found to exhibit similar leeway as a function of wind speed. Oil spill volume had no measurable effect on leeway, and slicks moved in the direction of the wind. The leeway increases with sea state and obeys a linear relationship with wind velocity in the wind ranges studied. (See also W78-00572) (Katz)
W78-00609

INTERTIDAL SEDIMENT HYDROCARBON LEVELS AT TWO SITES ON THE STRAIT OF JUAN DE FUCA,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
W. D. MacLeod, Jr., D. W. Brown, R. G. Jenkins, and L. S. Ramos.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 385-396, 1977. 7 fig, 4 tab, 11 ref.

Descriptors: *Oil, *Oil pollution, *Gas chromatography, *Sediments, *Intertidal areas, Chemical analysis, Analytical techniques, *Washington, *Mass spectrometry, *Monitoring, *Indicators, Baseline studies, Organic compounds, Pipelines.
Identifiers: *Alkanes, *Arenes, *Naphthalene, *Puget Sound(Washington).

Hydrocarbon baseline data are needed to assess the potential impact of oil pollution from tanker traffic in the Strait of Juan de Fuca. Initial studies were directed to intertidal sediments from two physically similar areas along the shipping lanes:

Port Angeles, WA and Dungesess Bay, WA. Latest analytical techniques such as solvent/slurry extraction, silica gel chromatography, and glass capillary GC were adapted for analyzing large numbers of intertidal sediments efficiently and expeditiously. It was suggested that arenes be monitored as indicators of oil pollution; over ten arenes are proposed for baseline analyses and monitoring. (See also W78-00572) (Katz)
W78-00611

CHARACTERIZATION OF VOLATILE HYDROCARBONS IN FLOWING SEAWATER SUSPENSIONS OF NUMBER 2 FUEL OIL,
Battelle-Pacific Northwest Labs., Richland, WA.
R. M. Bean, and J. W. Blaylock.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 397-403, 1977. 4 fig, 1 tab, 12 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, Oil, *Oil pollution, *Helium, *Chemical analysis, *Aromatic compounds, *Volatility, *Bioassay, *Pollutant identification, *Solubility, Organic compounds, Laboratory tests, Methodology.
Identifiers: No. 2 fuel oil, Helium partition gas chromatography.

Dilute suspensions of No. 2 fuel oil in seawater (less than one milligram per liter) have been analyzed for monocyclic aromatic hydrocarbons using helium partition gas chromatography. The methodology permits routine quantitation of volatile aromatic constituents at concentrations well below one microgram per liter. (See also W78-00572) (Katz)
W78-00612

SEDIMENT HYDROCARBONS AS ENVIRONMENTAL INDICATORS IN THE NORTHEAST GULF OF MEXICO,
Gulf Coast Research Lab., Ocean Springs, MS.
J. S. Lytle, and T. F. Lytle.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems., D.A. Wolfe, Ed., Pergammon Press, p. 404-412, 1977. 5 fig, 2 tab, 42 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Indicators, *Sediments, Sediment-water interfaces, *Bottom sediments, *Offshore platforms, *Continental shelf, Seasonal, Gulf of Mexico, Organic compounds, Mississippi, Florida, Alabama.
Identifiers: *Crude oil, *Olefins, *Alkanes.

Surface sediment samples were collected in 1975-76 from forty-five locations in the Gulf of Mexico along the continental shelf from Pascagoula, Mississippi to Fort Myers, Florida. Hydrocarbons were analyzed in the sediments for the Bureau of Land Management in an effort to survey hydrocarbons in the northeast Gulf and detect man-induced and seasonal effects in hydrocarbon profiles. There are three zones in this area as distinguished by their aliphatic hydrocarbon distributions. (See also W78-00572) (Katz)
W78-00613

SEASONAL VARIATIONS OF HYDROCARBONS IN THE WATER COLUMN OF THE MAFLA LEASE AREA,
Florida State Univ., Tallahassee. Dept. of Oceanography.
J. A. Calder.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 432-441, 1977. 4 fig, 3 tab, 10 ref.

Descriptors: Oil, *Oil pollution, *Gas chromatography, *Gulf of Mexico, *Offshore platforms, *Suspended solids, *Seasonal, *Aromatic compounds, *Zooplankton, Organic compounds, Biomass, Chemical analysis, Mississippi River, Pollutant identification.
Identifiers: *Biogenic hydrocarbons, *Aliphatic compounds.

A series of 15 stations in the northeast Gulf of Mexico were occupied during summer, fall and winter 1975-76. Samples were collected and analyzed by gas chromatography for dissolved hydrocarbons and those associated with suspended particulate material. Concentrations were higher near shore. Unresolved components were present in both dissolved and particulate phases, especially near the Mississippi River and Sound which may be the source of the material. (See also W78-00572) (Katz)
W78-00616

BAYESIAN MODEL DISCRIMINATION FOR BOD ANALYSIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
T. W. Constable, and E. A. BcBean.
Canadian Journal of Civil Engineering, Vol. 4, No. 3, p 371-379, September 1977. 8 fig, 4 tab, 13 ref.

Descriptors: *Model studies, *Biochemical oxygen demand, *Water pollution control, Waste water(Pollution), Treatment facilities, Probability, Simulation analysis, Equations, Systems analysis, Waste water treatment.
Identifiers: *Bayesian techniques, *Model discrimination techniques, *Hsiang-Reilly method, Primary influent, Nonlinear models, Water quality data.

The Hsiang-Reilly method, a discrete Bayesian model discrimination technique, is employed to select the best model of several alternative models to describe data relating observed BOD exertion as a function of time. Use of this approach avoids the need for linearization of equations and results in distributed probability estimates of the parameter magnitudes rather than simply point estimates. A case study application to the raw influent and primary effluent of the Waterloo Pollution Control Plant is included. The results indicate that although a three-parameter model often gives a better fit to observed BOD data than the two-parameter first-order model, differences between the BOD-progression curves for the models are often so small as to be insignificant. In view of these small differences, and considering that none of the proposed models could adequately describe observed deviations from the exponential BOD curves, the use of the first-order equation to describe BOD-progression relationships for the Waterloo Pollution Control Plant appears to be justified. (Bell-Cornell)
W78-00620

DESIGN OF TREND MONITORING NETWORKS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries, and Wildlife.
D. P. Lettenmaier, and S. J. Burges.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE5, Proceedings Paper 13257, p 785-802, October 1977. 4 fig, 5 tab, 24 ref, 3 append.

Descriptors: *Network design, *Water quality, *Monitoring, *Model studies, Mathematical models, Statistics, Statistical models, Filters, Stochastic processes, Sampling, Networks, Streams, Rivers, Watershed(Basins), Pollutants, Dissolved oxygen, Nitrogen, Coliforms, Temperature, Water temperature, Pollution, Water pollution.

The design of trend monitoring networks requires specification of both sampling frequencies and station locations. The extended Kalman filter, an algorithm that incorporates the imprecise knowledge of stream quality dynamics, was used to predict the variance of prediction of 8 water quality constituents (DO, PO4-P, NO3-N, NO2-N, NH3-N, fecal coliform, and temperature) as a function of distance downstream from a station. By setting a criterion of maximizing average trend detection power over a river basin, optimal combinations of sampling frequency and number of stations were determined for a fixed constraint on the total basin-wide sampling effort. The results showed that, in general, station placement is far less critical than the number of stations used. For most small- to moderate-sized basins and typical constraint levels faced by managing agencies, the optimum sampling program will have very few stations (often only one) with relatively high sampling frequencies at each station. (Sims-ISWS)
W78-00695

SOME EFFECTS OF DUSTFALL ON URBAN STORMWATER QUALITY,
Enviro-Measure, Inc., Knoxville, TN.
M. P. Barkdoll, D. E. Overton, and R. P. Betson.
Journal Water Pollution Control Federation, Vol. 49, No. 9, p 1976-1984, September 1977. 7 fig, 5 tab, 10 ref. U-910367-01-0.

Descriptors: *Fallout, *Water pollution, *Storm water, *Urban runoff, *Water quality, *Air pollution, Water pollution sources, Storm runoff, Rainfall, Watersheds(Basins), Heavy metals, Nutrients, Pollutants.
Identifiers: *Urban storm water quality.

Runoff from 47 storms in a small urban watershed was analyzed for 16 water contaminants. Dustfall also was collected and analyzed. There were 2 distinct but overlapping groups of contaminants found in the storm water quality analysis. Minerals and solids had relatively constant concentrations from storm to storm, whereas, heavy metals, nutrients, and chemical oxygen demand had decreasing concentrations with increasing storm water discharge. Further, chemical oxygen demand, Hg, Cl, Pb, SiO2, PO4, and As significantly influence storm water quality. Chemical oxygen demand, Hg, Cl, As, and PO4 are caused primarily by dustfall. The relative influence of dustfall for other constituents will have to be verified by further study. Pervious area in urban watersheds should not be disregarded in determining pollutant yields. Models using only street surface contaminants will yield conservative results. Removal was found to be a function of storm runoff volume and only mildly affected by runoff rates. Certain pollutants such as suspended solids, Ca, Mg, SO4, and CaCO3 are available in extremely large quantities. The constituents probably arise from the erosion of disturbed land areas. (Henley-ISWS)
W78-00697

COLORIMETRIC METHOD OF DETERMINATION OF AMIBEN IN AIR, WATER AND SOIL,
Kiev Inst. for the Advanced Training of Physicians (USSR).
L. S. Samosvat, and I. V. Voynova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 143, Price codes: A02 in paper copy, A01 in microfiche. FTD-ID(RS)I-1310-75, Wright-Patterson Air Force Base, Ohio, Foreign Technology Division, May 7, 1975. 5 p, 1 tab.

Descriptors: *Herbicides, *Agricultural chemicals, *Analytical techniques, *Testing procedures, *Chemical analysis, Weed control, Color reactions, Properties, Agriculture, Chemicals, Air, Analysis, Atmosphere, Chemistry, Soil analysis, *Pollutant identification.
Identifiers: *Amiben, *Colorimetric method.

Amiben, 3-amino-2, 5-dichlorobenzoic acid, is determined by reacting amiben with sodium nitrite in an acid medium, then reacting the phenyldiazonium salt obtained with 1-naphthol in an alkaline medium. Methods for extracting amiben from aerosol air filters, water, and soil were included. (Henley-ISWS)
W78-00700

POLYCYCLIC AROMATICS IN SURFACE AND GROUND WATER,
J. Borneff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-238 786-T, Price codes: A15 in paper copy, A01 in microfiche. EPA-TR 498-74, Environmental Protection Agency, Research Triangle Park, North Carolina, 1974. 22 p, 2 fig, 2 tab, 17 ref. Translated from SchrReihe Ver. Wass.-Boden-Lufthyg., p 53-65, 1973.

Descriptors: *Aromatic compounds, Pollutants, *Surface water, *Groundwater, *Water pollution sources, Water chemistry, Analytical techniques, Organic compounds, Water quality, Water pollution, Chemical analysis, Dusts, Aerosols, Soil contamination, Chemistry, *Pollutant identification, Foreign research.
Identifiers: *Polycyclics aromatics, *Carcinogens.

Carcinogenic polycyclic aromatics belong to the chronically effective harmful substances in drinking water, which are partly from natural origin and partly caused by pyrolytic processes. Since the aromatics appear in particularly high concentrations in waste water, they are significant as pollution possibilities. Their elimination from drinking water is necessary, although a small residual content of polycyclic concentrations in groundwate can be tolerated. In river water, 1/3 of the aromatics appear in corpuscular form, 1/3 is finely dispersed, and the rest actually is dissolved. In modern treatment plants, 2/3 of the aromatics can be eliminated by means of sedimentation, flocculation and filtration, the rest can be reduced by oxidation or A-carbon treatment to harmless residuals. It is believed that aromatics analysis represents a significant supplement to the customary research of drinking water: analysis application also is recommended by the WHO to assure the good taste and harmlessness of water. (Henley-ISWS)
W78-00702

THE NATURE AND BEHAVIOR OF GASES IN NATURAL WATERS,
Geological Survey of Canada, Ottawa (Ontario). Resource Geophysics and Geochemistry Div.
For primary bibliographic entry see Field 2K.
W78-00712

1975 ANNUAL REPORT.
National Oceanic and Atmospheric Administration, Oak Ridge, Air Resources Atmospheric Turbulence and Diffusion Laboratory, TN.
Report ATDL-76/14, September 1976. 583 p.

Descriptors: *Air pollution, *Diffusion, *Dispersion, *Model studies, Mathematical models, Pollutants, Path of pollutants, Industries, Powerplants, Cities, Theoretical analysis, Computer models, Solar radiation, Forests, Cooling towers, Winds, Meteorology.
Identifiers: *Plumes, Plume rise.

Research contributions for 1975 were compiled. Most of the contributions were concerned with the diffusion of air pollutants from power plants and other industries. Other subjects discussed were smog, solar radiation in forests, cooling towers, plume rise, and wind effects. Mathematical models were described in most of the papers. (See W78-00722 thru W78-00741), (Sims-ISWS)
W78-00721

SUMMARY OF ACTIVITIES AND PLANS-FY 1976-1977,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
R. P. Hosker, Jr., and R. A. Green.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 1-15, September 1976. 28 ref.

Descriptors: *Air pollution, *Path of pollutants, *Projects, *Model studies, Mathematical models, Powerplants, Cooling towers, Sulphur, Atmosphere, Environment, Pollutants, On-site investigations, Forests, Convection, Meteorology.
Identifiers: Plumes.

The Atmospheric Turbulence and Diffusion Laboratory (ATDL) in Oak Ridge, Tennessee, is operated for the Energy Research and Development Administration (ERDA) by the National Oceanic and Atmospheric Administration's (NOAA) Air Resources Laboratories, a group of research units generally concerned with problems of environmental pollution and its control. The ATDL is organized to perform research studies on atmospheric diffusion, transport, and removal of pollutants, including heat, and moisture with most emphasis on scales up to regional size (up to approximately 200 km). Current research programs include air transport studies, especially for the eastern Tennessee region; air pollution studies, including the meteorological effects of cooling towers and energy centers; research on plume and wake behavior, including effects of buoyancy, active thermal convection, and removal processes; extension of atmospheric transport, diffusion, and effluent removal models to special situations such as over-water and over-forest flows; and study of the role of forest structure on the energy balance and on diffusion. (See also W78-00721) (Sims-ISWS)
W78-00722

METEOROLOGICAL EFFECTS OF ENERGY DISSIPATION AT LARGE POWER PARKS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna, and F. A. Gifford.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 17-24, September 1976. 3 tab, 34 ref.

Descriptors: *Air pollution effects, *Cooling towers, *Meteorology, Fog, Clouds, Powerplants, Convection, Moisture content, Heat, Energy, Cloud physics, Drops(Fluids), Nuclear powerplants, Electric powerplants, Thermal powerplants.
Identifiers: Plumes, Vorticity, Large power parks.

Large (10,000 to 50,000 MW) power parks are being studied as one means of satisfying the nations's demand for energy. The dissipation of waste energy from these installations may result in significant meteorological effects. It was shown that the rate of atmospheric dissipation of the waste energy from power parks is approximately equal to the atmospheric dissipation of energy by geophysical phenomena such as thunderstorms, volcanoes, and large bushfires. Cumulus clouds and whirlwinds often be concentrated by large power parks. A theory of multiple plume rise was used to estimate the enhancement of plume rise from multiple cooling towers. Calculations were made of plume rise, ground level fog intensity, and drift deposition due to plume rise from 50 towers was estimated to be more than 110% of that from a single tower if the tower spacing is less than about 300 m. At locations within 100 km of the cooling towers, excess fog will occur about 1 or 2% of the time. The vapor plume will be appreciably longer than those from earth satellites most of the time. Since there are no power parks of this magnitude yet in existence, there are no measurements to test the calculations. The conclusions were highly tentative and indicated that much more research is required on the subject. (See also W78-00721) (Sims-ISWS)
W78-00723

TURBULENT DIFFUSION-TYPING SCHEMES: A REVIEW,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
F. A. Gifford.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 25-43, September 1976. 8 fig, 8 tab, 94 ref.

Descriptors: *Diffusion, *Turbulence, *Air pollution, Air circulation, Path of pollutants, Pollutants, Mixing, Reviews, Powerplants, Effluents, Winds, Meteorology.
Identifiers: *Diffusion-typing schemes.

Recent environmental concerns have increased greatly the need for turbulent typing schemes in atmospheric diffusion calculations. The standard methods by Brookhaven National Laboratory, Pasquill, the Tennessee Valley Authority, and others were reviewed, and differences, inconsistencies, and modifications to the basic schemes were discussed. Various exceptional flows occur to which existing turbulence typing schemes should not be applied directly: diffusion in near-calm, very stable conditions; diffusion over cities, water bodies, and irregular terrain; and diffusion in building wakes and near highways. Possible modifications to typing schemes in these cases were discussed. In all such exceptional cases, many more observational data are needed before reliable diffusion estimates can be made. (See also W78-00721) (Sims-ISWS)
W78-00724

PHOTOGRAPHIC ASSESSMENT OF DECIDUOUS FOREST RADIATION REGIMES,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00725

MODELING SMOG ALONG THE LOS ANGELES-PALM SPRINGS TRAJECTORY,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 221-263, September 1976. 12 fig, 4 tab, 42 ref.

Descriptors: *Smog, *Winds, *California, *Model studies, Mathematical models, On-site data collections, Pollutants, *Air pollution, Air circulation, Solar radiation, Path of pollutants.
Identifiers: *Southern California, *Los Angeles(Calif), *Palm Springs(Calif), Oxidants.

Observations of smog concentrations and wind patterns during the summer of 1973 in Los Angeles, Pomona, Riverside, Banning, and Palm Springs were presented. The observations showed that high oxidant concentrations at Banning and Palm Springs were presented. The observations showed that high oxidant concentrations at Banning and Palm Springs often are due to advection of smog from source regions in the more densely populated western part of the Los Angeles basin. A Pomona and Riverside, advection from upwind source regions combines with the effects of local emissions to cause long durations of high oxidant concentrations with peak times in the mid afternoon. An empirical model for the diurnal oxidant variation was suggested which satisfactorily simulates observed concentrations. More complex models which include chemical kinetics systems do not perform very satisfactorily at the rural stations of Banning and Palm Springs, especially at night when observed oxidant concentrations remain high. (See also W78-00721) (Sims-ISWS)
W78-00726

RESEARCH REQUIRED FOR PREDICTING THE BEHAVIOR OF PRESSURIZED GASES ESCAPING INTO THE ATMOSPHERE,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
G. A. Briggs.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 265-291, September 1976. 1 tab, 8 ref.

Descriptors: *Air pollution, *Gases, *Pressure, *Behavior, Winds, Atmosphere, Density, Temperature, Entrainment, Air entrainment, Expansion, Buoyancy, Mixing, Fluid mechanics.
Identifiers: Gas releases, Plumes.

The prediction of the behavior of pressurized gases accidentally released into the atmosphere requires many considerations, among which are thermodynamics, momentum, buoyancy (positive and negative), entrainment, and ambient wind and temperature structure. The areas were outlined that need to be considered and possible lines of research if the literature indicates the present state of knowledge is inadequate. (See also W78-00721) (Sims-ISWS)
W78-00727

TIME DEPENDENT MESOSCALE WIND FIELDS OVER COMPLEX TERRAIN,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00728

ATMOSPHERIC DISPERSION MODELS FOR ENVIRONMENTAL POLLUTION APPLICATIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
F. A. Gifford.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 311-335, September 1976. 6 fig, 2 tab, 105 ref.

Descriptors: *Air pollution, *Dispersion, *Model studies, Reviews, Winds, Mixing, Atmosphere, Diffusion, Mathematical models, Powerplants, Meteorology.
Identifiers: Plumes, Air pollution sources.

Pollutants are introduced into the air by many of man's activities. The potentially harmful effects they can cause are, broadly speaking, of 2 kinds: long-term, possibly large-scale and wide-spread chronic effects, including long-term effects on the earth's climate; and acute, short-term effects such as those associated with urban air pollution. This paper was concerned with mathematical cloud or plume models describing the role of the atmosphere, primarily in relation to the acute effects of air pollution, i.e., those effects arising from comparatively high concentration levels. (See also W78-00721) (Sims-ISWS)
W78-00729

URBAN DIFFUSION PROBLEMS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 337-356, September 1976. 4 fig, 4 tab, 95 ref.

Descriptors: *Air pollution, *Cities, *Model studies, Diffusion, Turbulence, Winds, Temperature, Mathematic models, Statistical models, Computer models, Pollutants, Path of pollutants, Meteorology.
Identifiers: *Urban diffusion models.

Emphasis was placed on the factors that cause diffusion in urban areas to present special problems or to differ from diffusion in other environments. Because of the obvious problems of urban air pollution and the stringent regulations laid down by governments, there has been a great increase in the number of observation programs and theoretical and applied studies of urban diffusion. But since most of the work has been directed towards solving local problems, there have been relatively few advances in the science of estimating urban air pollution. Studies tend to concentrate on monitoring programs or on straightforward application of existing techniques. Many of the studies are quite complex due to the large number of computer calculations which must be made in the process of insuring numerical stability or of accounting for the multiple sources and receptors. It is hoped that urban diffusion models can eventually be used confidently to make major decisions, such as in planning the lay-out of a new industrial park, in determining the effects of a new highway on air quality, or in estimating the results of a new automobile emissions exhaust system. (See also W78-00721) (Sims-ISWS)
W78-00730

RELATIVE DIFFUSION OF TETROON PAIRS DURING CONVECTIVE CONDITIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00731

DISPERSION OF SULFUR DIOXIDE EMISSIONS FROM AREA SOURCES,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
F. A. Gifford, and S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 365-376, September 1976. 7 fig, 2 tab, 4 ref.

Descriptors: *Air pollution, *Sulfur compounds, *Dispersion, Winds, Data processing, Analytical techniques, Forecasting, Mathematical models, Pollutants, Path of pollutants, Meteorology.
Identifiers: *Sulfur dioxide, Area sources.

An evaluation is presented of surface concentrations of sulfur dioxide emitted generally over an area. The most common example of an area source was provided by urban domestic and industrial heating, for which it is necessary to consider the sum of a large number of individual sources over an area of some convenient size. Given an area-source inventory, this paper provides a simple, systematic procedure for calculating the surface concentration at any point, averaged over an hour, a day, or a year. Area-source concentration calculations are a recent development compared with calculations of concentrations from isolated sources. There are discussions of some of the methods now available, but these all require the use of a high-speed electronic computer. The method described, although very simple, was shown to provide results of a precision comparable with that of the more elaborate computer calculations and can be used with confidence for area-source calculations in urban air pollution and regional air quality studies. An even simpler area-source calculation suitable for many air pollution control purposes also was described. The model was described in such a way that all the calculations can be done by hand. (See also W78-00721) (Sims-ISWS)
W78-00732

STANDARD DEVIATION OF WIND DIRECTION AS A FUNCTION OF TIME; THREE HOURS TO FIVE HUNDRED SEVENTY-SIX HOURS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00733

VALIDATION OF A MULTISOURCE DISPERSION MODEL FOR ATMOSPHERIC SULFUR CONCENTRATIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
W. M. Culkowski.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 389-394, September 1976. 2 tab.

Descriptors: *Sulfur compounds, *Air pollution, *Model studies, *Tennessee, Powerplants, Electric powerplants, Effluents, Pollutants, Mathematical models.
Identifiers: *Sulfur dioxide, *Walker Branch watershed(Tenn), Pollutant concentration.

Two tenths of 1% of the annual world output of sulfur dioxide, SO2, is generated within 25 km of the Walker Branch watershed. The prevailing wind pattern dictates that a substantial fraction of the effluent is transported to the vicinity of the Walker Branch area. The Air Transport Model (ATM) is the mechanism employed to estimate the concentration and/or deposition of an effluent at any given point. A test of the validity of the ATM was undertaken using data from SO2 monitoring stations established by the Tennessee Valley Authority (TVA). The location and type of monitoring stations employed were far from ideal. In addition, the tabulating requirements of TVA are often an order of magnitude more gross than the model predicts. Nevertheless, comparison of the model with TVA data showed excellent agreement. TVA supplied data for 3 parameters, SO2, suspended particulate, and settled particulate matter. Preliminary analysis indicated that only the SO2 concentrations tended to correlate with the output of the Bull Run steam plant. Accordingly, the ability of the ATM to correlate with TVA SO2 data was considered to be a valid test of the model. (See also W78-00721) (Sims-ISWS)
W78-00734

BEAM ENRICHMENT OF DIFFUSE RADIATION IN A DECIDUOUS FOREST,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 2B.
W78-00735

PLUME RISE PREDICTIONS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
G. A. Briggs.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 425-478, September 1976. 9 fig, 10 tab, 179 ref, 2 append.

Descriptors: *Air pollution, *Powerplants, *Model studies, Mathematical models, Reviews, Energy, Buoyancy, Mass, Electric powerplants, Cooling towers, Diffusion, Dispersion, Pollutants, Path of pollutants.
Identifiers: *Plumes, Plume models.

Several mathematical models used for predicting the plume rise were reviewed. In general, the models involve the conservation of mass, buoyancy, momentum, and energy. Cooling tower calculations were presented in a paper included as Appendix B. (See also W78-00721) (Sims-ISWS)
W78-00736

ASYMPTOTIC SOLUTIONS OF A SIMPLE URBAN DISPERSION MODEL FOR CHEMICAL POLLUTANTS,
Pembroke State Univ., NC. Dept. of Physics.
J. J. D'Arruda, and S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 479-498, September 1976. 1 tab, 3 ref.

Descriptors: *Air pollution, *Cities, *Model studies, Mathematical models, Pollutants, Path of pollutants, Equations, Chemicals, Winds, Diffusion, Analytical techniques.
Identifiers: Pollutant concentrations.

An analytical solution was developed for the set of partial differential equations describing the time rate of change of pollutant concentrations over an urban area, knowing the emissions' source strengths, the wind speed, the height of the pollutant cloud, the length of the region, and the chemical kinetics system were used as the basis for analysis. the resulting asymptotic solutions were shown to gree to 3 significant figures with solutions obtained by numerical integration using a high speed digital computer. (See also W78-00721) (Sims-ISWS)
W78-00737

CHEMISTRY OF SULFUR IN THE ATMOSPHERE,
Oak Ridge National Lab., TN.
C. F. Baes, Jr., J. T. Holdeman, and W. M. Culkowski.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 503-506, September 1976. 7 ref.

Descriptors: *Sulfur compounds, *Model studies, *Mathematical models, Chemistry, Aerosols, Powerplants, Acids, Humidity, Temperature, Pollutant, Path of pollutants, Air pollution, Ions, Chemicals.
Identifiers: Plumes.

Industrially produced sulfur enters the atmosphere in reactive forms, primarily SO2 and SO3, that should not be treated as inert pollutants for purposes of modeling. Since June of 1974, an effort has been under way to describe the equilibrium and kinetic aspects of sulfur chemistry in a form suitable for inclusion in the atmospheric transport model (ATM) being developed at Oak Ridge National Laboratory. A computer program has been written which calculates the amount and composition of aerosol and the equilibrium partial pressure of the gases. The program in its present form (SULCAL) calculates the composition of the aerosol and the partial pressure of SO2 in a power plant plume as a function of the distance downwind from the source. (See also W78-00721) (Sims-ISWS)
W78-00738

PREDICTED AND OBSERVED COOLING TOWER PLUME RISE AND VISIBLE PLUME LENGTH AT THE JOHN E. AMOS POWER PLANT,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
S. R. Hanna.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 509-551, September 1976. 5 fig, 6 tab, 26 ref.

Descriptors: *Cooling towers, *Effluents, *Model studies, Mathematical models, Powerplants, Electric powerplants, Heat, Water vapor, Humidity, Winds, Drops(Fluids), Clouds, Cloud physics, Effects, Meteorology.
Identifiers: Plumes, Plume rise, Plume models.

A one-dimensional numerical cloud growth model and several empirical models for plume rise and cloud growth were compared with 27 sets of observations of cooling tower plumes from the 2900 MW John E. Amos power plant in West Virginia. The 3 natural draft cooling towers are 200 m apart. In a cross wind, the plumes began to merge at a distance of about 500 m downwind. In calm conditions, with reduced entrainment, the plumes often did not merge until heights of 1000 m. The average plume rise, 750 m, was predicted well by the models, but day-to-day variations were simulated with a correlation coefficient of about 0.5. Model predictions of visible plume length agreed, on the average, with observations for visible plumes of short to moderate length (less than about 1 km). The prediction of longer plumes was hampered by the lack of knowledge of plume spreading after the plumes level off. Cloud water concentrations predicted by the numerical model agreed with those measured in natural cumulus clouds (about 0.1 to 1 g/kg). (See also W78-00721) (Sims-ISWS)
W78-00739

A NOTE ON DIFFUSION FROM SOME SIMPLE EXTENDED SOURCES TREATED AS A COLLECTION OF GAUSSIAN POINT SOURCES,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
P. Ulriksen.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 553-576, September 1976. 6 fig, 12 ref.

Descriptors: *Diffusion, *Air pollution, *Model studies, Mathematical models, Highways, Effluents, Dispersion, Industries, Powerplants, Pollutants, Path of pollutants.
Identifiers: *Air pollution sources.

The common use of the Gaussian diffusion formula for estimating concentrations of a contaminant emitted from a point source has led to extension of the method to line and area sources. In practical applications, highways usually are treated as infinite line sources, while domestic and small industrial emissions become area sources, divided into small squares, each one represented by a point source. The approximations of finite line sources by infinite lines, or of area sources by point sources, are valid only within a certain distance range, a fact not always taken into account. This note examined the behavior of several simple extended sources, treated as summations of point sources, each having a Gaussian diffusion pattern. Line sources, vertical area sources, and horizontal area sources were included. Line and horizontal area sources are common in air pollution problems. Vertical area sources are not usual in atmospheric diffusion but can be found in some problems of fluid mechanics or oceanic applications. (See also W78-00721)
W78-00740

ESTIMATION OF DOWNWASH EFFECTS,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
G. A. Briggs.
In: 1975 Annual Report; Report ATDL-76/14, Air Resources Atmospheric Turbulence and Diffusion Laboratory, Oak Ridge, Tennessee, p 577-583, September 1976. 1 tab, 5 ref.

Descriptors: *Air pollution, *Effluents, *Model studies, Mathematical models, Industries, Powerplants, Buildings, Winds, Effects, Pollutants, Path of pollutants, Equations.
Identifiers: *Downwash effects, Downwash, Stacks.

Reported was a simplified approach to the calculation of ground level concentrations of effluents from small industrial and fuel-burning installations. It was intended to serve as a first approximation to a very complex process. Because each stack, building, and terrain configuration is different, actual ground concentration frequently may differ from the values calculated here by a factor of 2. The procedures given were designed especially for source heights of less than 100 m; some of the simplifications made are not valid for large emissions. This paper gave a method for predicting the occurrence of downwash. Downwash is a common occurrence with small emissions and greatly increases ground concentrations in the immediate vicinity downwind of the source. (See also W78-00721) (Sims-ISWS)
W78-00741

APPLICATION OF NUMERICAL CLASSIFICATION IN ECOLOGICAL INVESTIGATIONS OF WATER POLLUTION,
Virginia Inst. of Marine Sciences, Gloucester Point, VA.
For primary bibliographic entry see Field 6G.
W78-00771

ENVIRONMENTAL ASSESSMENT PERSPECTIVES,
GCA Corp., Bedford, MA. GCA Technology Div.
For primary bibliographic entry see Field 5G.
W78-00773

MAPS SHOWING GROUND-WATER CONDITIONS IN THE NORTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00802

MAPS SHOWING GROUND-WATER CONDITIONS IN THE MONUMENT VALLEY AND NORTHERN PART OF THE BLACK MESA AREAS, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00803

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE BLACK MESA AREA, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00804

JARRETTSVILLE QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00805

BEL AIR QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00806

GROUND-WATER RESOURCES OF THE ALLUVIAL AQUIFERS IN NORTHEASTERN LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00811

WATER RESOURCES OF THE MAUNABO VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-00813

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1975.
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00817

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1976.
Geological Survey, Towson, MD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00818

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-00819

RECONNAISSANCE OF WATER QUALITY IN THE DUCHESNE RIVER BASIN AND SOME ADJACENT DRAINAGE AREAS, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
J. C. Mundorff.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 55, 1977. 47 p, 9 fig, 5 plates, 2 tab, 17 ref.

Descriptors: *Water quality, *Streams, *Utah, *Chemical analysis, *Sediment transport, Suspended load, Water analysis, Sampling, Data collections, Streamflow, Flow rates, Storm runoff, Evaluation, Maps.
Identifiers: *Duchesne River basin(Utah).

A water-quality reconnaissance in the Duchesne River basin and some adjacent drainage areas covered an area of about 4,400 square miles. Data were obtained one or more times at 108 sites during March 1973 to September 1974 and at 49 other sites during earlier years. Dissolved-solids concentrations are low in the surface water in the northern and western parts of the basin and increase markedly in the southeastern part of the basin. The increase results predominantly from diversion of large amounts of water having low dissolved-solids concentrations from upstream parts of the basin and the return to or entry into the stream of smaller amounts of water having much higher dissolved-solids concentrations. Additional diversions of water from the upper part of the basin will cause an increase in weighted average dissolved-solids concentrations in downstream reaches of the river. Tributaries to the Duchesne and Strawberry Rivers in the southern part of the basin have high boron concentrations. Concentrations as high as 20,000 micrograms per liter were observed at the mouth of Indian Canyon. Suspended-sediment concentrations as high as 36,200 milligrams per liter were observed in runoff from a thunderstorm in the southeastern part of the area. Sediment concentrations greater than 100,000 milligrams per liter could be expected during periods of intense thunderstorm runoff in many of the southern tributaries. (Woodard-USGS)
W78-00820

GROUND WATER IN THE LAJAS VALLEY, PUERTO RICO,
Geological Survey, Ft. Buchanan, PR. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00822

QUANTITY AND QUALITY OF URBAN STORM WATER IN SOUTHEAST FLORIDA,
Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 3D.
W78-00824

TECHNIQUES FOR MEASURING THE EFFECTS OF NUCLEAR POWER PLANTS ON LOCAL FISH,
Washington Univ., Seattle. Applied Physics Lab.
For primary bibliographic entry see Field 5C.
W78-00831

A TECHNIQUE FOR MEASURING INDUSTRIAL WASTE DISPERSION RESULTING FROM OCEAN DUMPING,
EG and G Environmental Consultants, Waltham, MA.
For primary bibliographic entry see Field 5B.
W78-00832

A 96-HOUR BIOASSAY OF OTTER CREEK, OHIO,
Heidelberg Coll., Tiffin, Ohio.
B. L. Prater, and M. A. Anderson.
Journal Water Pollution Control Federation, Vol 49, No 10, p 2099-2108, 1977. 3 fig, 5 tab, 9 ref.

Descriptors: *Sediments, *Bioassay, *Toxicity, *Streams, Mayflies, Plankton, Fauna, Research and development, Design, Aquatic life, Bioindicators, Water quality, Mortality, Daphnia, Sampling, Laboratory tests, Waterfleas, *Ohio, Benthos, Invertebrates.
Identifiers: *Otter Creek(Ohio), Hexagenia limbata, Asellus communis, Daphnia magna.

A sediment bioassay was described for evaluating sediment toxicity of Otter Creek, Ohio. Hexagenia limbata, Asellus communis, and Daphnia magna were used as test species. The sediment in the lower two-thirds of Otter Creek was not found to be conductive to the support or maintenance of aquatic biota. Certain area along the creek were grossly polluted and exhibited a high mortality of all test organisms. The design, apparatus, maintenance, and operation of the sediment bioassay were demonstrated. Possible applications of the bioassay using a variety of test species were discussed. (Klein)
W78-00890

RESIDUES OF CHLORINATED HYDROCARBONS IN COD LIVERS FROM THE KIEL BIGHT IN RELATION TO SOME BIOLOGICAL PARAMETERS,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
R. Schneider, and C. Osterroht.
Berichte der Dentschen Wissenschaftliche Kommissim fur Meeresforschung, Vol 25, p 105-214, 1976/1977. 5 fig, 1 tab, 9 ref.

Descriptors: *Fish physiology, *Fish, *Chlorinated hydrocarbon pesticides, *DDT, *DDE, Dieldrin, Polychlorinated biphenyls, Path of pollutants, Bioassay, Analytical techniques, Absorption, Lipids, Sampling, Commercial fishing, Chromatography, Sampling, Laboratory tests.
Identifiers: Bioaccumulation, Tissue analysis, *Cod, *Livers, Gadus morhua, TDE, Kiel(West Germany).

Cod livers sampled from two sites in the Kiel Bight and from a fishing ground in the Kattegat were analysed for residues of DDT, TDE, DDE, dieldrin, and PCBs. The estimation of pollutants was performed by gas liquid chromatography. The organo-chlorine residue concentrations based upon the wet weights of the livers were more closely correlated to the lengths of the fish than to the lipid contents in their livers. An explanation of this length-dependence was offered. A decrease of the PCB/DDT ratio with the size of cod was explained. Livers of cod caught in the Kiel Fjord contained significantly higher concentrations of organo-chlorine residues than livers of cod caught elsewhere. The only difference in the residue levels between cod livers from the Kiel Bight and from the Kattegat was a general presence of dieldrin in the latter ones. (Klein)
W78-00891

FIELD-LABORATORY DETERMINED AVOIDANCES OF THE SPOTFIN SHINER AND THE BLUNTNOSE MINNOW TO CHLORINATED DISCHARGES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
D. S. Cherry, R. C. Hoehn, S. S. Waldo, D. H. Willis, and J. Cairns, Jr.
Water Resources Bulletin, Vol. 13, No. 5, p 1047-1055, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Chlorine, *Effluents, *Power plants, *Chlorination, *Fish behavior, *Toxicity, *Minnow, *Shiners, Temperature, Water temperature, Heated water, Environmental effects, Water pollution sources, Water quality, Laboratory tests, On-site-investigation, Bioassay.
Identifiers: Avoidance, *Chlorine avoidance, Bluntnose minnow, Spotfin shiner, Notropis spilopterus, Pimephalus notatus.

The responses of the spotfin shiner and bluntnose minnow to intermittent chlorine discharges from a fossil fuel power plant were investigated by seine collections in the chlorinated discharge channel, and chlorine avoidances were obtained in a field laboratory at the power plant. No fish were captured by Seine during chlorination periods when total chlorine (TOR) and free chlorine (FCR) residuals were, respectively, 0.46 and 0.27 mg/l or higher at river water temperature of 12 C or less. Significant laboratory avoidances occurred at 0.10 to 0.20 mg/l TCR (0.03 to 0.14 mg/l FCR) for both species when exposed to increasing TCR concentrations of 0.10, 0.20, 0.30, and 0.40 mg/l. Responses varied with acclimation temperature (6, 12, 18, and 24 C) with no consistent trends between species. When exposed to a constant TCR concentration during any one test (0.14, 0.18, and 0.26 mg/l for the spotfin shiner and 0.11 and 0.17 mg/l for the bluntnose minnow), significant avoidances were observed at 0.26 and 0.17 mg/l for each species, respectively. In all laboratory trials, occurrence or residence times decreased with increasing chlorine concentration, with residence times as high as 64.7% at 0.10 mg/l TCR and as low as 8.3% at 0.40 mg/l being observed. (Klein)
W78-00895

TRACE METALS IN LIVER FROM BLUEFISH, TAUTOG AND TILEFISH IN RELATION TO BODY LENGTH,
Rhode Island Univ., Kingston. Dept. of Zoology.
H. C. Mears, and R. Eisler.
Chesapeake Science, Vol. 18, No. 3, p 315-318, 1977. 2 tab, 22 ref.

Descriptors: *Cadmium, *Chromium, *Copper, *Iron, *Manganese, *Nickel, *Zinc, *Metals, *Spectrophotometry, *Size, Metals, Path of pollutants, Analytical techniques, Chemical analysis, Animal growth, New Jersey.
Identifiers: Tissue analysis, *Bluefish, *Tautog, *Tilefish.

Livers from bluefish, tilefish and tautog collected during the summer of 1971 off the New Jersey coast were analyzed for Cd, Cr, Cu, Fe, Mn, Ni, and Zn by atomic absorption spectrophotometry. Liver ash from male and female tautog contained decreasing concentrations of Ni with increasing body length. Smaller males also contained greater levels of Cr and Cu in liver than large tautogs. Larger tilefish contained proportionately more Cd, Cu, and Fe in liver than smaller tilefish. Decreasing levels of Mn and Zn with body length were ap-

parent only for females. Livers from larger male bluefish were associated with higher concentrations of Fe than those from smaller males, while those from larger females contained lower concentrations of Cr than those from smaller females. The data suggest that future comparisons for trace metals which vary as a function of size be made only among fish of the same length. (Katz)
W78-00897

5B. Sources Of Pollution

AN INDUSTRIAL WASTE GUIDE TO THE MEAT INDUSTRY.
American Meat Inst., Washington, DC. Committee on Meat Packing Plant Waste Disposal.
Public Health Service, Publication No. 386, 1951, 12 p, 7 tab, 15 ref.

Descriptors: *Food processing industry, *Waste water treatment, Water analysis, *Waste identification, *Water pollution effects, *Water pollution sources, Activated sludge, Biochemical oxygen demand, Chemical precipitation, Design criteria, Flocculation, Biological treatment, Suspended solids, Trickling filters, Industrial wastes.
Identifiers: *Meat packing wastes.

The publication represents the efforts of waste technologists of the meat industry and others to develop a concise practical guide for operating and design personnel. Descriptions of plant processes, sources and quantity of wastes, character of wastes, and pollution effects of a sample of slaughterhouses and packinghouses are presented. In-plant remedial measures and treatment methods used by a sample of prominent plants are discussed. Studies and results of experiments made by the Sanitary District of Chicago, and treatment method results of four packinghouses are presented. methods and results of using sedimentation, chemical precipitation, trickling filters and activated sludge are discussed. (Prodehl-EPA, Corvallis)
W78-00508

PHOSPHATE/SEDIMENT INTERACTION IN TOLO AND LONG HARBOURS, HONG KONG AND ITS ROLE IN ESTUARINE PHOSPHORUS AVAILABILITY,
Fisheries Research Station, Aberdeen (Hong Kong).
H. P. Stirling, and A. P. Wormald.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 631-642, September 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Water pollution sources, *Phosphates, *Harbors, *Sediments, Pollution, Water pollution, Pollutants, Inorganic compounds, On-site investigations, Estuaries, Adsorption, Laboratory tests, Water quality, Sampling, Testing procedure, Water properties, Clays, Foreign research, Foreign countries.
Identifiers: *Hong Kong, *Phosphorus removal.

The phosphate adsorption capacities of estuarine sediments and sediment derived from reclamation works in Tolo Harbour were determined in seawater. The influences of temperature and pH were not important in the field, but large reductions in salinity following heavy rain enhanced phosphate adsorption. Most sediments exhibited a saturation point with increasing sediment concentration, beyond which there was little further adsorption. At the increasing saturation concentrations, estuarine sediments adsorbed 71-88% of added phosphate up to at least 100 micrograms P/l, while reclamation sediment adsorbed 95%. There was significantly less adsorption from higher concentrations up to 2 mg P/l. Adsorption capacity appeared to be related to the kaolinite content of the sediments. Laboratory and field observations showed that adsorption is reversible and the sediments act as a phosphate buffer, but the steady-state value is 3-9 micrograms P/l so desorption can occur only into unpolluted waters. The results contrast with rather higher equilibrium levels observed elsewhere. In polluted waters the sediments, especially those from land reclamation, permanently remove a large proportion of dissolved phosphate so that the danger of eutrophication should be reduced. (Humphreys-ISWS)
W78-00516

PREDICTION OF MERCURY DISTRIBUTION IN RIVER SEDIMENTS,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
A. Kudo, R. D. Townsend, and D. R. Miller.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 103, No EE4, Proceedings Paper 13128, p 605-614, August 1977. 3 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Path of pollutants, *Mercury, *Sediment distribution, *Canada, *Water pollution sources, *Heavy metals, *Forecasting, Rivers, Biomass, Sediment transport, On-site investigations, Trace elements, Bed load.
Identifiers: *Bed material, *Ottawa River.

Field studies on a 4.9-km reach of the Ottawa River confirmed that mercury in the system is almost completely (approx 97%) associated with the bed sediments. However, mercury concentration varies widely in the study section and is a function of particle size and type of sediments. A laboratory study, in which the distribution of radioactive mercury among various sediment components was monitored under dynamic conditions, lead to predictions of mercury concentrations that closely matched observed field values. Sediments with high organic content, in particular the wood chips and fiber deposits common in the Ottawa River, have associated with them 50 times the amounts of mercury associated with sand particles on a weight per weight basis. The results emphasized the importance of performing material classification and binding affinity analysis. (Adams-ISWS)
W78-00517

NITRATE-NITROGEN AND CHLORIDE MOVEMENT THROUGH UNDISTURBED FIELD SOIL,
Alabama A and M Univ., Normal.
J. W. Shuford, D. D. Fritton, and D. E. Baker.
Journal of Environmental Quality, Vol. 6, No. 3, p 255-259, 1977. 1 fig, 7 tab, 10 ref.

Descriptors: *Soil water movement, *Dispersion, *On-site tests, *Pennsylvania, Soil water, Nitrates, Chlorides, Mixing, Percoltion, On-site investigations, Movement, Irrigation, Analytical techniques, Analysis, Sampling, Ion transport, Ions, *Nitrogen.
Identifiers: *Nitrate-nitrogen.

Results were presented from a field study conducted to determine whether large pores represent a major pathway for NO3-N and Cl movement through undisturbed soil. A soil containing 410 ppm NO3-N and Cl as KNO3 and KCl was added to 3 experimental field plots enclosed by wooded barriers to prevent runoff. Initial and final soil samples were taken at various profile depths for ion analyses. Most of the NO3-N and Cl added in solution moved vertically with the water through the profile. Ion movement was influenced by large soil pores between structural units. A fourth field plot was designed to compare field-measured NO3-N and Cl concentrations with theoretical calculations, using time-dependent water flow velocity and dispersion equations. Soil solution samples were taken for ion analyses. Due to the incomplete mixing of water and ions with all soil pores, theoretical equations did not completely explain the field-measured NO3-N and Cl distribution. (Humphreys-ISWS)
W78-00520

COMPUTATIONAL HYDRAULICS: AN ALTERNATIVE VIEW,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
M. B. Abbott, and M. P. Vium.
Journal of Hydraulic Research, Vol. 15, No. 2, p 97-123, 1977. 11 fig, 39 ref, 3 append.

Descriptors: *Mathematical models, *Hydraulics, *Finite element analysis, *Water pollution, Boundary processes, Dispersion, Numerical analysis, Mathematical studies, Methodology.
Identifiers: *Computational hydraulics, Inverse schemes, Alternative methods.

Problems usually are posed in terms of determining what happens at given places and times. Problems can be posed alternatively by asking at which place a given event occurs at a given time. The main interest of inverse schemes, however, is not to immediate applications, but to their value in relativizing the direct schemes. The direct schemes work best when space variations in the quantities of interest are of the same order of magnitude over most of the computational domain, while inverse schemes are well-suited to situations where areas of interest are concentrated in small regions of the domain. Examples are the spillage, transport and dispersion of pollutants in watercourses, the propagation of Tsunamis waves, biochemical process at air-water and bed-water interfaces, and the transport of short wave energy. The alternative methods provide a generally superior resolution in these situations, as compared with the traditional ones, but this advantage is bought at the cost of an increased complexity of the numerical schemes or algorithms. (Singh-ISWS)
W78-00524

PREDICTING ESTUARINE SALINITY FROM RIVER INFLOWS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-00526

NITRIFICATION AND DENITRIFICATION IN MARINE SEDIMENTS FROM PUGET SOUND,
Washington Univ., Seattle. Dept. of Oceanography.
V. Grundmanis, and J. W. Murray.
Limnology and Oceanography, Vol. 22, No. 5, p 804-813, September 1977. 5 fig, 5 tab, 27 ref. IDOE-NSF DES75-03618.

Descriptors: *Sounds, *Washington, *Nitrification, *Denitrification, Sediments, Connate water, Limnology, Coasts, Sampling, On-site investigations, Analytical techniques, Analysis, Nitrates, Nitrites, Nitrogen cycle, Ammonia, Water quality, Water analysis, Distribution patterns, Path of pollutants.
Identifiers: *Pudget Sound(Wash).

The anomalous interstitial water chemistry in Puget Sound sediments (200-m water depth) indicates an intermediate zone at 20- to 30-cm depths which consists of a mixture of 90% interstitial water and 10% bottom water. Irrigation by burrowing benthic organisms is believed responsible. The vertical distribution of interstitial ammonia, nitrate, and nitrite indicates that nitrification is occurring in the intermediate sedimentary zone, with oxygen being supplied by the irrigation process. Above and below the intermediate zone, denitrification predominates. (Humphreys-ISWS)
W78-00537

THE SULFUR CYCLE OF A COASTAL MARINE SEDIMENT (LIMFJORDEN, DENMARK),
Aarhus Univ. (Denmark). Inst. of Ecology and Genetics.
B. B. Jorgensen.

Limnology and Oceanography, Vol. 22, No. 5, p 814-832, September 1977. 12 fig, 1 tab, 46 ref.

Descriptors: *Fjords, *Sulfur compounds, *Oxidation-reduction potential, *On-site tests, Reduction(Chemical), Limnology, Inorganic compounds, Metabolism, Degradation(Decomposition), Water quality, Sediments, Coasts, On-site investigations, Sampling, Analytical techniques, Chlorides, Anerobic conditions, Foreign research, Foreign countries, Distribution patterns, Dissolved oxygen, Chlorides.
Identifiers: *Denmark, Sulfur cycle.

The cyclic transformations of inorganic sulfur compounds in the sediments of a Danish Fjord were followed for 2 years. The in situ rate of sulfate reduction measured with a radio-tracer technique together with chemical determinations of various sulfur compounds were used to calculate a budget of the complete sulfur cycle. Sulfate reduction rates were high at the sediment surface (25-200 nmol SO2(2-)/cu cm/d), and there was still measurable activity at a depth of 1.5 m. Sulfate reduction also was compared with the benthic community metabolism measured as the oxygen uptake rate of the sediment. Sulfate reduction accounted for 53% of the total mineralization of organic matter in the sediment. Only 3% of the sulfide was derived from organic sulfur. Of all the sulfide produced, 10% was precipitated by metal ions within the anoxic sediment, while the rest was reoxidized at the surface. The results demonstrated the dynamic nature of the sulfur cycle, with turnover times for sulfate of 4-5 months and for free sulfide of 1-5 days. The calculations illustrated the dynamic nature of the sediment system and the danger of drawing conclusions from pool sizes to process rates. (Humphreys-ISWS)
W78-00538

THE FLAX POND ECOSYSTEM STUDY: EXCHANGES OF CARBON IN WATER BETWEEN A SALT MARSH AND LONG ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell, D. E. Whitney, C. A. S. Hall, and R. A. Houghton.
Limnology and Oceanography, Vol. 22, No. 5, p 833-838, September 1977. 2 fig, 2 tab, 22 ref. NSF AG-375.

Descriptors: *Salt marshes, *New York, *Ecosystems, *Carbon, Tidal marshes, Tidal waters, Sounds, Carbon dioxide, Analysis, Analytical techniques, Limnology, Organic matter, Salinity, Sampling, Organic compounds, Estuaries.
Identifiers: *Long Island Sound(NY), *Flax Pond(NY).

Flax Pond, a tidal marsh on the north shore of Long Island, New York, was used to examine the exchanges of carbon in its various forms between a salt marsh and the coastal waters. The marsh removed fine particulate carbon from the tidal water throughout the year; it tended to be a small source of C as total CO2 and dissolved organic carbon during summer, and a sink for both forms in winter. The net flux of total carbon over a year, measured as total CO2 and as particulate and dissolved organic C, was a small input into the marsh, estimated as about 51 g C/sq m. The data were consistent with others showing the marsh to be a net consumer of chlorophyll throughout the year and a strongly heterotrophic system in summer and do not support the conventional view of marshes as net sources of fixed carbon to coastal waters. (Humphreys-ISWS)
W78-00539

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 1. MASS TRANSFER PROPERTIES AND SILICA DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environnnement.
J-P. Vanderborght, R. Wollast, and G. Billen.
Limnology and Oceanography, Vol. 22, No. 5, p 787-793, September 1977. 8 fig, 14 ref.

Descriptors: *Diagenesis, *Sediments, *Mass transfer, *Mathematical models, *Sediment-water interfaces, Coasts, Interfaces, Profiles, Porosity, Oxidation-reduction potential, On-site investigations, Limnology, Kinetics, Model studies, Silica, Sulfates, Nitrates, Ammonia, Water analysis, Connate water, Foreign research, Foreign countries.
Identifiers: *Belgium, *North Sea, Two layer model.

The results of chemical analysis of the interstitial water of several samples of sediments from a large muddy zone along the Belgian North Sea coast were reported. When special care is taken to collect the cores without disturbing the water-sediment interface, the vertical concentration profiles display typical patterns that cannot be explained by constant diffusivity models and that suggest the existence of 2 distinct sedimentary layers with different mass transfer properties. A two-layer model was proposed to describe the vertical silica profiles. It assumes that the mass transfer coefficient in the first 3.5 cm of the sediment upper layer is 100 times higher than in the compacted lower layer. The large increase is due mainly to turbulent processes induced by the movement of the overlying water. From the model, the flux of dissolved silica across the water-sediment interface was calculated. The contribution of the upper layer represents 70% of the total flux of silica out of the sediments. As a consequence, the fluxes may be underestimated by a factor of 4 if the layer is discarded during sampling or handling of cores. (See also W78-00543) (Humphreys-ISWS)
W78-00542

KINETIC MODELS OF DIAGENESIS IN DISTURBED SEDIMENTS. PART 2. NITROGEN DIAGENESIS,
Brussels Univ. (Belgium). Lab. d'Environment.
J-P. Vanderborght, R. Wollast, and G. Billen.
Limnology and Oceanography, Vol. 22, No. 5, p 794-803, September 1977. 6 fig, 4 tab, 25 ref.

Descriptors: *Diagenesis, *Sediments, *Sediment-water interfaces, *Mathematical models, *Nitrogen, Coasts, Interfaces, Profiles, On-site investigations, Model studies, Equations, Limnology, Kinetics, Sulfates, Nitrates, Ammonia, Water analysis, Connate water, Foreign countries, Foreign research, Nitrification, Dentrification.
Identifiers: *Belgium, *North Sea, Two layer model.

A two-layer mass transfer model developed to describe the vertical silica profile in the sediments of a muddy zone of the North Sea along the Belgian coast was applied to the description of the microbiological processes involved in nitrogen diagenesis in the same sediments. Intense aerobic heterotrophic activity and nitrification were postulated in the upper layer. Dentrification and sulfate reduction were assumed to be preponderant in the lower layer. Vertical profiles of oxygen, sulfate, nitrate, and ammonium were calculated according to the model and adjusted to experimental profiles. The fluxes of nitrate and ammonium across the water-sediment interface and the rates of ammonification, nitrification, and denitrification in the 2 layers were calculated from the results of the models. As in the case of silica, the contribution of the upper layer is much more important than that of the underlying sediment. (See also W78-00542) (Humphreys-ISWS)
W78-00543

FERMENTATION AND ENZYMATIC SACCHARIFICATION OF CELLULOSE AND LIGNIN WASTE,
Rhode Island Univ., Kingston. Dept. of Chemical Engineering; Rhode Island Univ. Kingston. Dept. of Food Science and Technology; and Rhode Island Univ., Kingston. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W78-00554

THE DISTRIBUTION OF DIATOMS IN MISSISSIPPI SALT MARSHES,
Mississippi State Univ., Mississippi State. Dept. of Botany.
M. J. Sullivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 814, Price codes: A04 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, October 1977. 68 p, 7 fig, 21 tab, 18 ref. OWRT A-099-MISS(1), 14-34-0001-7052.

Descriptors: *Diatoms, Algae, Marshes, *Mississippi, *Salt marshes, *Distribution, Biological communities, Regression analysis, Energy, Temperature, Salinity, Soil moisture.
Identifiers: Graveline Bay Marsh(Miss), Spermatophytes.

Edaphic diatoms were collected trimonthly from beneath 5 monospecific stands of spermatophytes of Graveline Bay Marsh, Mississippi, over a yearly cycle. The 5 spermatophytes included Distichlis spicata, Scirpus olneyi, Juncus roemerianus, Spartina laterniflora, and S. patens. Of the 119 diatom taxa encountered, only 7 were endemic to a single spermatophyte zone. The single most abundant and evenly distributed diatom was Navicula tripunctata, which accounted for ca. 1 of every 5 individuals counted during the study. Calculation of relative abundance and niche breadth values for the 26 most abundant taxa indicated little seasonality in their distributions. The majority of these 26 taxa were not evenly distributed amongst the 5 communities, and this produced statistical differences amongst the communities with regards to various parameters of community diversity (e.g. H', S, and R'). Structural differences between selected pairs of diatom communities were quantified using a selected similarity index (SIMI) and the values generated were exceedingly variable. A multiple regression analysis indicated that structural differences between edaphic diatom communities were related to differences in temperature, salinity, blue light energy, elevation, and soil moisture.
W78-00555

EFFECTS OF SLUDGE APPLICATIONS ON SOIL WATER AND VEGETATION IN A NORTHERN HARDWOOD FOREST IN NEW ENGLAND,
New Hampshire Univ., Durham. Water Resources Research Center.
M. T. Koterba, J. W. Hornbeck, and R. S. Pierce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 768, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Research Report No 15, June 1977. 23 p, 6 fig, 1 tab, 37 ref. OWRT A-039-NH(2). 14-31-0001-4029.

Descriptors: *Sludge disposal, *Forest soils, Natural resources, *Vegetation, Liquid wastes, Rates of application, Application methods, *Soil water, *Soil chemistry, Ions, Lysimeters, Streams, New England, Forests, *New Hampshire.
Identifiers: *Ionic concentrations.

Dewatered and limed sludge obtained from a primary treatment plant was spread at two rates, 25 and 125 wet t/ha, on sandy loam soils in a northern hardwood forest in N.H. Changes in soil water chemistry were assessed using water samples collected at 20 and 45 cm depths with suction lysimeters. Changes in the understory vegetation were monitored using species diversity and frequency of individual species while changes in the overstory were based on the basal area growth of trees

> 5 cm in diameter. The light application of 25 t/ha caused only minor changes in soil water chemistry, but the heavy application of 125 t/ha caused increases in most of the major ions in soil water. At 20 cm, mean Cl concentrations rose to a maximum of 27.5 mg/l from background values of < 0.4 mg/l. SO4 initially declined 1.0 mg/l below background concentrations averaging 5.0 mg/l, and then rose to a maximum of 13.5 mg/l. Ca, which averaged about 2.0 mg/l, before the heavy application, also rose to about 13.0 mg/l. Mg, Na, K, H, and NO3 showed maximum increases in concentration that averaged 2- to 3-fold greater than background values of < 0.5 mg/l. At 45 cm, the increases in ionic concentrations following the heavy application were less than one half the increase that occurred at 20 cm. The concentration of most ions returned to background values within one year after the sludge was applied. The background chemistry of soil water at 45 cm was similar to streamwater chemistry in the study area. Thus, changes that occurred in soil water chemistry at this depth after sludge applications may reflect potential impacts on streams.
W78-00567

HYDROLOGIC AND BIOLOGIC CHARACTERISTICS OF NATURAL CHANNELS IN COASTAL MARSH OF MISSISSIPPI,
University of Southern Mississippi, Hattiesburg. Dept. of Geology.
O. L. Paulson, Jr., G. F. Pessoney, P. K. Stocks, K. A. Grimes, and J. Hovanesian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 813, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University Water Resources Research Institute, Completion Report, October 1977. 22 p, 3 fig, 7 tab, 2 ref.

Descriptors: *Water circulation, Biology, *Tidal effects, Seasonal, *Mississippi, *Monitoring, *Coastal marshes, Channels, Water quality, Biota, Salinity, Dissolved oxygen, Temperature, Nitrogen, Phosphorus, Bacteria, Coliforms, Sediments, Plankton, Sampling.

A study of the effects of tidal action on circulation, water quality and biota of natural channels in Gulf Coast marsh lands was conducted to serve as a basis for comparison with a previous study of man-made canals. Seasonal and tidal changes in velocity, salinity, dissolved oxygen, temperature, nitrogen, phosphorus, coliform bacteria, plankton, benthic organisms and sediments were monitored for one year. Fecal coliform were less than 100/100ml water for all but two samples, and dissolved oxygen averaged 7.9 ppm. Trawl samples contained representative fish of the area with highest numbers and diversity obtained when salinities were high. Plankton were representative of brackish environment with numbers being highest near bayou mouths adjacent to Mississippi Sound. Tidal flushing was adequate to maintain good water quality except at mid point of a flow-through channel. Circulation in a dead-end natural channel was significantly better than that previously observed on man-made canals.
W78-00568

STUDIES ON THE OIL POLLUTION OF SEDIMENTS IN THE SETO INLAND SEA,
Hiroshima Univ. (Japan). Dept. of Fisheries.
H. Yamada, and M. Kayama.
Bulletin of he Nansei Regional Fisheries Research Laboratory, Vol 9, p 19-31, 1976. 12 fig, 1 tab, 12 ref.

Descriptors: *Oil, *Oil pollution, *Organic compounds, *Lipids, *Path of pollutants, *Sediments, Sampling, Seas, Stagnant water, Oil industry, Water quality, Environmental effects, Analytical techniques.
Identifiers: Alkanes, Pristane, Squalene, *Seto Inland Sea(Japan).

A relationship between lipid content and ignition loss was recognized in the Seto Inland Sea. Lipids as well as the organic compounds were accumulated in the sediments of stagnant areas. The n-alkanes/pristane and squalene ratio explained the contribution of petroleum oil in sediments. Lipids extracted from mud at the northern part of Osaka Bay, Harima Nada, Kii Suido and the southern part of Beppu Bay contained a larger proportion of petroleum hydrocarbons than those obtained from other areas. The path of oil pollutants was traced using the ratio in the Seto Inland Sea. (Klein)
W78-00571

FATE AND EFFECTS OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS AND ECOSYSTEMS.
For primary bibliographic entry see Field 5C.
W78-00572

OIL SPILLS IN THE ALASKAN COASTAL ZONE - THE STATISTICAL PICTURE,
Coast Guard, Washington, D.C.
J. R. Harrald, B. D. Boyd, and C. C. Bates.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 1-7, 1977. 8 tab, 12 ref.

Descriptors: *Data processing, *Data storage and retrieval, *Data collections, *Oil spills, *Oil pollution, *Alaska, Statistics, Oil industry, Disasters, Coasts, Organic compounds, Water pollution sources.
Identifiers: Pollution Incident Reporting System, *Crude oil.

A U.S. Coast Guard method for collecting data on oil spills, the 'Pollution Incident Reporting System,' was described. Data include: pollutant source; volume, location; type of material spilled; plus 9 other categories of information. The recent history of oil spills along the Alaskan coast and prediction of future trends due to the development of major oil fields were discussed. (See also W78-00572) (Katz)
W78-00573

HYDROCARBONS IN THE WATER COLUMN,
Alaska Univ., College. Inst. of Water Resources.
D. G. Shaw.
In: Fish and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 8-18, 1977. 4 fig, 2 tab, 52 ref.

Descriptors: *Oil pollution, *Oil-water interfaces, *Oily water, *Solubility, *Solutes, *Dispersion, *Saturation, *Water chemistry, *Molecular structure, *Colloids, *Particle size, *Particle shape, Water pollution sources.
Identifiers: *Tar, *Crude oil, Tar balls.

The molecular characteristics of the interaction of petroleum hydrocarbons and water was presented. The water solubility of various particle sizes, from individually solvated molecules to large tar balls, were examined. The common practice of using non-equilibrium, non-steady state systems in evaluating the effects of petroleum on marine biota was criticized. (See also W78-00572) (Katz)
W78-00574

DISPERSAL AND ALTERATION OF OIL DISCHARGED ON A WATER SURFACE,
Chevron Oil Field Research Co., La Habra, CA.
D. C. McAuliffe.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 19-35, 1977. 2 fig, 3 tab, 98 ref.

Descriptors: *Oil spills, *Oil pollution, Oil-water interfaces, *Oily water, *Dispersion, *Biodegradation, *Emulsions, *Solubility, Evaporation, *Oxidation, *Chemical degradations, Molecular structure, *Weathering, Chemical properties, Water pollution sources, Organic compounds.
Identifiers: *Chemical dispersants, *Crude oil.

The fate of oil discharged to a water surface was reviewed. The physical, chemical, and biological alterations it subsequently undergoes were discussed in reference to methods for minimizing the adverse environmental consequences. The use of chemical dispersants to produce oil-water emulsions, which dilute and degrade more rapidly than a slick, was presented as a promising method to lessen the effects of oil spills. (See also W78-00572) (Katz)
W78-00575

BIODEGRADATION OF AROMATIC PETROLEUM HYDROCARBONS,
Texas Univ. at Austin.
D. T. Gibson.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 36-46, 1977. 7 fig, 4 tab, 54 ref.

Descriptors: *Biodegradation, *Pseudomonas, *Aquatic bacteria, *Carbon cycle, *Photosynthesis, *Aromatic compounds, *Oxidation, *Molecular structure, *Oil spills, *Enzymes, *Sulfur compounds, *Sulfur, Bacteria, Organic compounds, Microorganisms, Chemical properties.
Identifiers: *Dihydrodiols, *Crude oil, Degradation pathways.

An overview of the degradation pathways of aromatic hydrocarbons by prokaryotic and eukaryotic organisms was presented. Table listing monocyclic and polycyclic aromatic compounds that are oxidized by bacteria and the specific organism responsible were provided. The paucity of information on the biodegradation of the aromatic hydrocarbons present in crude oil was also discussed. (See also W78-00572) (Katz)
W78-00576

BIOTRANSFORMATION OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS INDIGENOUS TO THE ARCTIC AND SUBARCTIC,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 47-59, 1977. 3 fig, 6 tab, 45 ref.

Descriptors: *Metabolism, *Enzymes, *Toxicity, *Invertebrates, *Biodegradation, *Aromatic compounds, *Plankton, *Fish physiology, *Oil spills, *Oil pollution, *Animal metabolism, Animal physiology, Biochemistry, Organic compounds, Radioactivity techniques.
Identifiers: *Carcinogens, *Mutagens, Tissue analysis, Bioaccumulation.

The metabolism of the aromatic hydrocarbon fraction of petroleum by marine organisms was evaluated. It was pointed out that studies on the effects of petroleum on marine organisms have centered on the parent hydrocarbons rather than the potentially toxic metabolites. The biochemical pathways used by various plankton, invertebrates and fish to metabolize aromatic hydrocarbons were discussed. Particular emphasis was directed toward metabolite alterations of enzyme systems, tissue locations of various metabolites, and possible mutagenic activity. (See also W78-00572) (Katz)
W78-00577

ACCUMULATION AND TURNOVER OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS,
Skidway Inst. of Oceanography, Savannah, GA.
R. F. Lee.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 60-70, 1977. 3 tab, 61 ref.

Descriptors: *Metabolism, *Oil pollution, Animal metabolism, *Zooplankton, *Crustaceans, *Mollusks, *Fish physiology, *Animal physiology, *Oil spills, *Aromatic compounds, *Bioindicators, Biochemistry, Organic compounds, Monitoring, Reviews.
Identifiers: Bioaccumulation, Tissue analysis, *Crude oil, Tar, Depuration.

This review deals with the uptake, storage and discharge of petroleum hydrocarbons by marine organisms under laboratory and field conditions. Organisms collected from oil spill and chronically polluted areas were analyzed. Special attention was directed toward the ability of animals to depurate their hydrocarbons accumulated after exposure to oil. Organisms studied were: benthic algae; zooplankton; benthic crustaceans; benthic worms; bivalves; and fish. Bivalves received emphasis because of the extensive amount of laboratory and field studies on their accumulation of petroleum. (See also W78-00572) (Katz)
W78-00578

FOOD CHAIN TRANSFER OF HYDROCARBONS,
Woods Hole Oceanographic Institution, MA.
J. M. Teal.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 71-77, 1977. 36 ref.

Descriptors: *Food webs, *Fish food organisms, *Chlorinated hydrocarbon pesticides, *Oil spills, *Oil pollution, *Absorption, *Fish physiology, *Food chains, *Animal metabolism, Water pollution effects, Path of pollutants, Metabolism, Ecosystems, Organic compounds.
Identifiers: *Food web transfer.

Routes for the uptake of petroleum hydrocarbons by aquatic organisms other than foodweb magnification were examined. The pathway emphasized was that of foodweb transfer. Methods of pollutant transport considered included: transport by migrating or surface-feeding fish; sinking of materials such as tar particles; and hydrocarbon concentration in fecal pellets. (See also W78-00572) (Katz)
W78-00579

ACCUMULATION OF NAPHTHALENES BY GRASS SHRIMP: EFFECTS ON RESPIRATION, HATCHING AND LARVAL GROWTH,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. E. Tatem.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 201-209, 1977. 4 fig, 25 ref.

Descriptors: *Shrimp, *Growth rates, *Growth stages, *Larvae, *Larval growth, *Oil pollution, *Oil spills, *Respiration, *Hatching, *Reproduction, *Animal growth, Aromatic compounds, Organic compounds, Water pollution effects.
Identifiers: *Palaemonetes, *Naphthalene, *Sublethal effects, Tissue analysis, Bioaccumulation, Depuration, No 2 fuel oil.

Estuarine grass shrimp, Palaemonetes pugio, were exposed in artificial seawater to petroleum hydrocarbons from a No. 2 fuel oil. Exposure water and organisms were sampled periodically for naphthalene concentrations. Naphthalene levels in the exposure solution decreased rapidly while concentrations in the shrimp tissue increased dramatically. After 6 hr, tissue levels of methylnaphthalene were 150 times greater than water levels. Depuration of hydrocarbons was rapid and began during the exposure period; however, complete depuration did not occur. Respiratory rates were transiently depressed following exposure. Naphthalenes were also demonstrated to suppress larval hatching success and larval growth. A single 72-hour exposure of gravid female shrimp to PH (1.44 ppm) had a detrimental effect on larval hatching. Control females released an average of 45 larvae compared to 9 larvae for exposed females. A concentration of 0.72 ppm PH did not have a significant effect on larval hatching. Grass shrimp larvae continuously exposed to PH (0.85-0.52 ppm) weighed significantly less than control animals after 12 days. Removal of larvae to clean seawater resulted in accelerated growth. Exposure of adult grass shrimp to sublethal levels of PH or naphthalenes initially resulted in increased activity and disoriented swimming patterns. Animals which survived exposures seemed to recover completely when placed in uncontaminated seawater. (See also W78-00572) (Katz)
W78-00593

BIOLOGICAL SURVEY OF INTERTIDAL AREAS IN THE STRAITS OF MAGELLEN IN JANUARY, 1975, FIVE MONTHS AFTER THE METULA OIL SPILL,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
D. Straughan.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems, D. A. Wolfe, Ed. Pergammon Press, p. 247-260, 1977. 2 fig, 7 tab, 23 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, *On-site data collections, *Mussels, *Mathematical studies, *Intertidal areas, *Sediments, *Mortality, *Beaches, *Biota, Plant populations, Animal populations, Organic compounds, Invertebrates.
Identifiers: *Crude oil, *Tissue analysis, Chocalate Mousse, Metula, Kuwait crude, Straits of Magellan.

Field sampling was conducted in areas in the Straits of Magellen that were oiled and unoiled by oil spilled from the tanker Metula in August 1974. Marsh plants had started to grow through oil in the oiled areas. High levels of petroleum hydrocarbons were recorded in mussels in the oiled areas. The presence of byssus threads alone suggested recent loss of mussels in part of the heavily oiled area. The Kuwait crude oil spilled in the Straits of Magellen is similar to that spilled from the Torrey Canyon. In both instances there was large scale mousse formation. It is suggested that it is this physical impact that is the most significant factor and not the cold water conditions. (See also W78-00572) (Katz)
W78-00598

STUDIES ON PETROLEUM BIODEGRADATION IN THE ARCTIC,
Louisville Univ., KY. Dept. of Biology.
R. M. Atlas.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 261-269, 1977. 1 fig, 6 tab, 6 ref.

Descriptors: *Biodegradation, Oil, *Oil pollution, *Oil spills, *Nitrogen, *Phosphorus, *Marine microorganisms, *Aromatic compounds, *Aquatic bacteria, *Marine bacteria, *Oxygen requirements, *Abiotic environment, *Microbial degradation, Organic compounds, *Arctic, Alaska, Cold regions.
Identifiers: *Crude oil, *Paraffins, Beaufort Sea, Chukchi.

Microorganisms capable of biodegrading petroleum were found to be widely distributed in the Beaufort and Chukchi Seas, but to constitute only a low percentage of the indigenous heterotrophic microbial populations. Concentration of hydrocarbon utilizing microorganisms were lower in ice than in water of sediment. Hydrocarbon biodegradation potential was also lower in ice than in water of sediments. Rates of biodegradation were found to be limited by temperature and concentrations of available nitrogen and phosphorus. Residual oil had similar percentages of hydrocarbon classes as fresh oil; biodegradation of all oil component classes, including paraffinic and aromatic fractions, apparently proceeded at similar rates. (See also W78-00572) (Katz)
W78-00599

ARCTIC HYDROCARBON BIODEGRADATION,
Alaska Univ., College.
S. D. Arhelger, B. R. Robertson, and D. K. Button.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 270-275, 1977. 2 fig, 4 tab, 16 ref.

Descriptors: *Oil, *Oil pollution, *Oil slicks, *Biodegradation, Aquatic populations, *Sea water, *Oxidation, *Microbial degradation, *Marine microorganisms, *Aquatic bacteria, *Carbon dioxide, *Metabolism, Population, Arctic, Alaska, Radioactivity techniques, Tracers, Arctic Ocean.
Identifiers: *Alkanes.

Supplemented sterile sea water was inoculated with small sample volumes of raw sea water and examined for oil related micorbial activity. A ubiquitous Alaskan water microbial population of 10 to the 3rd power to 10 to the 5th power/l was indicated. Population estimates were based on the smallest sample volume that, when diluted into a supplemental sea water medium, produced cultures that would generate colonies on agar plates, became turbid, formed ATP, or disrupted added oil slicks. (See also W78-00572) (Katz)
W78-00600

THE ACCUMULATION AND DEPURATION OF NO. 2 FUEL OIL BY THE SOFT SHELL CLAM, MYA ARENARIA L.,
Industrial Environmental Research Lab.-Cincinnati, Edison, NJ. Oil and Hazardous Materials Spills Branch.
D. Stainken.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 313-322, 1977. 5 fig, 2 tab, 29 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Clams, *Aromatic compounds, *Retention, *Commercial shellfish, *Winter, *Seasonal, *Solubility, *Emulsions, *Toxicity, *Animal physiology, Mass spectrophotometry, Organic compounds.
Identifiers: Mya, Bioaccumulation, Depuration, *Naphthalene.

Young soft shell clams were exposed to subacute concentrations of No. 2 fuel oil-in-water emulsions under simulated winter (4C) spill conditions. A pattern of accumulation and discharge of petroleum constituents, an experimental depuration time and a potential transport mechanism of aromatic compounds from the fuel oil to the clams were experimentally determined. Clams accumulated the greatest amount of hydrocarbons within one week after the initial exposure. The accumulated hydrocarbons decreased each week as the hydrocarbon content of the water decreased. The depuration period was determined when the clams were transferred to an uncontaminated system for 14 days subsequent to the 28 day oil exposure. Accumulated hydrocarbons were rapidly, although

incompletely discharged. (See also W78-00572) (Katz)
W78-00604

THE FATE OF PETROLEUM HYDROCARBONS FROM A NO. 2 FUEL OIL SPILL IN A SEMINATURAL ESTUARINE ENVIRONMENT,
Virginia Inst. of Marine Science, Cloucester Point.
R. H. Bieri, and V. C. Stamoudis.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 332-344, 1977. 2 fig, 4 tab, 24 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Clams, *Oysters, *Estuaries, *Estuarine environment, *Aromatic compounds, *Absorbtion, *Gas chromatography, Sediment-water interfaces, *Biodegradation, *Toxicity, *Mortality, *Animal physiology, *Animal metabolism, Organic compounds.
Identifiers: *Alkanes, Depuration, *Aliphatic compounds, Bioaccumulation.

Oysters, Crassostrea virginica, and clams, Mercenaria mercenaria, were exposed to surface spills of No. 2 fuel oil in an esturaine area under seminatural conditions. The results showed that accomodated petroleum hydrocarbons in water reach their maximum concentration a few hours after the spills and then disperse very rapidly. Most hydrocarbons were below detection 25 hours after the spills. In oysters, while substantial hydrocarbon concentrations were present within 6 hours after the spill, uptake continued in some cases past 100 hours for both branched aliphatic and aromatic hydrocarbons, and appeared to be related to molecular weight. Clams acquired hydrocarbons at much lower concentrations than oysters. (See also W78-00572) (Katz)
W78-00606

EVAPORATION AND SOLUTION OF C2 TO C10 HYDROCARBONS FROM CRUDE OILS ON THE SEA SURFACE,
Chevron Oil Field Research Co., La Habra, CA.
C. D. McAuliffe.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 363-372, 1977. 1 fig, 7 tab, 11 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Evaporation, Air-water interfaces, *Solubility, *Aqueous solutions, *Vapor pressure, *Aromatic compounds, *Dispersion, Organic compounds, Sea water, On-site investigation.
Identifiers: *Crude oil, *Oil slicks, *Alkanes, *C2-C10 hydrocarbons.

Evaporation and solution of C2 to C10 hydrocarbons were measured from four ocean spills of two crude oils. Loss rates for these light hydrocarbons were in accordance with their vapor pressures. Oil discharged on a water surface is a nonequilibrium condition with respect to evaporation and solution. Hydrocarbons should dissolve from an oil slick in amounts related to their mole fractions in oil, and inversely proportional to their molecular weights. This was not observed, indicating that dissolved hydrocarbons quickly evaporated from the near-surface waters. These studies indicate that solution of hydrocarbons into the water column from crude oil slicks, followed by evaporation, resulted in immeasurably low concentrations of dissolved C2 to C10 hydrocarbons 15 minutes after each spill. (See also W78-00572) (Katz)
W78-00608

INPUT OF LOW-MOLECULAR WEIGHT HYDROCARBONS FROM PETROLEUM OPERATIONS INTO THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. M. Brooks, B. B. Bernard, and W. M. Sackett.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 373-384, 1977. 8 fig, 5 tab, 19 ref.

Descriptors: Oil, *Oil pollution, *Methane, *Propane, *Gulf of Mexico, *Offshore platforms, *Drilling, *Aromatic compounds, *Primary productivity, *Brines, *Toxicity, Water pollution sources, Organic compounds, Gas chromatography.
Identifiers: *Ethane, *Butane, *Aliphatic compounds, C1-C14 Hydrocarbons.

Dissolved C1 to C14 hydrocarbon patterns measured during the last 6 years in the Gulf of Mexico indicate that underwater venting of waste gases and brine discharges, both associated with offshore platforms, are the major sources of nonmethane light hydrocarbons to upper Gulf coastal waters. These sources are apparently responsible for the two orders of magnitude increase in Louisiana Shelf waters over open ocean levels of the light hydrocarbons. Analyses of the hydrocarbons composition of vented gases and brines and estimates of their annual discharge rates indicate that up to 450 metric tons of C5 to C10 hydrocarbons are being added to Louisiana Shelf waters each year. (See also W78-00572) (Katz)
W78-00610

THE STABILITY OF EMULSIFIED CRUDE OILS AS AFFECTED BY SUSPENDED PARTICLES,
Delaware Univ., Newark. Dept. of Civil Engineering.
C. P. Huang, and H. A. Elliott.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 413-420, 1977. 11 fig, 2 tab, 15 ref.

Descriptors: Oil, *Oil pollution, *Suspended solids, *Suspension, *Emulsions, *Oil spills, *Colloids, *Electrochemistry, *Electrical properties, Oil-water interfaces, Organic compounds, Aquatic habitats.
Identifiers: *Crude oil, *Charged particles, Nigerian crude oil, Venezuelan crude oil, Iranian crude oil.

Interaction between emulsified crude oil and naturally occurring suspended solids, such as oxides, hydroxides, carbonates, and clays can significantly affect emulsion stability, and thereby govern the distribution and the toxicity potential of oily pollutants in the aquatic environment. The stability of three crude oil emulsions, viz., Nigerian, Venezuelan and Iranian, was studied in response to various types and concentrations of suspended solids, viz., A12O3, Si02, and kaolinite. Interfacial reactions between emulsion and solid were influenced by the physical and chemical properties of both kinds of particles involved as well as the chemical characteristics of the aqueous phase. (See also W78-00572) (Katz)
W78-00614

CHEMICAL CARCINOGENS IN THE MARINE ENVIRONMENT BENZO(A)PYRENE IN ECONOMICALLY IMPORTANT BIVALVE MOLLUSKS FROM OREGON ESTUARIES,
Oregon State Univ., Corvallis. Dept. of General Science.
M. C. Mix, R. T. Riley, K. I. King, S. R. Trenholm, and R. L. Schaffer.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 421-431, 1977. 6 fig, 2 tab, 32 ref.

Descriptors: *Aromatic compounds, *Estuaries, *Estuarine environment, Commercial shellfish, *Mollusks, *Clams, *Mussels, *Oysters, Oil, *Oil pollution, *Oil spills, Organic compounds, *Oregon, Monitoring.
Identifiers: *Carcinogens, *Benzo(a)pyrene, Tissue analysis.

Levels of carciongenic polycyclic aromatic hydrocarbons present in bivalve mollusks from Oregon's estuaries were studied. Because of many unique features in their life history and biology, indigenous shellfish were found to be useful for monitoring the marine environment. Detectable levels of benzo(a)pyrene were found in commercially important shellfish from 38 of 44 sampling sites in five Oregon Bays. (See also W78-00572) (Katz)
W78-00615

DISTRIBUTION OF PETROLEUM HYDROCARBONS IN WESTERNPORT BAY (AUSTRALIA): RESULTS OF CHRONIC LOW LEVEL INPUTS,
Victoria Ministry for Conservation, Melbourne (Australia).
K. A. Burns, and J. L. Smith.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 442-453, 1977. 3 fig, 3 tab, 32 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Mussels, *Bioindicators, *Industrial wastes, *Toxicity, Coasts, *Sediments, *Aromatic compounds, Animal physiology, Organic compounds, Water pollution sources, Chemical analysis, *Australia.
Identifiers: Bioaccumulation, Tissue analysis, Westernport Bay(Australia).

A study of hydrocarbons in Westernport Bay was undertaken to assess the impact of the chronic low level input associated with man's use of the environment even in the absence of major oil spills. Aims of this project are (1) to measure amount of background hydrocarbon pollution associated with present land development, (2) to identify sources and levels of inputs, (3) to measure hydrocarbon accumulation from chronic input, (4) to gain a detailed picture of the partitioning of hydrocarbons in this environment which includes measurements of hydrocarbons in the water column, sediments and selected organism, and (5) to assess the impact of chronic petroleum discharge on the structure and productivity of the ecosystem. The mussel, Mytilus edulis, was the major indicator species used to establish problem areas and probable sources of petroleum input. (See also W78-00572) (Katz)
W78-00617

WATER QUALITY MODELING OF A HIGH MOUNTAIN STREAM,
California Univ., Los Angeles. Office of Environmental Science and Engineering.
J. D. White, and J. A. Dracup.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2179-2189, October 1977. 7 fig, 5 tab, 8 ref.

Descriptors: *Water quality, *Simulation analysis, *Streams, *Computer models, Dissolved oxygen, Dissolved solids, Nutrients, Reach(Streams), Mathematical models, Systems analysis.
Identifiers: Fecal coliforms, Rainstorms.

A water quality simulation model, DOSAG II, was chosen to simulate water quality parameters on a section of Middle Fork Bishop Creek between the elevations of 3,050 and 2,400 m (10,000 ft and 8,000 ft) above mean sea level. The computer model was calibrated for this stream and in general for other mountainous streams at similar elevations. The model predicted water quality conditions that should exist in the study area. A comparison with observed data indicated the existence of undefined non-point sources along the lower reaches of the stream. In particular, total dissolved solids and nutrient levels increased near a resort. Dissolved oxygen levels remained at or slightly above the saturation point. Fecal coliform concen-

trations were found to be related to the incidence of rainstorms in the study area. (Bell-Cornell)
W78-00623

A COMPUTER PROGRAM FOR MODELING OF WATER QUALITY PARAMETERS IN STEADY STATE MULTI-DIMENSIONAL NATURAL AQUATIC SYSTEMS, (SECOND EDITION),
Environmental Protection Agency, New York. Data Systems Branch.
S. C. Chapra, and G. A. Nossa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 372, Price codes: A06 in paper copy, A01 in microfiche. Final Report, October 1974. 102 p, 2 tab, 15 fig, 12 ref.

Descriptors: *Water quality standards, *Mathematical models, *Computer models, *Computer programs, Simulation analysis, Kinetics, Biochemical oxygen demand, Dissolved oxygen, Nutrients, Equations.
Identifiers: *Natural aquatic systems.

HARO3 is a computer program which can be used to model the steady-state distribution of water quality variables for multi-dimensional bodies of water. The technique underlying the program is based on the conservation of mass and up to two variables reacting in a feed forward fashion with first order kinetics may be modeled. This program was developed for analysis of the Biochemical Oxygen Demand (BOD) - Dissolved Oxygen system, but with minor modifications the program can be used to model analogous variables such as chlorides, phosphates, coliform bacteria, etc. HARO3 has been compiled in three versions. The first version handles a system of up to 50 segments and is designated HAR50; similarly HAR100 and HAR200 handle a maximum of 100 and 200 segments correspondingly. The only difference between these versions is in the size of the arrays defined in the programs. (See also W78-00633) (Bell-Cornell)
W78-00632

SNSIM1/2 'A COMPUTER PROGRAM FOR THE STEADY-STATE WATER QUALITY SIMULATION OF A STREAM NETWORK,'
Environmental Protection Agency, New York. Data Systems Branch.
R. E. Braster, S. C. Chapra, and G. A. Nossa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 923, Price codes: A04 in paper copy, A01 in microfiche. Final Report, February 1975. 52 p, 5 fig, 2 tab, 9 ref, 2 appen.

Descriptors: *Computer programs, *Computer models, *Simulation analysis, *Streams, *Networks, *Water quality, Dissolved oxygen, Biochemical oxygen demand, Evaluation, Rivers, Tributaries, Environmental control, Effects, Reach(Streams), Kinetics, Equations, Mathematical models, Systems analysis.
Identifiers: *Streeter-Phelps equation, Prediction.

Described is the SNSIM computer program which can be used to formulate a steady-state, one-dimensional simulation model of a stream network. Based on an expanded form of the Streeter-Phelps equation, SNSIM is designed to evaluate and/or predict the dissolved oxygen (DO) and the carbonaceous and nitrogenous BOD profiles in a river or stream where the effects of dispersion can be assumed to be insignificant. The stream network consists of a river and its tributaries which are segmented into sections of constant hydrologic, physical, chemical and biological parameters. Loads may be applied pointwise at the ends of the section or as distributed sources along its length. As well, point sources of both BOD and DO deficit from minor tributaries can be input at the ends of a section and background loads of BOD and DO deficit can be introduced at the system's upstream ends. The expanded Streeter-Phelps equation is then applied to each section to determine the CBOD, NBOD and DO deficit response to the loadings. Mass balances are applied at the junction of sections. Provided herein is a description of the program as well as its input. (See also W78-00632) (Bell-Cornell)
W78-00633

TIME AND SPACE VARIATION IN THE SURFICIAL SEDIMENTS OF THE NEW YORK BIGHT APEX,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W78-00684

QUALITY OF WATER DISCHARGED FROM THREE SMALL AGRONOMIC WATERSHEDS IN THE MAUMEE RIVER BASIN,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
L. A. Jones, N. E. Smeck, and L. P. Wilding.
Journal of Environmental Quality, Vol. 6, No. 3, p 296-302, July-September 1977. 1 fig, 5 tab, 17 ref.

Descriptors: *Sediments, *Lake Erie, *Water pollution sources, *Water quality, *Agricultural runoff, *Soil analysis, Geology, Glacial drift, Analytical techniques, Sediment transport, Particle size, Water pollution, *Agricultural watersheds, Calcium, Magnesium, Sodium, Potassium, Soil chemistry, Lakes, Ohio.
Identifiers: *Sediment mineralogy, *Stream pollution, *Maumee River Basin(Ohio), Sediment particle size, Glacial till soils.

The investigation was aimed at evaluating the quality of water and the characteristics of sediments leaving 3 nearly level watersheds in the Lake Plain sector of the Maumee River Basin during a 32-month period as a function of soils comprising the watersheds. Each watershed consisted of a soil of major extent (Paulding, Hoytville, or Millgrove) developed from the 3 most extensive geologic deposits present in the basin: lacustrine, glacial till, and beach sand, respectively. The results indicated that water quality is a function of soil characteristics, discharge, and year. The fine-textured Paulding watershed yielded lower concentrations of calcium, magnesium, and bicarbonate ions than the other 2 watersheds, but higher concentrations of sodium, potassium, and phosphorus. High concentrations of the latter 3 elements were attributed to the presence of septic tank effluent in the drainage ditch sampled. The Paulding watershed also yielded the highest concentration of sediment, which implies that nearly level watersheds of the basin, particularly fine-textured watersheds, may represent significant contributors of sediment entering the Maumee River. Flocculation of clay minerals in the sediments during fluvial transport resulted in increasing particle size and changing mineralogy on moving downstream from headwater areas. (Henley-ISWS)
W78-00688

SOLUBLE AND SEDIMENT NITROGEN LOSSES AS RELATED TO LAND USE AND TYPE OF SOIL IN EASTERN CANADA,
Macdonald Coll., Ste Anne de Bellevue (Quebec). Dept. of Renewable Resources.
G. H. Neilsen, and A. F. MacKenzie.
Journal of Environmental Quality, Vol. 6, No. 3, p 318-321, July-September 1977. 2 fig, 4 tab, 25 ref.

Descriptors: *Agricultural runoff, *Nitrogen compounds, *Sediments, *Runoff, *Agricultural watersheds, Water quality, Leaching, Water pollution sources, Nitrates, Nutrients, Pollutants, Water analysis, Water chemistry, Nitrites, Nitrogen, Analytical techniques, Soil analysis, Water analysis, *Canada.
Identifiers: *Agricultural drainage, Discharge rates, Stream pollution.

In order to assess the amounts and types of nitrogen lost in agricultural drainage, 7 agricultural watersheds, with a range of land use patterns and types of soil in southwestern Quebec and southeastern Ontario, were selected, and measurements of discharge rates, soluble inorganic nitrogen, and sediment Kjeldahl nitrogen were made during 1974-75. Correlations of the losses with land use and kind of soil were used to identify critical watershed factors affecting nitrogen loss. Soluble inorganic N concentrations in streams did not exceed 3.5 micrograms/ml. No watershed lost more than 5 kg/ha soluble N, except for the watershed with the maximum corn acreage (33%), which lost 22.8 kg N/ha per year. The pronounced significance of spring melt runoff was demonstrated by the movement of from 56 to 100% of annual soluble N from the monitored watersheds during March, April, and May. Sediment was a major transporter of N in the area, moving from 22 to 67% of total watershed N. Watersheds with greater corn acreage and relatively impermeable soils lost more soluble N, while watersheds with more organic soils and greater cultivated area lost more sediment N. (Henley-ISWS)
W78-00689

THE VELUWE ARTIFICIAL RECHARGE PLAN WATER QUALITY ASPECTS,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 5G.
W78-00690

DESIGN OF TREND MONITORING NETWORKS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5A.
W78-00695

SOME EFFECTS OF DUSTFALL ON URBAN STORMWATER QUALITY,
Enviro-Measure, Inc., Knoxville, TN.
For primary bibliographic entry see Field 5A.
W78-00697

1975 ANNUAL REPORT.
National Oceanic and Atmospheric Administration, Oak Ridge, Air Resources Atmospheric Turbulence and Diffusion Laboratory, TN.
For primary bibliographic entry see Field 5A.
W78-00721

SUMMARY OF ACTIVITIES AND PLANS-FY 1976-1977,
National Oceanic and Atmospheric Administration, Oak Ridge, TN. Air Resources Atmospheric Turbulence and Diffusion Lab.
For primary bibliographic entry see Field 5A.
W78-00722

AQUATIC TRANSPORT OF HEAVY METALS IN THE URBAN ENVIRONMENT,
Rutgers Univ., New Brunswick, NJ. Dept. of Environmental Sciences.
W. G. Wilber, and J. V. Hunter.
Water Resources Bulletin, Vol 13, No 4, p 721-734, August 1977. 2 fig, 9 tab, 18 ref. OWRT A-050-NJ(1).

Descriptors: *Heavy metals, *Urban runoff, *Sediments, *New Jersey, On-site investigations, Data processing, Water pollution, Pollutants, Path of pollutants, Storm runoff, Precipitation(Atmospheric), Storm water, Chemical analysis, Rivers, Drainage, Urbanization.
Identifiers: *Lodi(NJ), *Saddle River(NJ).

A study was conducted for the past 2 years on a 4.6 mile stretch of the Saddle River near Lodi, New Jersey. The primary objectives of the study were twofold: initially, the amounts of various heavy metals being contributed to the Saddle River by stormwater runoff, rainfall, and individual tributaries, etc., were investigated to better delineate the distribution of various sources of heavy metals to the aquatic environment. Secondly, a series of benthal deposits from the Saddle River were analyzed to determine the fate of the metals once introduced into the receiving stream. A mass balance analysis of heavy metals in the Saddle River was performed to determine the amount of materials contributed from unrecorded sources. The results of the study seemed to demonstrate the importance of considering the potential scouring of river sediments as a secondary source of metals in determinations of this type. The distribution of metals in precipitation samples collected in the study was found to be similar to that in runoff, with lead and zinc predominating. Relative concentrations of metals in precipitation as compared to those of stormwater were relatively insignificant. Metal concentrations of bottom sediments were found to vary considerably from sample to sample. (Sims-ISWS)
W78-00742

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5C.
W78-00751

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME I: EXECUTIVE SUMMARY,
American Public Works Association, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-00752

GROUND-WATER RESOURCES OF THE ALLUVIAL AQUIFERS IN NORTHEASTERN LARIMER COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00811

DISTRIBUTION OF INJECTED WASTEWATER IN THE SALINE LAVA AQUIFER, WAILUKU-KAHULUI WASTEWATER TREATMENT FACILITY, KAHULUI, MAUI, HAWAII,
Geological Survey, Menlo Park, CA. Water Resources Div.; Geological Survey, Reston VA.; and Geological Survey, Tallahassee, FL. Water Resources Div.
W. L. Burnham, S. P. Larson, and H. H. Cooper, Jr.
Open-file report 77-469, June 1977. 58 p, 14 fig, 2 tab, 12 ref.

Descriptors: *Waste water disposal, *Injection wells, *Path of pollutants, *Aquifer characteristics, *Hawaii, Saline water systems, Groundwater movement.
Identifiers: *Saline lava aquifer, Maui(Hawaii).

Field studies and digital modeling of a lava rock aquifer system near Kahului, Maui, Hawaii, describe the distribution of planned injected wastewater from a secondary treatment facility. The aquifer contains water that is almost as saline as seawater. The saline water is below a seaward-discharging freshwater lens, and separated from it by a transition zone of varying salinity. Injection of wastewater at an average rate of 6.2 cubic feet per second is planned through wells open only to the aquifer deep within the saline water zone. The lava rock aquifer is overlain by a sequence of residual soil, clay, coral reef deposits, and marine sand that form a low-permeability caprock which semiconfines the lava rock aquifer. Under conditions measured and assumed without significant change. After reaching a new steady state, the wastewater will discharge into and through the caprock sequence within an area measuring approximately 1,000 feet inland, 1,000 feet laterally on either side of the injection site, and about 2,000 feet seaward. Little, if any, of the injected wastewater may be expected to reach the upper part of the caprock flow system landward of the treatment plant facility. (Woodard-USGS)
W78-00814

A TECHNIQUE FOR MEASURING INDUSTRIAL WASTE DISPERSION RESULTING FROM OCEAN DUMPING,
EG and G Environmental Consultants, Waltham, MA.
D. Frye, G. Williams, and A. Davison.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 33A-1 - 33A-5, 1977. 5 fig, 10 ref.

Descriptors: *Dispersion, *Industrial wastes, *Waste disposal, *Fluorescence, *Water pollution sources, Measurement, Environmental effects, Baseline studies, Fluroescent dye, Path of pollutants.
Identifiers: *Outer Continental Shelf, Ocean dumping.

A measurement technique for collecting detailed information on the dispersion of industrial wastes discharged at sea has been developed and utilized on two studies off the U.S. East Coast. This technique employs a towed hose array capable of drawing water continuously from four depths as a survey vessel moves through a waste plume. In-line instrumentation automatically records seawater pH and fluorescence, a measure of waste concentration when fluorescent dye has been used to tag the waste. Sampling ports in the hose array can be used to collect discrete seawater samples in cases where the waste has not been tagged with dye, or for additional chemical analyses. Basic and acid wastes have been studied using this technique for periods up to 12 hours after discharge. Comprehensive data on short-term oceanic dispersion have resulted. In the two studies both continuous waste concentration measurements and discrete sampling techniques were used. Well-defined waste plumes were observed with a highly variable nature immediately after dujp with a much more regular distribution observed after several hours. The waste was limited vertically by the presence of a thermocline at about the 20-meter depth. (See also W78-00827) (Sinha-OEIS)
W78-00832

EFFECTS OF PRODUCED WATERS ON THE MARINE ENVIRONMENT,
Shell Development Co., Houston, TX; and Exxon Production Research Co., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-00834

FATE OF PETROLEUM HYDROCARBONS IN MARINE ANIMALS,
Skidaway Inst. of Oceanography, Savannah, GA.
R. F. Lee.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 40C-1 - 40C-4, 1977. 2 fig, 29 ref.

Descriptors: *Water pollution, *Aromatic compounds, *Monitoring, *Aquatic animals, Oil pollution, Crabs, Worms, Fishes, Clams, Mussels.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, Detoxification, Metabolic pathways.

The concentration of hydrocarbons in marine animals exposed to oil reflects the relative importance of uptake, metabolism, storage and discharge. Crabs, worms and fish have a detoxification system in the liver or intestinal tract which degrades aromatic hydrocarbons to hydroxylated derivatives. Compared with the parent hydrocarbon, hydroxylated derivatives are more water-soluble and are released by the animals. Thus metabolic pathways help to reduce the level of hydrocarbon in the animal. The process is sometimes referred to as a detoxification mechanisms. Third generation worms chronically exposed to oil are resistant to oil, presumably because they contain high levels of hydrocarbon degrading enzymes. Bivalves, including clams, oysters and mussels, do not possess this enzyme system and tend to accumulate hydrocarbons to a greater extent than other marine animals. Because of this fact it has been suggested that they can be used to monitor ocean waters for petroleum pollution. (See also W78-00827) (Sinha-OEIS)
W78-00835

WEATHERING OF SPILLED OIL AND METHODS OF ACCELERATING,
Chevron Oil Field Research Co., La Habra, CA.
C. D. McAuliffe.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 40D-1 - 40D-10, 1977. 1 fig, 5 tab, 90 ref.

Descriptors: *Oil spills, *Weathering, *Dispersion, *Water pollution, *Environmental effects, Evaporation, Sedimentation.
Identifiers: *Outer Continental Shelf, Chemical dispersion, Spreading, Depuration.

Oil spilled on water undergoes alteration by physical, chemical, and biological processes. Rapid physical processes include spreading, movement with winds and water currents, evaporation of volatile components, solution, water-in-oil emulsification, dispersion as small droplets into water, spray injection into the air, and sedimentation. As the oil spreads, less rapid biological and photochemical processes start. Low-molecular-weight hydrocarbons rapidly evaporate, and the very small amounts of these that dissolve quickly evaporate from near-surface waters. Chemical dispersants can be used to change an oil slick into a dilute oil-in-water emulsion. Dispersed oil does not travel as far as in a slick, and shorelines are less threatened. Weathering processes of dispersed oil are accelerated, oil toxicity is more quickly reduced, and most of the known adverse effects from oil spills are lessened or eliminated. This paper reviews the weathering and documented temporary effects of oil spills, and summarizes the advantages of chemically dispersing oil slicks. (See also W78-00827) (Sinha-OEIS)
W78-00836

PRACTICAL APPLICATIONS OF FLOATING BREAKWATERS FOR SMALL CRAFT HARBORS,
Alaska Div. of Water and Harbors, Junean.
For primary bibliographic entry see Field 8B.
W78-00855

SEA ICE THICKNESS PROFILING AND UNDER-ICE OIL ENTRAPMENT,
Cold Regions Research and Engineering Lab., Fairbanks, AK.
For primary bibliographic entry see Field 5G.
W78-00861

CHEMISTRY OF MARINE PETROLEUM SEEPS IN RELATION TO EXPLORATION AND POLLUTION,
I. R. Kaplan, and W. E. Reed.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 3 (of 4), p 425-434, OTC 2933, 1977. 6 fig, 6 tab, 53 ref.

Descriptors: *Seepage, *Oil pollution, *Water pollution sources, *Oil spills, *Resources development, *Weathering, Chemical analysis, Exploration, Baseline studies, Sediments, California.
Identifiers: *Outer Continental Shelf, Natural seepage, Hydrocarbons, Crude oil.

Natural oil seepage contributes approximately 10% of the annual input of petroleum hydrocarbons to the marine environment and half of that arises from the continental shelves of the circum-Pacific. Chemical properties of submarine petroleum seeps off the Southern California borderland have been studied in relation to crude oil produced in the same geographic area, the compositional changes due to weathering in the marine environment, and the hydrocarbon and trace-element compositions of the surrounding sea water and adjacent sediments. This investigation has been undertaken to determine whether the hydrocarbon compositions of sea water or surface sediments reflect the composition of nearby seepage and can be used to identify previously unknown petroleum sources to resolve problems of pollution and to aid in exploration. (Sinha-OEIS)
W78-00864

NATURAL OIL SEEP DETECTION IN MARINE ENVIRONMENTS,
J. A. Eyer, J. E. Foreman, and G. L. Raney.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 325-330, OTC 2765, 1977. 3 fig, 7 ref.

Descriptors: *Seepage, *Oil pollution, *Water quality control, *Water pollution sources, Monitoring.
Identifiers: *Outer continental shelf, Pollution detection, Natural seepage.

The objective of this project was to determine the feasibility of detecting natural hydrocarbon seeps in the marine environment. In hostile environments, such as the Bering Sea, Beaufort Sea, Baffin Bay, Gulf of Alaska, and the North American East Coast (offshore), areas containing seeps could be upgraded providing all other exploration criteria were met. The natural oil seep detection mission was flown by NASA on July 30, 1974. The second mission was flown on Nov. 22, 1974, over the same area in the Gulf of Mexico. A combination of electronic and photographic data gathering systems was used. In this particular case the occurrence of natural hydrocarbon seeps can be directly correlated to geologic parameters that have ben documented by seismic work and subsequent drilling. It is of interest to note that the seeps that were active prior to drilling are still active after drilling. This is probably because the reservoirs containing the hydrocarbons were not produced and subsurface pressures were not significantly lowered because of hydrocarbon production. LANDSAT and SKYLAB imagery was searched in an attempt to correlate the aircraft data with space acquired imagery but without success. (Sinha-OEIS)
W78-00865

MERCURIC CHLORIDE UPTAKE BY EGGS OF THE RICEFISH AND RESULTING TERATOGENIC EFFECTS,
South Dakota Univ. Vermillion. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-00885

PENTACHLOROPHENOL DISTRIBUTION IN A FRESH WATER ECOSYSTEM,
University of Southern Mississippi, Hattiesburg. Inst. of Environmental Science.
R. H. Pierce, Jr., C. R. Brent, H. P. Williams, and S. G. Reeves.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 2, p. 251-258, 1977. 2 tab, 26 ref.

Descriptors: Pesticides, *Pesticide residues, *Pesticide Kinetics, *Wood preservatives(Pesticides), *Industrial wastes, Industrial water, *Bottoms sediments, Bottom sampling, *Wood wastes, Water pollution sources, Fishkill, Benthic fauna, Fungicides.
Identifiers: Tissue analysis, Bioaccumulation, *Pentachlorophenol, Chlorinated compounds.

The effects of an industrial waste overflow into a small creek were examined. A nearby lake sustained a fishkill from the waste water, which contrained PCP. Seventeen months after the spill PCP was found to persist in leaf litter and bottom sediments (up to 1,200 ppb). This persistence provides a potential for continuous contamination of the water column and biological magnification via detritus- and benthic-feeding organisms. (Katz)
W78-00886

RESIDUES OF CHLORINATED HYDROCARBONS IN COD LIVERS FROM THE KIEL BIGHT IN RELATION TO SOME BIOLOGICAL PARAMETERS,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
For primary bibliographic entry see Field 5A.
W78-00891

ACCLIMATION OF FATHEAD MINNOWS AND LAKE TROUT TO RESIDUAL CHLORIDE AND BROMINE CHLORINE,
Grand Valley State Coll., Avendale, MI.
G. M. DeGraeve, and R. W. Ward.
Journal Water Pollution Control Federation, Vol 39, p 2172-2177, 1977. 3 tab, 17 ref.

Descriptors: *Minnows, *Chlorine, *Trout, *Bromine, *Halides, *Chlorination, *Toxicity, *Lake trout, Water quality, Laboratory tests, Resistance, Effluents, Mortality, Lethal limit, Wastes, Disinfection, Water treatment, Waste water treatment.
Identifiers: *Fathead minnow, Tolerance, *Chlorobrominated effluent.

Fathead minnows and lake trout with previous exposure (longer than 2 hours) to chlorinated or chlorobrominated effluent respectively were capable of tolerating high levels of TRC or TRBC (total residual chlorine; total residual bromine chlorine) for longer periods of time than fish that were not previously exposed to either halogen. For fathead minnows there was a linear relationship between duration of previous exposure and tolerance to residual halogen levels in excess of 96-hour TL50 values. The acclimation of fathead minnows to TRC was most apparent after 4 or more hours of exposure to low TRC concentrations. Even after long-term exposure to sublethal levels of TRC in effluent, fathead minnows were not able to survive high TRC concentrations. (Klein)
W78-00892

THE EFFECTS OF MINE ACID ON THE POND RIVER WATERSHED IN WESTERN KENTUCKY,
Western Kentucky Univ., Bowling Green.
For primary bibliographic entry see Field 5C.
W78-00894

ALDRIN AND DIELDRIN UPTAKE IN INSECTICIDE-RESISTANT AND SUSCEPTIBLE MOSQUITOFISH (GAMBUSIA AFFINIS),
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-00896

THE BEHAVIOUR OF MERCURY IN THE SYSTEM WATER - FISH,
Technische Hochschule, Darmstadt (West Germany). Fachbereich fuer Anorganische Chemie und Kernchemie.
J. H. Kramer, and B. Neidhart.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 6, p 699-704, 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Mercury, *Tracers, *Radiochemical analysis, *Tagging, Path of pollutants, Metals, Toxicity, Analytical techniques, Organic compounds, Lipids, Lethal limit, Water pollution effects.
Identifiers: Bioaccumulation, *Methylmercury compounds, Organic mercury, Inorganic mercury, Poecilia reticulata, Guppies.

The direct take (Excluding the food chain) of different dissolved mercury compounds by female Poecilia reticulata was studied. Using radiochemical tracers the authors investigated: (1) accumulation rates as a function of the chemical form of the dissolved Hg compounds; (2) accumulation rates as a function of the Hg concentration in the water; and, (3) the release of incorporated Hg in deionized water as a function of the Hg compound and the incorporation time. It was proposed that, in the case of the complex compounds, the complexing groups may have a screening effect, so that adsorption at the surface of the cells is insignificant or non-existent. This was supported by the finding of a direct relationship between free Hg in the water and rate of accumulation. The release of inorganic Hg was found to be about 17 times as fast as the releadse of incorporated methyl-HgCl. (Katz)
W78-00898

EPIBENTHIC INVERTEBRATES OF CROTON BAY IN THE HUDSON RIVER,
Boyce Thompson Inst. For Plant Research, Inc., Yonkers, NY.
M. E. Crandall.
New York Fish and Game Journal, Vol. 24, No. 2, p 178-186, 1977. 3 fig, 3 tab, 7 ref.

Descriptors: *Invertebrates, *Benthic fauna, *Hudson River, *Estuarine environment, *On-site data collections, *Landfills, Research equipment, Animal groupings, Aquatic life, Benthos, Amphipoda, Diptera, Isopods, Gastropods, Mussels, Equipment, On-site-investigation, Methodology, New York.
Identifiers: *Mason traps, Decapods, Polychaetes, Barnacles, Croton Bay(Hudson River).

An 8-month survey of the epibenthic fauna of Croton Bay in the Hudson River (NY) was conducted. Modified Mason traps were efficient in sampling many highly mobile or sessile organisms that are difficult to capture with conventional gear. Organisms of at least 39 genera were taken including four amphipids, two isopods, two decapods, a complex of chironomids, three gastropods and several polychaetes. In addition, the setting patterns of the barnacle, Balanus improvisus, and the mussel, Congeria leucophaetea, are described. The benthic organisms collected from Croton Bay were representative of the fauna present in similar habitats of a large portion of the Tappan Zee and Haverstraw Bay which is typically estuarine. The results of this study indicate that there is little stress imposed of the epibenthic community by the Croton Point landfill. (Katz)
W78-00899

5C. Effects Of Pollution

THE FLAX POND ECOSYSTEM STUDY: EXCHANGES OF CARBON IN WATER BETWEEN A SALT MARSH AND LONG ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5B.
W78-00539

THE DISTRIBUTION OF DIATOMS IN MISSISSIPPI SALT MARSHES,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-00555

STUDIES ON THE OIL POLLUTION OF SEDIMENTS IN THE SETO INLAND SEA,
Hiroshima Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W78-00571

FATE AND EFFECTS OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS AND ECOSYSTEMS.
Pergamon Press, 1977. 478 p, Proceedings of a Symposium, Nov 10-12, 1976, Seattle, Wash. Edited by D.A. Wolfe and others.

Descriptors: *Oil wastes, *Oil pollution, *Oil spills, *Conferences, Marine algae, Marine animals, *Marine biology, Marine fish, Marine plants, *Aromatic compounds, *Phenols, *Bioassay, *Sea water, *Toxicity, *Mortality, Aquatic environment, *Habitats, Water pollution effects, Water pollution sources, *Path of pollutants, Organic compounds, Chemical analysis, Analytical techniques.
Identifiers: *Crude oil, Tissue analysis, Bioaccumulation, Napthalene, Aliphatic compounds.

This volume presents most of the papers which were presented November 10-12, 1976 at an international symposium by the same title, held at the Olympic Hotel in Seattle, Washington. The Symposium consisted of three half-day plenary sessions of invited papers and three half days of concurrent sessions for contributed papers describing original research results. On the final afternoon, a Panel was convened to discuss future research priorities in this field. The Symposium was sponsored by the National Oceanic and Atmospheric Administration and the Environmental Protection Agency to provide a vehicle for documenting the current status of research on the fates and effects of petroleum in marine environments, and for identifying areas still in need of future research. (See W78-00573 thru W78-00617) (Katz)
W78-00572

OIL SPILLS IN THE ALASKAN COASTAL ZONE - THE STATISTICAL PICTURE,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5B.
W78-00573

HYDROCARBONS IN THE WATER COLUMN,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W78-00574

DISPERSAL AND ALTERATION OF OIL DISCHARGED ON A WATER SURFACE,
Chevron Oil Field Research Co., La Habra, CA.
For primary bibliographic entry see Field 5B.
W78-00575

BIODEGRADATION OF AROMATIC PETROLEUM HYDROCARBONS,
Texas Univ. at Austin.
For primary bibliographic entry see Field 5B.
W78-00576

BIOTRANSFORMATION OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS INDIGENOUS TO THE ARCTIC AND SUBARCTIC,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-00577

ACCUMULATION AND TURNOVER OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS,
Skidway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-00578

FOOD CHAIN TRANSFER OF HYDROCARBONS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5B.
W78-00579

COMPARATIVE OIL TOXICITY AND COMPARATIVE ANIMAL SENSITIVITY,
National Marine Fisheries Service, Auke Bay, AL. Auke Bay Fisheries Lab.
For primary bibliographic entry see Field 5A.
W78-00580

RESPONSES TO SUBLETHAL LEVELS OF PETROLEUM HYDROCARBONS: ARE THEY SENSITIVE INDICATORS AND DO THEY CORRELATE WITH TISSUE CONCENTRATION,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5A.
W78-00581

THE EFFECTS OF PETROLEUM HYDROCARBON EXPOSURE ON THE STRUCTURE OF FISH TISSUES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5A.
W78-00582

THE EFFECTS OF PETROLEUM HYDROCARBONS ON MARINE POPULATIONS AND COMMUNITIES,
Massachusetts Univ., Gloucester. Marine Station.
A. D. Michael.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 129-137, 1977. 1 tab, 33 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, Population, Animal populations, Aquatic populations, *Fish populations, *Biological communities, *Benthic fauna, *Benthic flora, *Genetics, *Toxicity, *Mortality, *Plankton, *Invertebrates, Mammals, Water birds, Environmental effects, Water pollution effects, Reviews.

Literature on the effects of oil spills on plankton, invertebrates, fish, birds and mammals was summarized. Several recent studies on marine populations were discussed in order to illustrate the short-comings of many investigations. The need for more detailed analyses of how these populations are altered or eliminated by acute and chronic exposure to oil was emphasized. (See also W78-00572) (Katz)
W78-00583

EFFECTS OF CERTAIN PETROLEUM PRODUCTS ON REPRODUCTION AND GROWTH OF ZYGOTES AND JUVENILE STAGES OF THE ALGA FUCUS EDENTATUS DE LA PYL,
Environmental Research Lab., Narragansett, RI.
J. L. Steele.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 138-142, 1977. 3 tab, 12 ref.

Descriptors: Algae, Growth stages, *Growth rates, *Bioassay, *Reproduction, *Aquatic algae, *Intertidal areas, *Toxicity, *Juvenile growth stage, *Fertility, *Oil pollution, *Fertilization, Organic compounds, Water pollution effects.
Identifiers: *Crude oil, *Fucus, No 2 fuel oil, Jet fuel.

A method has been devised to utilize easily obtainable eggs of Fucus as a bioassay. The effects of various petroleum products on growth and early development of the zygote has been studies. A crude oil had much less effect on Fucus growth than did No. 2 fuel oil or two jet fuels. When exposuure occured immediately prior to and during release of gametes, no germination or growth occurred with any of the oil types, even at the lowest concentration used. (See also W78-00572) (Katz)
W78-00584

EFFECT OF CRUDE OIL ON TROUT REPRODUCTION,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
H. O. Hodgins, W. D. Gronlund, J. L. Mighell, J. W. Hawkes, and P. A. Robisch.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 143-150, 1977. 2 fig, 3 tab, 18 ref.

Descriptors: *Fertility, *Rainbow trout, *Reproduction, *Oil pollution, *Hatching, *Fish eggs, *Mortality, *Spawning, *Fish reproduction, *Fry, *Oil, Salmonids, Organic compounds, Path of pollutants, Fish diets.
Identifiers: *Crude oil.

Prudhoe Bay crude oil was incorporated into the diet (1 g oil/kg food) of adult rainbow trout during sexual maturation to assess the effects of long-term petroleum exposure on salmonid fish reproductive success. Parallel control fish received identical rations, except without added petroleum. When the fish reached maturity, six to seven months after initiation of petroleum exposure, a total of 31 test and 10 control crosses were made. Mean survival through hatching was 86% and 90% for test and control eggs, respectively; the difference was non-significant (P = 0.10). Test and control males were virtually identical in fertility. Mean survival from hatching to swim-up fry stage of development was 76% for test and 91% for control fish; again the difference was not significant (P = 0.10). In addition, no gross morphological or histological abnormalities were observed in offspring of petroleum-fed fish. The results of these studies were, therefore, that there was no significant impairment of reproductive success detected from this type of dietary exposure to petroleum. (See also W78-00572) (Katz)
W78-00585

THERMAL CONDUCTANCE OF IMMERSED PINNIPED AND SEA OTTER PELTS BEFORE AND AFTER OILING WITH PRUDHOE BAY CRUDE,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
For primary bibliographic entry see Field 5A.
W78-00586

EFFECTS OF EXTERNAL APPLICATIONS OF FUEL OIL ON HATCHABILITY OF MALLARD EGGS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
P. H. Albers.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 158-163, 1977. 4 tab, 12 ref.

Descriptors: *Oil pollution, *Oil spills, *Toxicity, *Bird eggs, *Mortality, *Ducks(Wild), *Mallard duck, *Embryonic growth stage, *Incubation, *Hatching, *Biological membranes, *Growth rates, *Reproduction, Oil, Organic compounds, Growth stages.
Identifiers: *Crude oil.

An experiment was performed to determine the toxicity of oil to incubating eggs. Number 2 fuel oil, a mixture of 9 paraffin compounds, and propylene glycol were applied to the surface of artificially incubated mallard (Anas platyrhynchos) eggs. Embryonic mortality was significantly greater ($P <$ or equal to 8.01) in all oil treated groups and the paraffin mixture group than in the control group. Most of the post-hatching (4 weeks) weights of the ducklings in all treatment groups were not significantly different ($P > 0.01$) from the control. Thus, the transfer of even small quantities of oil to the egg surface is sufficient to reduce hatchability. (See also W78-00572) (Katz)
W78-00587

EFFECTS OF EXTERNAL APPLICATIONS OF NO. 2 FUEL OIL ON COMMON EIDER EGGS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
R. C. Szaro, and P. H. Albers.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 164-167, 1977. 4 tab, 13 ref.

Descriptors: *Mortality, *Embryonic growth stage, *Bird eggs, *Oil pollution, *Oil spills, *Common eider duck, *Hatching, *Fertility, *Toxicity, *Reproduction, Growth stages, Waterfowl, Ducks(Wild), Organic compounds.

Because eggs of marine birds may be exposed to oil adhering to the feathers of adult birds, a study was undertaken to determine the effects of oil contamination. Two hundred common eider eggs were divided into four experimental sets of 50 each. Two sets were treated with No. 2 fuel oil in amounts of 5 microliters to 20 microliters; a third with 20 microliters of propylene glycol, a neutral blocking agent. The fourth set served as a control. Hatching success was 96 percent for the eggs treated with 20 microliters propylene glycol, 96 percent for the controls and 92 percent for the eggs treated with 5 microliters oil hatched. Only 69 percent of the eggs treated with 20 microliters of oil survived - a significant reduction in hatchability (P 0.05). Mean Hatching weights for all sets were statistically equal. Thus, oil pollution may significantly increase embryonic mortality in marine birds. (See also W78-00572) (Katz)
W78-00588

THE EFFECT OF PETROLEUM HYDROCARBONS ON THE SURVIVAL AND LIFE HISTORY OF POLYCHAETOUS ANNELIDS,
California State Univ., Long Beach. Dept. of Biology.
R. S. Carr, and D. J. Reish.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 168-173, 1977. 5 tab, 11 ref.

Descriptors: *Bioassay, *Toxicity, *Mortality, *Reproduction, *Annelids, *Oil pollution, *Oil spills, Littoral, Solubility, *Aromatic compounds, *Life cycles, *Life history studies, Organic compounds.
Identifiers: *Polychaetes, *Crude oil, No 2 Fuel Oil, South Louisiana Crude oil.

The toxicity of seawater-soluble fractions of No. 2 fuel oil and South Louisiana crude oil to five species of polychaetous annelids was determined. The results of these 28-day bioassays indicate a wide variability in sensitivity among the species tested with the two oils. The water soluble fractions of No. 2 fuel oil were more toxic to all species tested than South Louisiana crude oil. The effects of petrochemicals on reproduction were measured for some species. Using the number of offspring produced as a measure of effect, a significant suppression in reproduction was noted at some concentrations of fuel oil. However, a reproductive stimulation was observed for one species exposed to South Louisiana crude oil. (See also W78-00572) (Katz)
W78-00589

CYTOLOGICAL DAMAGE IN MERCENARIA MERCENARIA EXPOSED TO PHENOL,
Delaware Univ., Newark.
C. R. Fries, and M. R. Tripp.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 174-181, 1977. 20 fig, 4 plates, 12 ref.

Descriptors: *Phenols, *Aromatic compounds, *Clams, *Cytological studies, *Animal metabolism, Animal physiology, *Biological membranes, *Electron microscopy, *Toxicity, *Mortality, Organic compounds, Animal pathology, *Clams, Molluscs.
Identifiers: Histology, *Phagocytes, Gills, Hemocytes.

Adult clams were exposed to various concentrations of phenol in artificial seawater for 24 hours. Control animals were placed in artificial seawater only. Gills, gut, digestive gland and blood cells (hemocytes) were damaged. Basophilic tissue staining was evident at the lower concentrations of phenol; moderate necrosis and sloughing of ciliated ephithelial layers were seen at higher concentrations. Blood sinuses were distended and contained precipitated hemolymph. Electron microscopy also showed damage to epithelial cells. Cell and nuclear membranes remained intact at low concentrations; intracellular organelles (lysomoes, mitochondria, etc.) were in various stages of disintegration. (See also W78-00572)
W78-00590

INTERACTIVE EFFECTS OF TEMPERATURE, SALINITY SHOCK AND CHRONIC EXPOSURE TO NO. 2 FUEL OIL ON SURVIVAL, DEVELOPMENT RATE AND RESPIRATION OF THE HORSESHOE CRAB, LIMULUS POLYPHEMUS,
Texas A and M Univ., College Station. Dept. of Biology.
R. B. Laughlin, Jr., and J. M. Neff.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 182-191, 1977. 4 fig, 2 tab, 17 ref.

Descriptors: *Crabs, Solubility, *Oil, *Water temperature, *Salinity, Larvae, *Larval growth stage, *Growth rates, Growth stages, *Respiration, *Animal metabolism, *Bioassay, *Toxicity, *Oil pollution, *Thermal stress, Osmosis, Organic compounds, Benthic fauna.
Identifiers: *Horseshoe crab, Limulus polyphemus, No 2 fuel oil, Water soluble fractions, Arachnids.

Eggs and the first three instars of the horseshoe crab were exposed to water-soluble fractions (WSF) of No. 2 fuel oil. Survival of larvae decreased with decreasing temperature and increasing WSF concentration. The significance of differences in growth and development rates were difficult to determine because of high variability in these traits. These appear to be the least sensitive indicators of petroleum hydrocarbon stress. The respiration rate of oil-exposed animals was significantly higher than that of controls at nearly all salinity/temperature combinations. The interaction of salinity and WSF exposure on respiratory rate was highly significant. The data suggest that the ability to adapt to new environmental conditions rather than maintenance of any give equilibrium metabolic state is an important parameter to consider when evaluating the impact of petroleum on estuarine organisms. (See also W78-00572) (Katz)
W78-00591

EFFECTS OF DISPERSED CRUDE OIL UPON THE RESPIRATORY METABOLISM OF AN ARCTIC MARINE AMPHIPOD, ONISMUS (BOEKISIMUS) AFFINIS,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 192-200, 1977. 5 fig, 2 tab, 14 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Metabolism, *Animal metabolism, *Bioassay, *Animal physiology, *Respiration, *Mortality, *Toxicity, Organic compounds, Arctic, Marine animals, Crustacean, Lethal limit.
Identifiers: *Crude oil, *Onisimus, *Sublethal effects.

Short-term lethality is an unsuitable criterion for assessing the ecological effects of pollutants. A variety of sublethal physiological effects may impair an organism's ability to function normally and lead to a reduction or elimination of sensitive populations in a polluted area. The effects of exposure to sublethal concentrations of dispersed crude oils upon the respiratory metabolism of a marine amphipod have been examined. At low oil concentrations metabolism was significantly depressed but with increasing concentration a reversal of the response occurs. A possible explanation for this complex response was presented. The effects of other factors, such as oil type, presence of dispersants, nutritional state of the animals and weathering of the oil, upon the metabolic response were also considered. (See also W78-00572) (Katz)
W78-00592

ACCUMULATION OF NAPHTHALENES BY GRASS SHRIMP: EFFECTS ON RESPIRATION, HATCHING AND LARVAL GROWTH,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-00593

EFFECTS OF A SEAWATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL AND ITS MAJOR AROMATIC COMPONENTS ON LARVAL STAGES OF THE DUNGENESS CRAB, CANCER MAGISTER,
Oregon State Univ., Newport. Marine Science Center.
R. S. Caldwell, E. M. Caldarone, and M. H. Mallon.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 210-220, 1977. 2 fig, 6 tab, 13 ref.

Descriptors: *Oil, *Oil pollution, *Toxicity, *Mortality, *Aromatic compounds, *Crabs, *Larval growth stage, *Solubility, *Bioassay, *Hatching, *Biological membranes, Organic compounds, Water pollution effects.
Identifiers: *Crude oil, *Naphthalene, *Cancer, *Benzene, Water soluble fractions, Zoeae larvae.

Larval stages of the Dungeness crab were exposed continuously to dilutions of Cook Inlet crude oil water-soluble fraction (WSF) of seawater solutions of naphthalene or benzene for periods lasting up to 60 days. Effects on survival, duration of larval development and size were employed as indicators of toxic effects. The concentration of aromatic hydrocarbons in the WSF were inversely related to the degree of alkylation in each of the benzene and naphthalene families, but the acute toxicity of the 12 compounds was directly related to the degree of alkyl substitution. In addition, naphthalene and its derivatives were more toxic than benzene and its derivatives, but was less concentrated in the WSF. Because of these relationships, the individual aromatic compounds, con-

tributed approximately equally to the acute toxicity of the WSF. (See also W78-00572) (Katz)
W78-00594

MOLTING AND SURVIVAL OF KING CRAB (PARALITHODES CAMSCHATICA) AND COONSTRIP SHRIMP (PANDALUS HYPSINOTUS) LARVAE EXPOSED TO COOK INLET CRUDE OIL WATER-SOLUBLE FRACTIONS,
National Marine Fisheries Service, Auke Bay, AL. Auke Bay Fisheries Lab.
T. A. Mecklenburg, S. D. Rice, and J. F. Karinen.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 221-228, 1977. 2 fig, 2 tab, 25 ref.

Descriptors: Oil, *Oil pollution, *Bioassay, *Larval growth stage, Larvae, *Mortality, *Toxicity, *Shrimp, *Crabs, *Lethal limit, *Crustaceans, Commercial shellfish, Organic compounds, Alaska, Methodology.
Identifiers: *Crude oil, Pandalus, Paralithodes, *King Crab, Water soluble fraction.

Larvae of the coonstripe shrimp and king crab were exposed to solutions of the water-soluble fraction (WSF) of Cook Inlet crude oil in a series of bioassays on intermolt stages I and II and the molt period from stage I to stage II. Molting larvae were more sensitive than intermolt larvae to the WSF, and molting coonstripe shrimp larvae were more sensitive than molting king crab larvae. When molting larvae were exposed to high concentrations of the WSF for as little as 6 hr, molting success was reduced by 10-30% and some deaths occurred. When larvae were exposed to these high concentrations for 24 hr or longer, molting declined 90-100% and the larvae usually died. The lowest concentrations tested did not inhibit molting at any length of exposure, but many larvae died after molting. Median lethal concentrations (LC50's) based on 144 hr of observation for molting coonstripe shrimp and 120 hr for molting king crab were much lower than the 96-hr LC50's, showing that the standard 96-hr LC50 is not always sufficient for determining acute oil toxicity. (See also W78-00572) (Katz)
W78-00595

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), EXPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND OIL-CONTAMINATED SEDIMENT IN THE LABORATORY,
National Marine Fisheries Service, Auke Bay, AL. Auke Bay Fisheries Lab.
T. L. Taylor, and J. F. Karinen.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p 229-237, 1977. 3 fig, 1 tab, 19 ref.

Descriptors: *Oil, *Oil pollution, Solubility, *Bottom sediments, *Toxicity, *Mortality, *Clams, *Animal behavior, *Predation, *Bioindicators, *Bioassay, Alaska, Organic compounds, Behavior, Water pollution effects.
Identifiers: *Crude oil, Oil slicks, *Macoma, *Naphthalene, Water soluble fraction.

This clam will likely be subjected to oil slicks layered on the mud and to water-soluble fractions (WSF) of crude oil or oil-contaminated sediment. Gentle settling of crude oil over clam beds had neglible effects on clams observed for 2 months. Water-soluble and oil-treated sediment (OTS) fractions of Prudhoe Bay crude oil inhibited burrowing and caused clams to move to the sediment surface. Although short-term exposures of clams to the WSF of crude oil and OTS caused few deaths, behavorial responses of clams to oil may be of great importance to their survival in the natural environment. (See also W78-00572) (Katz)
W78-00596

LONG TERM BIOLOGICAL EFFECTS OF BUNKER C OIL IN THE INTERTIDAL ZONE,
New Brunswick Univ., St. John. Dept. of Biology.
M. L. H. Thomas.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D. A. Wolfe, Ed., Pergammon Press, p. 238-245, 1977. 2 fig, 6 tab, 20 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Mortality, *Toxicity, *Biological communities, *Clams, *Animal metabolism, *Sediments, *Intertidal areas, Lagoons, *Aquatic algae, Metabolism, Organic compounds, Biota.
Identifiers: *Bunker C Oil, Fucus, Mya, Chedabucto Bay, Nova Scotia.

In February, 1970 a large spill of Bunker C oil occurred in Chedabucto Bay, Nova Scotia, Canada when the tanker 'Arrow' grounded. Oil from the tanker has persisted for over six years on rocks and in intertidal sediments on the shores of the bay. During this period mortalities of common species in all major communities on both exposed and sheltered shores have occurred. Delayed recolonization appears to be related to long term toxicity. Soft-shell clams in lagoonal sediments have shown persistent mortalities proportional to oil content of sediments. This pattern appears to be a result of direct toxicity, environmental change caused by oil and sub-lethal metabolic effects. (See also W78-00572) (Katz)
W78-00597

BIOLOGICAL SURVEY OF INTERTIDAL AREAS IN THE STRAITS OF MAGELLEN IN JANUARY, 1975, FIVE MONTHS AFTER THE METULA OIL SPILL,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5B.
W78-00598

STUDIES ON PETROLEUM BIODEGRADATION IN THE ARCTIC,
Louisville Univ., KY. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-00599

ARCTIC HYDROCARBON BIODEGRADATION,
Alaska Univ., College.
For primary bibliographic entry see Field 5B.
W78-00600

BIOAVAILABILITY OF SEDIMENT-SORBED NAPHTHALENES TO THE SIPUNCULID WORM, PHASCOLOSOMA AGASSIZII,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5A.
W78-00601

FACTORS AFFECTING THE RETENTION OF A PETROLEUM HYDROCARBON BY MARINE PLANKTONIC COPEPODS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5A.
W78-00602

EFFECTS OF TEMPERATURE AND SALINITY OF NAPHTHALENES UPTAKE IN THE TEMPERATURE CLAM, RANGIA CUNEATA AND THE BOREAL CLAM, PROTOTACA STAMINEA,
Texas A and M Univ., College Station. Dept. of Biology.
K. W. Fucik, and J. M. Neff.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 305-312, 1977. 4 fig, 2 tab, 22 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Absorption, *Salinity, *Water temperature, *Animal metabolism, *Animal physiology, *Mortality, Seasonal, *Clams, *Mollusks, Saline water, Organic compounds.
Identifiers: *Crude oil, *Naphthalenes, Depuration, Rangia, Prototaca.

Both species were exposed to a 25% WSF (water soluble fraction) of Southern Louisiana crude oil for three days under varying temperature and salinity regimes. In three uptake experiments, the greatest naphthalenes concentrations were measured in those clams exposed at the lowest temperatures. Statistical analysis confirmed that naphthalenes uptake in the different temperature-salinity groups in each experiment was significantly different. Temperature was shown to have the greatest effect on this difference. Temperature and salinity had no effect on the release of naphthalenes in either R. cuneata of P. staminea. (See also W78-00572) (Katz)
W78-00603

THE ACCUMULATION AND DEPURATION OF NO. 2 FUEL OIL BY THE SOFT SHELL CLAM, MYA ARENARIA L.,
Industrial Environmental Research Lab.-Cincinnati, Edison, NJ. Oil and Hazardous Materials Spills Branch.
For primary bibliographic entry see Field 5B.
W78-00604

EFFECTS OF CHLORINATED BIPHENYLS AND PETROLEUM HYDROCARBONS ON THE ACTIVITY OF HEPATIC ARYL HYDROCARBOR HYDROXYLASE OF COHO SALMON (ONCORHYNCHUS KISUTCH) AND CHINOOK SALMON (O. TSHAWYTSCHA),
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
E. H. Gruger, Jr., M. M. Wekell, and P. A. Robisch.
In: Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. D.A. Wolfe, Ed., Pergammon Press, p. 323-331, 1977. 4 tab, 31 ref.

Descriptors: Oil, *Oil pollution, *Oil spills, *Salmonids, *Polychlorinated biphenyls, *Enzymes, *Salmon, *Chinook salmon, *Animal metabolism, Animal physiology, *Aromatic compounds, Organic compounds.
Identifiers: *Coho salmon, *Aryl hydrocarbon hydroxylase, Microsomes, *Hepatic microsomes, *Hematology, Biotransformation.

Saltwater-adapted coho and chinook salmon were fed two mixtures of test compounds: one composed of chlorobiphenyls and the other of petroleum hydrocarbons. Induction of aryl hydrocarbon (benzo(a)pyrene) hydroxylase activity occurred in hepatic microsomes form coho salmon within the first two weeks of hydrocarbon exposure. This induction was potentiated by the presence of chlorobiphenyls; however, no effect on enzyme activity was found with chlorobiphenyls alone. The results indicate that chlorobiphenyls act synergistically with hydrocarbons to induce the enzyme system in coho salmon. In chinook salmon, the activity of aryl hydrocarbon hydroxylase in hepatic microsomes was depressed by the chlorobiphenyls and hydrocarbons, administered both separately and together. It was concluded that chlorobiphenyls in marine environments may alter the activity of hydroxylases regulating the accumulation and discharge of petroleum hydrocarbons in organisms. (See also W78-00572) (Katz)
W78-00605

THE FATE OF PETROLEUM HYDROCARBONS FROM A NO. 2 FUEL OIL SPILL IN A SEMINATURAL ESTUARINE ENVIRONMENT,
Virginia Inst. of Marine Science, Cloucester Point.
For primary bibliographic entry see Field 5B.
W78-00606

INTERLABORATORY CALIBRATION FOR THE ANALYSIS OF PETROLEUM LEVELS IN SEDIMENT,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-00607

EVAPORATION AND SOLUTION OF C2 TO C10 HYDROCARBONS FROM CRUDE OILS ON THE SEA SURFACE,
Chevron Oil Field Research Co., La Habra, CA.
For primary bibliographic entry see Field 5B.
W78-00608

DETERMINATION OF THE LEEWAY OF OIL SLICKS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W78-00609

INPUT OF LOW-MOLECULAR WEIGHT HYDROCARBONS FROM PETROLEUM OPERATIONS INTO THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-00610

INTERTIDAL SEDIMENT HYDROCARBON LEVELS AT TWO SITES ON THE STRAIT OF JUAN DE FUCA,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W78-00611

CHARACTERIZATION OF VOLATILE HYDROCARBONS IN FLOWING SEAWATER SUSPENSIONS OF NUMBER 2 FUEL OIL,
Battelle-Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-00612

SEDIMENT HYDROCARBONS AS ENVIRONMENTAL INDICATORS IN THE NORTHEAST GULF OF MEXICO,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 5A.
W78-00613

THE STABILITY OF EMULSIFIED CRUDE OILS AS AFFECTED BY SUSPENDED PARTICLES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-00614

CHEMICAL CARCINOGENS IN THE MARINE ENVIRONMENT BENZO(A)PYRENE IN ECONOMICALLY IMPORTANT BIVALVE MOLLUSKS FROM OREGON ESTUARIES,
Oregon State Univ., Corvallis. Dept. of General Science.
For primary bibliographic entry see Field 5B.
W78-00615

SEASONAL VARIATIONS OF HYDROCARBONS IN THE WATER COLUMN OF THE MAFLA LEASE AREA,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W78-00616

DISTRIBUTION OF PETROLEUM HYDROCARBONS IN WESTERNPORT BAY (AUSTRALIA): RESULTS OF CHRONIC LOW LEVEL INPUTS,
Victoria Ministry for Conservation, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W78-00617

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
M. R. Scalf, W. J. Dunlop, and J. F. Kreissl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 095, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-096, August 1977. 35 p, 11 fig, 4 tab, 23 ref. 1BA609.

Descriptors: *Septic tanks, *Waste disposal, *Water pollution sources, Land use, Planning, Design, Construction, Soil types, Geology, Topography, Aquifer characteristics, Groundwater recharge, Carrying capacity, Groundwater movement.
Identifiers: Septic disposal.

Septic tank-soil absorption systems are the most widely used method of on-site domestic waste disposal with almost one-third of the United States population depending on such systems. In spite of the fact that the percentage of newly constructed homes using septic tanks is decreasing, the total number continues to increase. Properly designed, constructed, and operated septic tank systems have been demonstrated to be an efficient and economical alternative to public sewer systems, particularly in rural and sparsely developed suburban areas. They have also demonstrated the potential for contamination of ground and surface waters due to their widespread use in unsuitable situations. Zoning and land use planning for areas relying on septic tanks should be based on soil variability, geology, topography and aquifer characteristics. Assessment of the social and economic consequences of converting from individual units to sewered and central treatment facilities must consider loss of groundwater recharge. Additional research is needed regarding: (1) the movement and fate characteristics in the subsurface environment of septic tank pollutants, especially viruses and organics; (2) the density of septic tank systems that can be tolerated before pollution problems necessitate sewers or septic system modifications; and (3) the development of septic system modifications and alternative individual sewage disposal system. (Nessa-NC)
W78-00751

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME I: EXECUTIVE SUMMARY,
American Public Works Association, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-00752

OCEANS '77 CONFERENCE RECORD.
Institute of Electrical and Electronics Engineers, Inc., New York.; and Marine Technology Society, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00827

PALAU: NATIVE PARADISE OR PETROLEUM SUPERPORT,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
D. F. Soule.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 1977, Vol 1, p 5D-1-5D-6, 1977. 1 fig, 19 ref.

Descriptors: *Environmental effects, *Resources development, *Reefs, *Coral, *Baseline studies, Harbors, Oil pollution, Oil spills.
Identifiers: *Outer Continental Shelf, *Superports, *Palau, Trust Territory Deepwater ports.

The islands of Palau are part of the Trust Territory of the United States and are about 600 miles east of Mindanao and almost due south by some 1800 miles of the southern Honshu cities of Osaka and Nagoya. Transshipment of oil in smaller tankers to the shallower waters of Japan would require a deepwater port and tank storage areas, as well as low populations to minimize protest on possible pollution. Physically Palau has ideal deepwater port areas and sheltered lagoons or reefs that could be filled for storage tanks or refineries. Construction impacts of dredging would be severe; coral reefs are alive only at a thin surface layer and silting can destroy them, as was demonstrated in Kaneohe Bay in Hawaii. Since the currents and trade winds flow from NE to SW, turbidity plumes could affect the major, very productive part of the reef. (See also W78-00827) (Sinha-OEIS)
W78-00828

OCEAN DUMPING -- RESEARCH AND MONITORING OF OCEAN DISPOSAL EFFECTS,
National Oceanic and Atmospheric Administration, Rockville, MD.
P. M. Cohern.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 1, p 23B-1 - 23B-4, 1977. 11 ref.

Descriptors: *Waste disposal, *Environmental effects, *Water pollution effects, Monitoring, Baseline studies.
Identifiers: *Continental Shelf, *Ocean dumping, New York Bight, Dumpsites.

A relatively new program at the National Ocean survey, in the research and monitoring of ocean waste disposal effects, is discussed. The background leading to the structuring of this program is described, and an overview of what waste materials are deposited in ocean areas and where those areas are located is presented. Certain basic issues of ocean disposal are commended on and studies in one area are described in some detail. The present trend appears to favor use of deeper, off-the-shelf sites. There are arguments to be made for and against this. No one can say that use of off-the-shelf sites is always environmentally preferable. Disposal on the continental shelf in waters of 30-100 meters can impose severe environmental penalties, but impacts are usually confined to a discreet area and are relatively easier to monitor. In theory dumpsites should be selected either for containment or dispersal. Only where no dumping has occurred can descriptions or baselines of conditions be established beforehand. The deepwater dumpsite DWD-106, off the coast of Delaware is described in detail. (See also W78-00827) (Sinha-OEIS)
W78-00830

TECHNIQUES FOR MEASURING THE EFFECTS OF NUCLEAR POWER PLANTS ON LOCAL FISH,
Washington Univ., Seattle. Applied Physics Lab.
W. C. Acker.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 1, p 23C-1 - 23C-2, 1977. 5 fig.

Descriptors: *Environmental effects, *Acoustics, *Nuclear powerplants, *Resources development, *Water pollution effects, *Thermal pollution, Fish, Water quality.
Identifiers: *Outer Continental Shelf, Thermal plumes, Acoustic measurement.

The Applied Physics Laboratory and Fisheries Research Institute at the University of Washing-

ton have developed acoustic equipment and techniques that are now being used to help assess the effects of coastal power plants on fish. The technique consists of acoustic assessment of fish abundance with a portable, towed assessment system and simultaneous measurement of the temperature at several depths in and around the thermal plume. When the acoustic-temperature measurements are used in conjunction with an acoustically directed sample fishing program, data on species composition can also be obtained. These data can then be used to help predict the potential long-range impact of the power plant on the local fish stock. This paper describes the equipment and techniques developed for these measurements and discusses some of the results. (See also W78-00827) (Sinha-OEIS)
W78-00831

ENVIRONMENTAL ASPECTS OF DRILLING FLUID AND DRILL CUTTINGS DISPOSAL,
Exxon Co., Houston, TX.
R. P. Zingula.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 40A-1 - 40A-4, 1977. 1 tab, 12 ref.

Descriptors: *Toxicity, *Water pollution, *Environmental effects, *Resources development, Offshore platforms, Drilling fluids, Dispersion, Dilution.
Identifiers: *Outer Continental Shelf, Drilling cuttings, Drilling muds.

More than 21,000 wells have been drilled for hydrocarbons in the offshore United States since 1947, with no known permanent damage to the marine biota. A large number of reports and publications dealing with mud and cuttings discharged from offshore wells and closely related topics were studies. Except in rare and unusual circumstances, the discharge of drilling mud and cuttings from normal well drilling operations has not caused and will not cause serious environmental damage. There is no question that drilling mud, mud components and cuttings are acutely toxic to various organisms if the concentrations are great enough, as is adequately shown by the results from the vast number of static bioassays that have been conducted. There is also no question that dilution and dispersion lower concentrations such that the discharge will cause neither immediate nor long-term damage. Some of the studies and their results are discussed in this paper, and an abbreviated bibliography is included for reference. (See also W78-00827) (Sinha-OEIS)
W78-00833

EFFECTS OF PRODUCED WATERS ON THE MARINE ENVIRONMENT,
Shell Development Co., Houston, TX; and Exxon Production Research Co., Houston, TX.
F. T. Weiss, and C. B. Koons.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 40B-1 - 40B-10, 1977. 1 fig, 4 tab, 41 ref.

Descriptors: *Water pollution effects, *Environmental effects, *Metals, *Microbial degradation, Aromatic compounds, Oil pollution.
Identifiers: *Outer Continental Shelf, *Produced water, Hydrocarbons, Dilution, Biochemical uptake, Volatilization.

Detailed data on the composition of produced waters are now more completely available, especially for inorganic ions. A review of these data and their significance leads to the conclusion that toxic components are present in very low concentrations in produced waters if at all. Natural forces such as dilution, evaporation, photooxidation and biological reactions rapidly reduce the concentration of any hydrocarbon or organic toxic components in the produced waters to levels not harmful to the marine environment and biota. Inorganic components are reduced in toxicity by chelation and sedimentation processes. Field data show that low-level discharge of produced waters has little to no detrimental effects on the marine environment or biota. (See also W78-00827) (Sinha-OEIS)
W78-00834

FATE OF PETROLEUM HYDROCARBONS IN MARINE ANIMALS,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-00835

WEATHERING OF SPILLED OIL AND METHODS OF ACCELERATING,
Chevron Oil Field Research Co., La Habra, CA.
For primary bibliographic entry see Field 5B.
W78-00836

CEPEX HARDWARE: (NOW AND IN THE FUTURE),
Case Existological Labs. Ltd., Victoria (British Columbia).
J. N. Case.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2, p 44C-1 - 44C-4, 1977. 8 fig, 1 tab, 5 ref. Grant IDO73-09763-A02.

Descriptors: *Water pollution effects, *Ecosystems, *Environmental effects, Aquaculture, Resources development, Pollutants.
Identifiers: *Outer Continental Shelf, *Chronic exposure, Controlled Ecosystem Pollution Experiment, Controlled Experimental Ecosystems.

The Controlled Ecosystem Pollution Experiment (CEPEX) is a cooperative multi-disciplinary research effort designed to test the effects of chronic exposure to low levels of pollutants on pelagic marine organisms. The method adopted was to erect large test tubes in the sea. The best way to fill the enclosure was to 'capture' the natural environment and avoid filling by pumping. Techniques have now been developed to allow night captures which increase the versatility of the closed ecosystem. The experiments would basically attempt to: have replicable CEE's (Controlled Experimental Ecosystems) which are experimentally manipulative, be of sufficient size to encompass two or more trophic levels at their natural population levels for one life cycle of the highest trophic level, have hardware which would be of non-toxic materials and as transparent as possible. Each CEE consists of: a float supporting all other equipment from the surface, a plastic container which has a basic cylindrical shape with a connected cone at the bottom, shrouds and weights to support the container shape and resist currents, and a dacron cone to support the bottom of the plastic container. Meaningful work in the open ocean would require a CEE of approximately 100 meter depth to experiment in the euphotic zone. This leads to some rather exotic size bags if the proportions of either of the present systems are followed. If remote sensing of pelagic species was perfected, then perhaps aircraft-launched, automatically deployed CEE's could report over larger areas of the ocean continuously to detect changes in environmental quality and biomass quantity. (See also W78-00827) (Sinha-OEIS)
W78-00837

PHYSICAL FACTORS AFFECTING THE SITING OF DREDGED MATERIAL ISLANDS,
Texas A and M Univ., College Station. Dept. of Geology.
C. C. Mathewson, and R. M. McHam.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2 p Poster-G-1 - Poster G-6, 1977. 5 fig, 12 ref.

Descriptors: *Dredging, *Islands, *Environmental effects, *Resources development, Texas.
Identifiers: *Outer Continental Shelf, *Artificial islands, Siting, Coastal zone.

Dredge material islands are significant features formed very rapidly in comparison to normal geologic processes. A study of the affect of geologic processes on the redistribution of island sediment has identified ten physical factors that should be considered in selecting disposal sites in bays and lagoons. These factors include: wind; waves; tidal fluctuations, both astronomic and wind; currents, both fluvial and tidal; the physical characteristics of the dredge material; climate of the area; physiography of the basin; islands design, shape and height; affects of man, such as ship wake and land subsidence; and the biology of the site, both flora and fauna. These ten factors were found to interact in a complex manner that cannot easily be quantitatively evaluated. As-a-result, the physical environmental data needed for the selection of disposal sites or sites for island construction will remain a geological art rather than mathematical calculation. (See also W78-00827) (Sinha-OEIS)
W78-00838

HAWAII AND THE MANGANESE NODULE INDUSTRY,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6G.
W78-00839

TRACE METAL CONTENT OF PLANKTON AND ZOOPLANKTON COLLECTED FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Middle Atlantic Coastal Fisheries Center.
R. A. Greig, A. Adams, and D. R. Wenzloff.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 1, p 3-8, July 1977. 2 fig, 3 tab, 4 ref.

Descriptors: *Baseline studies, Water pollution effects, Plankton, Zooplankton, New York, Silver, Cadmium, Nickel, *Trace elements, *Metals.
Identifiers: Outer Continental Shelf, *Trace metals, *New York Bight, *Long Island Sound.

Various plankton were obtained from Long Island Sound and the New York Bight. The purpose of the study was to obtain baseline data on trace metal levels in zooplankton from these areas and possibly to determine any differences in metal levels related to geographical location of sampling. The levels of silver, cadmium, and nickel in plankton did not differ markedly for the various geographic locations from both the New York Bight and Long Island Sound collections. Silver levels ranged from 0.5-1.4 ppm in all samples, whereas cadmium levels were in the range of 0.5-2.4 ppm and nickel levels ranged from 0.9-4.6 ppm for all samples. The copper lead, and zinc levels in zooplankton varied greatly as a function of either species or geographic location; thus, interspecific differences could not be determined. Individuals of the same species of zooplankton were collected from different geographical locations and large variations in copper, lead, and zinc levels were observed. (Sinha-OEIS)
W78-00859

ENVIRONMENTAL CONDITIONS ON THE CONTINENTAL SHELF OFF WEST GREENLAND,
Danish Inst. of Applied Hydraulics, Copenhagen.
For primary bibliographic entry see Field 5G.
W78-00862

ALONG-SHORE COHERENCE OF WINDS ALONG THE NORTH ALASKAN COAST FOR OIL SPILL ANALYSIS,
Coast Guard Research and Development Center, Groton, CT.

G. L. Hufford, J. P. Welsh, I. M. Lissauer, and B. D. Thompson.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 3 (of 4), p 529-532, OTC 2947, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: *Oil spills, *Alaska, *Forecasting, *Dispersion, Storms, Models.
Identifiers: *Outer Continental Shelf, *North Slope, Predictions, Wind fields.

Forecasting the movement and dispersal of spilled oil along the Alaskan North Slope coast requires the description of the wind field(s). From analysis of available data there appears to be three regimes: a western regime (represented by data from Barrow); a central regime (represented by Lonely and Oliktok Point); and an eastern regime (represented by Barter Island). These regimes must be taken into account in the prediction of oil spill movement during 'normal conditions.' During storm conditions (passage of low pressure systems) the entire coast appears to be regionally controlled rather than locally. An existing Coast Guard storm model can be used to predict coastal winds. (Sinha-OEIS)
W78-00863

OUTER CONTINENTAL SHELF DEVELOPMENT IN THE SANTA BARBARA CHANNEL: LACK OF DETECTABLE IMPACT ON FISHERIES,
F. J. Hester, and R. Evans.
In: Proceedings of 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 261-267, OTC 2756, 1977. 1 fig, 4 tab, 11 ref.

Descriptors: *Fisheries, *Resources development, *Environmental effects, *Oil spills, *Water pollution effects, California, Gases, Seepage, Shellfish.
Identifiers: *Outer continental shelf.

The sport and commercial fish catch in the Santa Barbara Channel over a 20 year period was examined in an attempt to detect possible changes in catch that might be associated with OSC activity in the area during that same period. Such changes were not found, indicating that the effects of OCS activities were non-existent, or minor compared to natural changes in the ocean climate or to fishing pressure on the resources themselves. (Sinha-OEIS)
W78-00867

ENVIRONMENTAL ASPECTS OF DRILLING MUDS AND CUTTINGS FROM OIL AND GAS EXTRACTION OPERATIONS IN OFFSHORE AND COASTAL WATERS,
Exxon Production Research Co., Houston, TX.
P. H. Monaghan, C. D. McAuliffe, and F. T. Weiss.
In: Proceedings of 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 251-260, OTC 2755, 1977. 1 fig, 7 tab, 15 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Drilling fluids, *Mud, *Oil pollution, Bioassay, Gases, Coasts.
Identifiers: *Outer continental shelf.

Drilling mud and cuttings discharged from the more than 21,000 wells drilled offshore and in coastal waters of the United States have not caused detectable environmental damage either short-term or long-term. This is the conclusion from a study of reports of underwater observations during actual discharges of mud and cuttings, laboratory bioassay results for materials used in drilling muds, and actual well histories and laboratory results used in estimating the concentrations of mud components. The materials added in greatest amounts to drilling muds are barite (barium sulfate) and bentonite clays. Bioassay data indicate that these solid materials are nontoxic. Any acute toxicity for a typical mud should be due mainly to the dissolved ligno-sulfonate thinner. However, rapid dispersion and dilution quickly lower the concentrations (within a few minutes to an hour) below those found to be toxic in bioassay tests conducted for four days without provision for dispersion and dilution. Mud and cuttings discharges apparently have not caused long-lasting effects, as a wide variety of mobile and fixed organisms are found on and under oil producing platforms. In the Gulf of Mexico, 10- to 15-yr old cuttings are not longer distinguishable from the normal sediments. Studies in Timbalier Bay have documented no adverse effects on marine life or buildup of hydrocarbons metals. (Sinha-OEIS)
W78-00868

EFFECTS AND UPTAKE OF CHLORINATED NAPHTHALENES IN MARINE UNICELLULAR ALGAE,
Environmental Research Lab., Gulf Breeze, FL.
G. E. Walsh, K. A. Ainsworth, and L. Faas.
Bulletin of Environmental Contamination and Toxicology, Vol 8, no 3, p 297-302, September 1977. 2 tab, 15 ref.

Descriptors: *Water pollution effects, *Toxicity, *Food webs, Algae, Chlorine, Tophic level.
Identifiers: *Outer Continental Shelf, *Chlorinated naphthalenes.

Studies on effects and uptake of three commercial mixtures of chlorinated napthalenes in marine unicellular algae are described. A chlorinated naphthalene formulation that contained a mixture of mono- and dichloro isomers was more toxic to marine algae than were formulations of two-, tetra-, penta-, and hexchloro isomers. However, uptake was directly related to chlorine content. The penta and hexachloronaphthalenes are generally the most toxic to animals, and if algae were exposed to these compounds in nature, it is possible that they could serve as vehicles for transfer to aquatic animals. Transfer through food webs could begin with algae and result in effects at higher trophic levels. (Sinha-OEIS)
W78-00873

IMPAIRMENT OF ANTIPREDATOR BEHAVIOR IN PALAEMONETES PUGIO BY EXPOSURE TO SUBLETHAL DOSES OF PARATHION,
Environmental Research Lab., Gulf Breeze, FL.
J. A. Farr.
Transactions of the American Fisheries Society, Vol 106, No 3, p 287-290, 1977. 1 tab, 16 ref.

Descriptors: *Pesticide toxicity, *Shrimp, *Organophosphorous pesticides, *Killifishes, *Predation, *Competition, *Biological communities, *Behavior, *Fish behavior, Pesticides, Commercial shellfish, Insecticides.
Identifiers: *Parathion, Palaemonetes, Sublethal effects.

Grass shrimp when exposed to sublethal concentrations of methyl or ethyl parathion, become more susceptible to predation by gulf killifish. An increase in spontaneous activity renders them more easily detected by a predator and they fatigue more quickly when being pursued. Such changes in a multi-prey community could result in altered predator preferences and subsequently could change community structure and trophic relationships. (Katz)
W78-00874

IMPINGEMENT OF FISHES AT PEACH BOTTOM ATOMIC POWER STATION, PENNSYLVANIA,
Ichthyological Associates, Inc., Drumore, PA.
For primary bibliographic entry see Field 8I.
W78-00875

USE OF THE LESLIE MATRIX FOR ASSESSING ENVIRONMENTAL IMPACT WITH AN EXAMPLE FOR A FISH POPULATION,
Stone and Webster Engineering Corp., Boston, MA. Environmental Div.
For primary bibliographic entry see Field 8I.
W78-00876

PRIMARY AND SECONDARY EFFECTS OF STRESS IN FISH: SOME NEW DATA WITH A GENERAL REVIEW,
Fisheries and Marine Service, West Vancouver (British Columbia). Research and Resource Service Directorate.
M. M. Mazeaud, F. Mazeaud, and E. M. Donaldson.
Transactions of the American Fisheries Society, Vol 106, No 3, p 201-212, 1977. 9 fig, 1 tab, 78 ref.

Descriptors: *Metabolism, *Oxygen requirements, Fish physiology, *Chinook salmon, *Sockeye salmon, *Fish genetics, *Dehydration, Animal metabolism, Salmonids, Genetics, Resistance, Freshwater, Fish, Marine fish.
Identifiers: Handling stress, *Catacholamines, *Corticosteroids, *Endocrine system, *Osmoregulation, Primary stress effects, Secondary stress effects.

Handling in fish induces perturbations of various biological parameters which have been investigated or reviewed in an attempt to analyze and quantify the resulting stress. Endocrine changes, being early consequences of stress, are referred to as primary effects. Original data obtained on coho, sodkeye, and chinook salmon show that all types of stress result in an increase in circulating catacholamines, mainly adrenaline. In mature male coho salmon, struggling and hypoxia also resulted in an increase of plasmatic icorticosteroids. Secondary effects occur as a result of these endocrine changes. Metabolic disturbances include a pronounced increase in blood glucose, and either a decrease or an increase of plasmatic free fatty acid (FFA) according to the species. These metabolic disturbances brought about by stress of short duration are shown to be of relatively long duration. Recent advances in the understanding of osmoregulation processes show that the action of catacholamines on gill permeability may explain the stress-induced water imbibition of fish in fresh water and the dehydration of fish in seawater. Beyond some practical considerations, the results reported open up the possibility for genetic selection of varieties of high or low response to stress. (Katz)
W78-00877

TOXINS OF THE GONVAULAX SP. AND INFESTED BIVALVES IN OWASE BAY,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
Y. Oshima, W. E. Fallon, Y. Shimizu, T. Noguchi, and Y. Hashimoto.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42, No 8, p 851-856, 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Toxins, *Toxicity, *Algal toxins, *Clams, *Dinoflagellates, *Chromatography, Poisons, Chemical analysis, Mortality, Eutrophication, Public health, Phytoplankton, Molluscs, Commercial shellfish.
Identifiers: Gonovaulax, Soft shell clams, Saxitoxin.

Algal specimens, mussels and short-necked clams were collected during or immediately after the outbreak of Gonvaulax sp. at Owase Bay in 1975. Extraction and purification of the toxins were carried out according to the method used for the isolation of the toxins in softshell clams and cultured G. tamarensis. By a combination of Sephadex G-15, Bio-Gel P-2 and Bio-Rex 70 column chromatography, six toxins were isolated from each specimen. Of these, five were identified as saxitoxin, GTX1, GTX1', GTX2, and GTX3, respec-

tively, which were found in G. tamarensis. The major toxin JGX1 was found to be a new one. (Katz)
W78-00878

SALINITY ACCLIMATION IN THE SOFT-SHELL CLAM, MYA ARENARIA,
Maine State Dept. of Marine Resources, West Boothbay Harbor. Research Lab.
E. P. Creaser, and D. A. Clifford.
Fishery Bulletin, Vol 75, No 1, p 225-230, 1977. 2 fig, 2 tab, 21 ref.

Descriptors: *Temperature, *Salinity, *Saline water, *Salt tolerance, *Water temperature, *Thermal stress, *Clams, Commercial shellfish, Water properties, Water pollution, Sewage, Water chemistry, Mollusks, Clams.
Identifiers: *Depuration, Acclimation, Soft shell clams.

This investigation was undertaken to establish the relationship of temperature to acclimation time when Mya is immersed into dilutions of seawater. The results are applicable to many real situations where Mya are harvested from an area with one set of environmental conditions and subjected to acclimation and depuration in an area of another. It was discovered that acclimation to concentrations proceeded faster than adjustment to dilutions. Temperature was seen to be directly related to the rate of acclimation, that is, the lower the water temperature, the longer the acclimation period. (Katz)
W78-00879

CHRONIC TOXICITY OF GUTHION TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS RAFINESQUE),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
I. R. Adelman, L. L. Smith, Jr., and G. D. Siesennop.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 6, p. 726-733, 1976. 5 tab, 11 ref.

Descriptors: *Minnows, *Insecticides, Toxicity, *Mortality, *Lethal limit, *Fecundity, *Fertility, *Life cycles, Water quality standards, Pesticides, Organic pesticides, Water pollution effects, Growth stages, Bioassay, Phosphothioate pesticides.
Identifiers: *Guthion, Pimephales, Fathead minnow.

Data on the chronic toxicity of an environmental contaminant, important for establishing water quality standards, are not known for the insecticide Guthion. Fathead minnows were exposed to various concentrations of Guthion over a complete life cycle, from egg through fry in the second generation, in order to determine a maximum acceptable toxicant concentration (MATC). The lowest concentration of Guthion that had an adverse effect was 0.51 micro g/l where fecundity was drastically reduced. Estimates of the MATC ranged from 0.51 to 1.8 micro g/l. (Katz)
W78-00880

THE MASS MORTALITY OF COMMON MURRES IN THE IRISH SEA IN 1969,
Aberdeen Univ. (Scotland). Dept. of Zoology.
W. R. P. Bourne.
Journal of Wildlife Management, Vol. 40, No. 4, p. 789-792, 1976. 34 ref.

Descriptors: *Mortality, *Pesticide residues, *Toxicity, *Viruses, Epidemics, Diseases, *Animal diseases, Heavy metals, Polychlorinated biphenyls, Pathology, Path of pollutants, Bird eggs, Birds, Chlorinated hydrocarbon pesticides.
Identifiers: Tissue analysis, Bioaccumulation, *Murre, Uria, *Irish Sea.

Information concerning several occurrences of mass mortalities of the common murre (Uria aalge) was summarized. Data were presented on tissue concentrations of heavy metals and pesticides in samples from both birds and eggs. The possibility that the epidemic-like deaths are due to a pathogenic organism rather than toxic chemicals was discussed. (Katz)
W78-00881

SIZE-RELATED FACTORS ASSOCIATED WITH DIELDRIN CONCENTRATIONS IN MUSCLE TISSUE OF CHANNEL CATFISH ICTALURUS PUNCTATUS,
Iowa Cooperative Fishery Research Unit, Ames.
R. V. Bulkley, R. L. Kellogg, and L. R. Shannon.
Transactions of the American Fisheries Society, Vol. 105, No. 2, p. 301-307, 1976. 5 fig, 2 tab, 21 ref.

Descriptors: *Dieldrin, *Insecticides, Pesticides, *Organic pesticides, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Size, *Channel catfish, Pesticide kinetics, Growth rates, Growth stages, Age, Metabolism, Fish physiology, Environmental effects.
Identifiers: *Tissue analysis, *Bioaccumulation, *Metabolic rate.

Dieldrin concentrations in muscle tissue of channel catfish, Ictalurus punctatus, from the Des Moines River, Iowa were compared in relation to body total length, age, sex, and fat content. Data suggest that several interacting size-related factors determine the amount of dieldrin assumulated by channel catfish, and that size alone is not a good indicator of dieldrin content in muscle under similar exposure conditions. (Katz)
W78-00882

THE TOLERANCE OF WARM-WATER PRAWNS TO RECIRCULATED WATER,
Ministry of Agriculture, Fisheries and Food, Conway (Wales). Fisheries Experiment Station.
J. F. Wickins.
Aquaculture, Vol. 9, p. 19-37, 1976. 7 fig, 6 tab, 22 ref.

Descriptors: *Mortality, *Toxicity, *Lethal limit, *Ammonia compounds, *Nitrogen compounds, *Nutrient removal, *Growth rates, *Recirculated water, Hydrogen ion concentration, Nitrification, Nitrates, Nitrites, Phosphates, Continuous flow, Inhibitors, Water chemistry, Carbon dioxide, *Ammonia.
Identifiers: *Prawns, Penaeus, Macrobrachium.

Ten species of penaeid and one caridean prawn were exposed to ammonia (as ammonium chloride) and nitrite and nitrate (as sodium salts) in a series of acute and chronic toxicity tests. Approximate 48-h LC50's for seven penaeid species considered together were: 1.29 mg unionized NH3-N/l; 170 mg NO2-N/l; 3400 mg NO3-N/l. Five chronic toxicity tests with ammonia were made. Each test lasted 3 weeks and showed that a mean concentration of 0.45 mg NH3-N/l reduced the growth of 5 penaeid species by 50% of that of the controls. A 'Maximum acceptable Level' which reduced growth by 1-2% of that of the controls was estimated to be 0.10 mg NH3-N/l. The importance of inorganic carbon in sea water in relation to mortality of cultured prawns is discussed. Since most marine operators measure ammonia in terms of total ammonia nitrogen (NH4-N) the calculated amounts of NH4-N that correspond to 0.10 mg NH3-N/l ('the maximum acceptable level') in sea water over a range of pH, temperature and salinity are tabulated. (Katz)
W78-00883

EFFECTS OF BENZENE ON GROWTH, FAT CONTENT, AND CALORIC CONTENT OF STRIPED BASS, MORONE SAXATILIS,
National Marine Fisheries Services, Tiburon, CA. Tiburon Lab.
S. Korn, J. W. Struhsaker, and P. Benville.
Fishery Bulletin, Vol. 74, No. 3, p 694-698, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Growth rates, *Aromatic compounds, *Striped bass, *Animal growth, *Toxicity, *Juvenile growth stage, Fish physiology, Metabolism, Water pollution effects, Oil pollution, Organic compounds, Oil spills.
Identifiers: Sublethal effects, Tissue analysis, *Benzene, Acclimation.

Experiments were conducted to determine what effects sublethal levels of benzene had on energy utilization by fish as measured by growth, fat content and caloric content. Wet weight, dry weight and fat content decreased with increasing benzene concentration. There was an apparent acclimation of the fish to benzene at the low level (3.5 micro l/l) by the end of the 4-wk exposure period. Although the fish may be able to adapt by metabolic detoxification and depuration of benzene and metabolites, after more prolonged periods the competitive effects on energy utilization may not only decrease growth by also increase mortality or reduce ability to withstand environmental stress. (Katz)
W78-00884

MERCURIC CHLORIDE UPTAKE BY EGGS OF THE RICEFISH AND RESULTING TERATOGENIC EFFECTS,
South Dakota Univ. Vermillion. Dept. of Biology.
J. F. Heisinger, and W. Green.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 6, p. 665-673, 1975. 4 fig, 2 tab, 25 ref.

Descriptors: *Mercury, *Toxicity, *Mortality, *Embryonic growth stages, *Fish eggs, *Inorganic compounds, *Lethal limit, Water pollution, Water pollution effects, Path of pollutants, Fish physiology, Metals, Bioassay, *Absorption.
Identifiers: Teratology, Bioaccumulation, Tissue analysis, Mercury compounds, *Mercuric chloride, *Ricefish, Oryzias, Biological concentration.

Eggs collected from adult Japanese medaka were incubated for 16 days in solutions containing 10, 15, 20 and 30 ppb mercury as mercuric chloride. The mean hatchability of control eggs was 46.7 percent. Experimental eggs incubated in 10 ppb and 15 ppb mercury had hatching percentages of 58.3 and 20.3, respectively. (Chi Square = 12.8, P .0005). None of the 20 ppb or 30, experimental eggs hatched. Hemorrhaging, blood vessel deterioration and loss of blood cells were observed in 79 percent of the 15 ppb experimental eggs and all the 20 and 30 ppb experimental eggs. Neigher the control nor the 10 ppb experimental eggs demonstrated any of these abnormalities. The LC100 for 384 hours was between 20 ppb and 30 ppb. The 10, 15, 20, and 30 ppb experimental eggs concentrated mercury directly from the incubating solution 1,600, 1,900, 2,700, and 1,900 times, respectively. The total concentration of mercury in these eggs after 16 consecutive days was 16,000, 29,000, 54,000, and 56,000 ppb respectively. (Katz)
W78-00885

PENTACHLOROPHENOL DISTRIBUTION IN A FRESH WATER ECOSYSTEM,
University of Southern Mississippi, Hattiesburg. Inst. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-00886

RESPONSES OF EMBRYONIC CYATHURA POLITA (STIMPSON) (ISOPODA: ANTHURIDEA) TO VARYING SALINITIES,
Citadel, Charleston, SC. Dept. of Biology.
B. J. Kelley, and W. D. Burbanck.
Chesapeake Science, Vol 17, No 3, p. 159-167, 1976. 4 fig, 5 tab, 26 ref.

Descriptors: *Embryonic growth stage, *Salinity, *Saline water, *Salt tolerance, *Osmosis, *Semipermeable membranes, *Juvenile growth stage, *Membranes, *Biological membranes, *Membrane processes, *Isopods, *Metabolism, Salts, Animal physiology, Life cycles.
Identifiers: Osmoregulation.

The salinity responses of the embryonic stages of the isopod Cyathura polita have been studied. The development of cleaving eggs and embryos from the two cell stage through juveniles leaving the marsupium was observed in salinities of 0, 0.5, 10, 20, 30 and 40%. The marsupial stages are the most salinity sensitive stages in the life cycle. Normal development can proceed in water with salinities in the interval between 0 and 30%. The vitelling and embryonic membranes osmoregulate, maintaining concentration differences in dilute and concentrated media. Membrane shedding is an osmotic process and is the developmental event most vulnerable to osmotic disruption. Fluids within the vitelline and embryonic membranes are favorable to water uptake in 0 to 20%, but not in 30 and 40%. After hatching, membrane-less juvenile are limited hyperosmotic regulators. The distribution of C. polita conforms to the salinity limitations of the marsupial stages. (Katz)
W78-00887

TOXICITY OF METHOXYCHLOR AND NALED TO SEVERAL LIFE STAGES OF LANDLOCKED ATLANTIC SALMON,
New York State Dept. of Environmental Conservation, Albany.
H. J. Dean, J. R. Colquhoun, and H. A. Simonin.
New York Fish and Game Journal, Vol 24, No 2, p. 144-153, 1977. 2 fig, 5 tab, 5 ref.

Descriptors: *Bioassay, *Toxicity, *Growth stages, *Pesticide toxicity, *Pesticide residues, Fry, *Pesticide kinetics, *Mortality, *Atlantic salmon, Salmon, Analytical techniques, Pesticides, Chlorinated hydrocarbon pesticides, Juvenile fish.
Identifiers: *LC50, *Naled, *Methoxychlor.

The toxicity of methoxychlor and naled was determined for several life stages of landlocked Atlantic Salmon. By static bioassay, it was found that for methoxychlor the 24-hour LC50 to feeding fry and yearlings was 92 and 75 micrograms per liter, respectively. For naled, the 24-hour LC50 to feeding fry and fingerlings was 165 micrograms per liter. Effects other than death were also noted. (Katz)
W78-00888

PHYSIOLOGIC AND ENVIRONMENTAL FACTORS INFLUENCING THE CALCIUM-TO-TISSUE RATIO IN POPULATIONS OF THREE SPECIES OF FRESHWATER PULMONATE SNAILS,
Oakland Univ., Rochester, MN. Dept. of Biological Sciences.
R. D. Hunter, and W. W. Lull.
Oecologia, Vol 29, p. 205-218, 1977. 3 fig, 4 tab, 37 ref.

Descriptors: *Calcium, *Chemical analysis, *Calcium carbonate, *Snails, *Population, *Animal physiology, Analytical techniques, Laboratory tests, Inorganic compounds, Aquatic animals, Mollusks, Growth stages, Genetics.
Identifiers: Tissue analysis, *Pulmonates, Shells, Physa gyrina, Physa integra, Helisoma anceps.

A study of three species of freshwater pulmonate snails was carried out from 1973 to 1976, primarily in Michigan. The ratio of whole animal calcium content to tissue dry weight (Ca:tissue ratio) changes with age, but these changes are largely restricted to early growth and do not significantly affect individuals over 40 mg total dry weight, regardless of species. Ca: tissue ratio of Physa gyrina did not vary greatly between populations and showed a narrow range over a wide range of environmental calcium concentrations. Shell mass in P. gyrine is therefore either physiologically regulated in all populations (at a species specific constant level) or interpopulation variation is minimized by moderatly high levels of gene flow between populations. There was no relationship between Ca:tissue ratio and environmental calcium for either Physa integra of Helisoma anceps over a wide range of snail and environmental calcium values. In both of the foregoing species, shell calcium content varied greatly between populations. This variation did not conform to any apparent geographic cline. (Katz)
W78-00889

A 96-HOUR BIOASSAY OF OTTER CREEK, OHIO,
Heidelberg Coll., Tiffin, Ohio.
For primary bibliographic entry see Field 5A.
W78-00890

ACCLIMATION OF FATHEAD MINNOWS AND LAKE TROUT TO RESIDUAL CHLORIDE AND BROMINE CHLORINE,
Grand Valley State Coll., Avendale, MI.
For primary bibliographic entry see Field 5B.
W78-00892

THE INFLUENCE OF DDT AND DDE ON THE EMBRYOGENESIS AND THE MORTALITY OF LARVAE OF COD (GADUS MORHUA L.),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
V. Dethlefsen.
Berichte der Deutschen Wissenschaftliche Kommissionfur Miercesforschung, Vol 25, p 115-148, 1976/1977. 24 fig, 6 tab, 102 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Fish eggs, *Toxicity, *Mortality, *Larvae, *DDT, *DDE, Growth stages, Life cycles, Metabolism, Absorption, Fish physiology, Environmental effects, Fish reproduction, Water quality, Resistance, Path of pollutants.
Identifiers: *Embryogenesis, *Cod, Gadus morhua.

Artificially fertilized eggs of cod were exposed to different concentrations of DDT and DDE in seawater. The percentages of malformed and dead embryos and malformed and dead larvae increased with increasing concentration of DDT, the lowest concentration of DDT still producing harmful effects was 0.025 ppm for embryos and 0.0095 ppm for larvae. Mortality showed three phases of pronounced susceptibility; epiboly, beginning of hatching and end of yolk sac phase. A shifting of the percentual hatching during the hatching period was mainly caused by larvae staying two to three days longer in their egg membranes than control embryos. Length of hatched larvae decreased with increasing concentrations of DDT. DDT proved to be more toxic than DDE; combinations of the two substances did not reveal synergistic effects. Present concentration of DDT in North Sea water was not considered likely to produce acute toxic effects to embryos and larvae of cod, but the ability of organisms to accumulate DDT from ambient water was thought to merit further investigation. (Klein)
W78-00893

THE EFFECTS OF MINE ACID ON THE POND RIVER WATERSHED IN WESTERN KENTUCKY,
Western Kentucky Univ., Bowling Green.
R. Dyer.
Water Resources Bulletin, Vol 13, No 5, p 1069-1074, 1977. 2 fig, 2 ref.

Descriptors: *Mine acids, *Acid mine water, *Sulfur compounds, *Mine wastes, *Coal mines, Water sheds(Basins), Runoff, Environmental effects, Mine drainage, Water pollution sources, Mine water, Ecosystems, Land reclamation, Trees, Kentucky, Wildlife, Migration.

The effects of H2S04 formed in unreclaimed coal mines were discussed. The acid was found to flow into lower swamp areas where it caused considerable damage to the ecosystem. The major effect was the mass destruction of thousands of trees and various other phreatophytic plants, resulting in wildlife migrating out of the affected areas. New methods of mine acid abatement were considered to make mass reclamation of the area more realistic now than in the past. (Klein)
W78-00894

FIELD-LABORATORY DETERMINED AVOIDANCES OF THE SPOTFIN SHINER AND THE BLUNTNOSE MINNOW TO CHLORINATED DISCHARGES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-00895

ALDRIN AND DIELDRIN UPTAKE IN INSECTICIDE-RESISTANT AND SUSCEPTIBLE MOSQUITOFISH (GAMBUSIA AFFINIS),
Mississippi State Univ., Mississippi State. Dept. of Zoology.
J. Watkins, and J. D. Yarbrough.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 6, p 731-737, 1975. 3 tab, 10 ref.

Descriptors: *Insecticides, *Aldrin, *Dieldrin, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Pesticide toxicity, *Tracers, *Marking techniques, *Tagging, *Biological membranes, *Permselective membranes, Lethal limit, Toxicity, Carbon radioisotopes, Populations, Membranes.
Identifiers: Tissue analysis, *Mosquitofish, Gambusia, Bioaccumulation.

Insecticide-resistant and susceptible mosquitofish were exposed to 14-C labeled aldrin and dieldrin for timed intervals. Whole body and tissue levels of the two organochlorine insecticides were compared between the two populations, as well as visible symptoms of poisoning. The fact that there was always a greater amount of the two insecticides in both whole body and tissues of S fish and R fish is suggestive of an effective insecticide barrier in R fish. However, this barrier can only be effectively demonstrated at high concentrations. The possibility of a greater turnover rate in R fish than in S fish cannot be ignored. However, the equal insecticide levels in R and S fish at the lower insecticide treatments seem to indicate equal turnover rates in both populations. This does not rule out the possibility that at higher insecticide treatments R fish may have eliminated the insecticides at a greater rate than S fish. (Katz)
W78-00896

TRACE METALS IN LIVER FROM BLUEFISH, TAUTOG AND TILEFISH IN RELATION TO BODY LENGTH,
Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-00897

THE BEHAVIOUR OF MERCURY IN THE SYSTEM WATER - FISH,
Technische Hochschule, Darmstadt (West Germany). Fachbereich fuer Anorganische Chemie und Kernchemie.
For primary bibliographic entry see Field 5B.
W78-00898

EPIBENTHIC INVERTEBRATES OF CROTON BAY IN THE HUDSON RIVER,
Boyce Thompson Inst. For Plant Research, Inc., Yonkers, NY.
For primary bibliographic entry see Field 5B.
W78-00899

TOXICITY OF WATER-SOLUBLE GASOLINE FRACTIONS TO FOURTH-INSTAR LARVAE OF THE MOSQUITO AEDES AEGYPTI L.,
Vermont Univ., Burlington. Dept. of Zoology.
W. O. Berry, and J. D. Brammer.
Environmental Pollution, Vol. 13, p. 229-234, 1977. 2 tab, 12 ref.

Descriptors: *Toxicity, *Gasoline, *Mosquitos, *Larvae, *Growth stages, *Larval growth, *Bioassay, *Aromatic compounds, Oil pollution, Fuels, Aquatic insects, Water pollution, Water pollution effects, Cuticle.
Identifiers: *LD50, *Benzene, *Toluene, *Xylene, Water soluble fraction.

The toxicity of water-soluble components of gasoline to laboratory-reared fourth-instar larvae of the mosquito, Aedes aegypti (L.) was investigated. A median lethal dose (LD50) and a non-lethal dose (NLD) were established for these larvae following a 24 h exposure to water-soluble fractions of benezene, toluene, and xylenes. Based on the actual amount of each component in solution, static toxicity bioassays showed that acute toxicity of these monoaromatics increased in the sequence benzene, toluene, Xylenes. However, toxicity increased in the sequence xylenes, benzene, toluene when results were examined with respect to the amount of aromatic added to water to produce the LD50. The importance of determining the concentrations of compounds dissolved in water when conducting any investigation of biological effects of water pollutants is stressed. Preliminary toxicity studies with other larval stages of A. aegupti indicate that water-soluble gasoline fractions are more toxic to the younger instars. Aquatic stages of the mosquito appeared to be exceptionally susceptible during moulting. This suggests that the cuticle serves as a barrier against entrance of water-soluble aromatics. (Katz)
W78-00900

5D. Waste Treatment Processes

VIBRATING SCREENS IN INDUSTRIAL WASTE WATER TREATMENT,
Link Belt Co., Colmar, PA.
W. P. Stilz.
In: Proceedings 10th Industrial Waste Conference, Purdue University, Lafayette, Indiana, Eng. Ext. Ser. No. 89, p. 381 - 390, May 1955. 4 fig.

Descriptors: *Screens, *Design criteria, *Food processing industry, *Hydraulic equipment, Industrial wastes, Pre-treatment(Water), *Waste water treatment.
Identifiers: Meatpacking wastes, Vibrating screens.

The functions, basic design criteria and advantages of the vibrating screen for use in industrial waste treatment are discussed. Vibrating screens normally operate at speeds of 1000- 20000 rpm in a motion of 1/32 in. to 1/8 in. Capacities on liquid type screens are based on percent open area of the cloth; normally type 304 stainless steel wire is used. Four typical examples of low cost installations in processing plants are presented; at the Rath Packing Company, Waterlook, Iowa vibrating screens are used to dewater 600 to 700 gpm of paunch manure; and to screen all wastewater from the plant processing floor, the solids being used as fertilizer. (Prodehl-EPA, Corvallis)
W78-00507

AN INDUSTRIAL WASTE GUIDE TO THE MEAT INDUSTRY.
American Meat Inst., Washington, DC. Committee on Meat Packing Plant Waste Disposal.
For primary bibliographic entry see Field 5B.
W78-00508

RENDERING PLANT WASTE TREATMENT STUDIES, II. PILOT PLANT INVESTIGATIONS,
North Carolina Univ. at Chapel Hill. School of Public Health.
M. L. Granstrom.
Sewage and Industrial Wastes, Vol. 24, No. 12, p. 1478-1488, December 1952. 8 fig, 2 tab, 1 ref.

Descriptors: *Waste water treatment, *Trickling filters, *Anaerobic digestion, *Chlorination, *Flocculation, *Food processing industry, Biochemical oxygen demand, Chemicals, Data collections, Air entrainment, Laboratory tests.
Identifiers: *Rendering wastes, Anaerobic fermentation.

Discussed are the findings of such rendering plant waste treatment processes chemical treatment using alum and chlorine with and without acid for pH control; air flocculation with and without alum; trickling filter pilot plant with recirculation, aeration, and effluent chlorination; anaerobic fermentation of the total waste; and sludge drying properties before and after observed digestion. All tests were performed on samples of the effluent from the grease removal tank. The experimental work using air flocculation with or without alum indicated some advantage to this treatment over straight settling. The waste is amenable to trickling filter treatment; a recirculation ratio of at least 2:1 should be maintained. There is essentially no stabilization in anaerobic fermentation, only coagulation, so, settling tank should be provided. Sludge can be handled with standard procedures and digestion is feasible. (Prodehl-EPA, Corvallis)
W78-00509

WASTES FROM SMALL POULTRY DRESSING ESTABLISHMENTS,
Center for Disease Control, Atlanta, GA.
For primary bibliographic entry see Field 5A.
W78-00510

TREATMENT OF WASTE FROM SMALL SLAUGHTERHOUSES,
Pennsylvania State Univ., University Park. Dept. of Sanitary Engineering.
R. R. Kountz.
In: Proceedings of the 9th Industrial Waste Conf., Purdue University, Lafayette, Indiana, Engr. Ext. Serv. No. 87, p 195-201, May 1954. 1 tab.

Descriptors: *Chemical precipitation, *Filtration, *Food processing industry, *Waste water treatment, Biochemical oxygen demand, Industrial wastes, Laboratory tests, Septic tanks.
Identifiers: *Meat packing wastes, Chemical treatment, Sand filtration.

When stream pollution must be abated cheaply and simply treatment of wastes from small slaughterhouses poses a special problem in contrast to the large complete meat plant. Research on this problem was done by the Pennsylvania State College of Engineering with assistance from the State Department of Health. Activated sludge and conventional trickling filter methods are uneconomical and unsatisfactory. When two sand filters were operated in series, waste was applied at a rate of 200,000 gallons per acre per day in four days at two-hour intervals and yielded a reduction of 95% BOD in the summertime and 85% in the wintertime. A single filter yields 85% and 60%, respectively. Septic tanks satisfactorily reduce the pollution load if a relatively large tank size can be justified. Hypochlorite-alum treatment of slaughterhouse waste will produce 95% or better reduction in BOD values of 1000-3000 ppm, but reduction drops off rapidly to 60 to 70% as the amount of process cooking in the plant increases. (Prodehl-EPA, Corvallis)
W78-00511

TANNERY WASTE MANAGEMENT,
Cincinnati Univ., Dept. of Environmental Engineering.
J. D. Eye.
Summary paper of presentation at the U.S. - Polish Waste Treatment R and D Seminar, Winter 1975. 20 p, 5 fig, 7 tab.

Descriptors: *Chromium, *Lagoons, *Tannery wastes, *Waste water treatment, Aerated lagoons, Anaerobic digestion, Aerobic treatment, Biochemical oxygen demand, Sulfides, Suspended solids, Waste identification.

Tanning of hides into leather creates a large volume of highly polluted wastes. Initially most of the pollutants are contained in relatively small volume highly concentrated waste fractions. Separation and pretreatment of waste fractions prior to blending for clarification and biological treatment appears to be the most efficient method for managing these wastes. Plant arrangement and discharge schedules often prevent effective separation of the waste fractions hence it may be necessary to treat the combined wastes as a single effluent. When separation and pretreatment are possible the usual procedure is to oxidize the sulfides with air using manganese as a catalyst and to precipitate chrome as chromium hydroxide. In some cases flue gas is used to lower the pH of the lime bearing wastes. The treatment of the combined waste streams usually includes screening, primary clarification with or without coagulants, aerobic biological treatment by activated sludge or aerated lagoons or a combination of aerated and non-aerated lagoons, final clarification, and disinfection if required. Treatment efficiencies for BOD and suspended solids removal often are well above 90 percent. Operational problems particularly those related to cold weather operation are discussed. (Prodehl-EPA, Corvallis)
W78-00512

RENDERING PLANT WASTE TREATMENT STUDIES,
North Carolina Univ. at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 5A.
W78-00513

SEWAGE EFFLUENT DISPOSAL THROUGH CROP IRRIGATION,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5E.
W78-00514

FERMENTATION AND ENZYMATIC SACCHARIFICATION OF CELLULOSE AND LIGNIN WASTE,
Rhode Island Univ., Kingston. Dept. of Chemical Engineering; Rhode Island Univ. Kingston. Dept. of Food Science and Technology; and Rhode Island Univ., Kingston. Dept. of Microbiology.
S. M. Barnett, D. Aidala, C. W. Houston, and A. G. Rand, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 820, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, September 19, 1977. 85 p, 28 fig, 91 ref. OWRT B-070-RI(1), 14-34-0001-6115.

Descriptors: Aeration, *Biodegradation, *Biological treatment, *Enzymes, Effluents, *Cellulose, *Lignin, Microorganisms, *Oxygenation, Pressure, Pollution abatement, Water pollution treatment, *Waste water treatment, *Fermentation, Foaming, Liquid wastes, Microbial degradation, Fungi.

Identifiers: *Trichoderma vinde, Coriolus versicolor, Phanerochaete chrysosporium.

This study is concerned with the effects of foaming and pure oxygen utilization upon growth and enzyme production of the organism T. viride QM9414 in a submerged fermentation solid cellulose; and the isolation of extracellular laccases from pure cultures of Coriolus versicolor and Phanerochaete chrysosporium. Pure oxygen flow rates are varied, and during growth and enzyme production data are compared to results obtained during air fermentation runs (with flow rates five times those of pure oxygen for comparison purposes and still to meet oxygen requirements of the organism for growth). At an initial cellulose concentration of 1.0% for all fermentation runs, aeration with pure oxygen resulted in an enhancing effect upon enzyme production rate (about 1.5-2 times as fast as with air). Better oxygen utilization was associated with the pure oxygen fermentations as indicated by slightly lower average DO levels. This was attributed to better oxygen mass transfer during the oxygen fermentations, which would favor protein synthesis. Foaming was a problem common to both air and oxygen systems, but more so to air runs, especially during the first 3-4 days. Enzyme was present in the foam, which would account in part for lower levels in solution. Cell autolysis, which favors good enzyme production, occurred at earlier times during the oxygen fermentations, which would also help to explain better enzyme production rates with pure oxygen. The phenomenon of catabolic repression, characteristic of both glucose and cellobiose, seemed to be evident especially during the earlier stages of both air control runs, which would have inhibited enzyme production during these times. The isolated laccase derived from the organisms degrade a purified lignin. The concentrated enzyme also showed substrate specificity for both guaiacol and hydroquinone and yielded a positive syringaldazine test.
W78-00554

DETOXIFICATION BY BARK FILTRATION OF SHOCK LOADS TO SECONDARY TREATMENT SYSTEMS,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 800, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, October 1977. 40 p, 9 fig, 16 tab, 27 ref. OWRT A-100-MISS(1), 14-34-0001-7052.

Descriptors: *Pulp wastes, Pulp and paper industry, *Waste water treatment, *Filtration, *Absorption, Biological treatment, Microorganisms, Microbiology.
Identifiers: Pine bark, Shock loads.

Pine bark, an abundant manufacturing residue, is examined for its effectiveness as an absorbent for leveling shock loads which can disrupt a pulp mill's wastewater treatment system. Two types of bark, aged (5-8 years old) and raw, were evaluated in batch tests as absorbents for shock loads. Three sizes of each bark were tested. Aged bark was considerably more effective than raw bark in both rate of absorption and amount of absorption of shock loads. Bark size affected the rate of absorption, but not the total amount of absorption at equilibrium. Microbial activity was observed in effluent containing shock loads that had been contacted with bark. Untreated shock loads prevented microorganisms from growing. It is estimated that an aged bark filter 6 feet deep and less than 1/3 acre in size would be sufficient to neutralize the shock loads from a typical pulp mill for one year.
W78-00556

DUAL MEDIA FILTRATION OF WASTE STABILIZATION POND EFFLUENT,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
M. T. Bond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 769, Price codes: A04 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, September 1977. 52 p, 22 fig, 5 tab, 16 ref, append. OWRT A-107-MISS(1), 14-34-0001-7052.

Descriptors: *Oxidation lagoons, Algae, *Filters, *Filtration, Effluents, *Waste water treatment, Suspended solids, Settling basins, Nitrogen, Phosphorus.
Identifiers: *Dual media filtration, Sand filters, Coal filters.

This laboratory study examined the possibility of using dual media filtration as a method to remove suspended solids from waste stabilization pond effluents. Three filters were used. Filter beds were constructed by placing a layer of coal on top of a layer of sand. A minimum amount of intermixing of the two materials occurred when the filters were backwashed. Filter sands having an effective grain size of 0.2, 0.4 and 0.6 mm were used to pack six-inch diameter plexiglas columns to a depth of 24 inches. All coal media had an effective size of 0.9 mm, a uniformity coefficient of 1.5, and an in-column depth of 6 inches. Filters were operated both with and without the addition of coal to the beds. Maximum removal of suspended solids was approximately 50% for the 0.2 mm effective grain size dual media filters. Filters could be operated for only 8 to 14 hours before clogging. Nitrogen and phosphorus removal by the filters was organically bound material, contained in the cells of algae, and other matter was retained in the media. Backwash requirements for cleaning the 0.2 mm sand were much less than for the coarse filters. Dual media filters were much easier to clean than sand filters.
W78-00557

ADVANTAGES AND DISADVANTAGES OF REGIONAL SEWERAGE SYSTEMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W78-00562

BAYESIAN MODEL DISCRIMINATION FOR BOD ANALYSIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-00620

HEURISTIC ALGORITHM FOR WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
C. H. Chiang, and D. T. Lauria.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE5, p 863-876, October 1977. 6 fig, 3 tab, 18 ref.

Descriptors: *Waste water treatment, *Pollution abatement, *Algorithms, Computer programs, Costs, Sanitary engineering, Optimization, Planning, Cost comparisons, Regions, Treatment facilities, Sewers, Pumping plants, Equations, Evaluation, Systems analysis.
Identifiers: *Heuristic methods, Systems engineering.

A heuristic algorithm has been developed for engineers and planners to make cost evaluations during regional wastewater planning in regard to the location, timing, and scale of treatment plants, sewers, and pumping stations. The algorithm is an iterative procedure which consists of both spatial and temporal cost comparisons in the search for optimality in wastewater planning. While spatial comparisons explore the possibility of combining two or more spatially distinct plants, temporal comparisons consider the possibility of combining two or more temporally distinct plants and transport lines. The algorithm yields quickly a sequence of good or perhaps least-cost solutions with modest machine and user requirements. (Bell-Cornell)
W78-00630

DISCUSSION 'REGIONAL PLANNING FOR LAND DISPOSAL OF WASTEWATER,' BY R.E. MARKLAND, ET AL.,
Meta Systems, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W78-00644

LARGE WASTE TREATMENT SYSTEMS: DESIGN FOR BOTH EFFICIENCY AND INFLOW LEVEL OF EACH PROCESS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
In: Large Engineering Systems: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, Aug. 9-12, 1976. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, 1977, p 285-296. 5 fig, 17 ref.

Descriptors: *Waste water treatment, *Design, *Economic efficiency, *Liquid wastes, *Treatment facilities, *Networks, Optimization, Efficiencies, Algorithms, Equations, Analytical techniques, Inflow, Biochemical oxygen demand, Environmental control, Water quality control, Systems analysis, Dynamic programming.
Identifiers: *Cost minimization, Goal programming.

Waste treatment entails reduction of the loads which wastes exert on the environment and/or the balancing of these loads among receiving environmental media. Regarding liquid wastes, a waste treatment system might be a specific unit operation within a treatment plant, the whole treatment plant, or a group of plants along a stream. In designing a waste treatment system, the essential measures of system effectiveness refer to the inflow capacity, the operation efficiency, the outflowing waste load, and the cost. The design problem is to select the system operating conditions in terms of waste load reduction and the inflow level that minimizes cost and keeps outflowing wastes within specified limits. In the case of a plant, the above dual selection refers to each and every process. Although the cost of a treatment system is a function of both efficiency and inflow level, existing analytical tools ignore inflow level as a design variable. As is typical of several large systems, capability of the analytical tool and/or availability of relevant data have limited system analysis. Herein, a detailed statement of the general waste treatment system design problem is presented in analytical terms. Simplifications and limitations of existing solution methods are discussed. Suggested is an efficient network model through which the system can be optimized for both inflow and efficiency of each component process. This new model can consider the design of a wholly new system or an expansion of an existing system. Each arc of the network model corresponds to a unit process. The optimization algorithm developed is especially efficient for large networks. (Bell-Cornell)
W78-00647

LEGAL CRITICAL FACTOR ANALYSIS (IN COMPLIANCE WITH THE AREA-WIDE WASTE TREATMENT MANAGEMENT PLANNING PROGRAM).
Miami Valley Regional Planning Commission, Dayton, OH.

For primary bibliographic entry see Field 5G.
W78-00651

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5C.
W78-00751

NATIONWIDE EVALUATION OF COMBINED SEWER OVERFLOWS AND URBAN STORMWATER DISCHARGES. VOLUME I: EXECUTIVE SUMMARY,
American Public Works Association, Chicago, IL.
R. H. Sullivan, M. J. Manning, J. P. Heaney, W. C. Huber, and M. A. Medina, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 133, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/2-77-064a, September 1977, 95 p. 13 fig, 31 tab. 68-03-0283.

Descriptors: *Storm runoff, *Cities, *Urban drainage, *Water pollution sources, *Urban runoff, *Water pollution control, Combined sewers, Separated sewers, Environmental effects, Simulation analysis, Treatment, Secondary treatment, Waste water treatment, Storage, Waste storage, Optimization, Management, Annual costs, Capital cost, Biochemical Oxygen Demand, Suspended solids, Sites, Heavy metals, Planning, Project planning, Multiple purpose projects.
Identifiers: *Urban stormwater discharges, Street refuse, Site specific factors, Prediction models.

This study analyzes the cost of abating pollution from combined sewer overflows and urban stormwater; the impact of these discharges on receiving waters; and the pollution potential of these discharges. Continuous simulation runs using one year of hourly data were made to determine the attainable level of pollution control with a specific availability of storage volume and treatment rate in five cities--Atlanta, Denver, Minneapolis, San Francisco, and Washington, D.C. This procedure was used to derive generalized equations relating pollution control to storage and treatment. These results were combined in a simple optimization which determined the optimal mix of storage and treatment for any feasible level of control for any city. The nationwide assessment resulted in specific annual and capital investment cost estimates for given levels of control. These costs can be reduced significantly if stormwater pollution control is integrated with best management practices and integrated into a multi-purpose program. The assessment of pollution potential and resulting impact of urban runoff identified direct connections between parameters such as biochemical oxygen demand (BOD) and suspended solids, and the amount of street refuse. Some parameters appear to be related to more site specific factors. Practical limitations necessitate relating pollution abatement to BOD and suspended solids. (Nessa-NC)
W78-00752

CONTROL OF WATER POLLUTION IN NEW YORK CITY,
New York City Dept. of Water Resources.
For primary bibliographic entry see Field 6E.
W78-00796

5E. Ultimate Disposal Of Wastes

SEWAGE EFFLUENT DISPOSAL THROUGH CROP IRRIGATION,
Wisconsin Univ., Madison. Dept. of Soils.
C. D. Henry, R. E. Moldenhauer, L. E. Engelbert, and E. Truog.
Sewage and Industrial Wastes, Vol. 26, No. 2, p 123-135, February 1954. 4 fig, 3 tab, 11 ref.

Descriptors: *Crops, *Waste disposal, Food, *Irrigation effects, *Sewage effluents, Biochemical oxygen demand, Data collections, Disinfection, Fertilizers, Ground water, Infiltration, Land use.
Identifiers: *Meat packing wastes.

Investigations were carried out to provide information under certain specific conditions with regard to the amount of wastewater that can be applied, and its effect on crops, soil, and ground water conditions. Investigations on the disposal of sewage effluent through irrigation from Oscar Mayer and Company packing plant were begun in August, 1950; initially by lysimeters on various soil types, and later by the field irrigation method. Irrigation on Reed canary grass, followed treatment by primary settling and trickling filters. Samples of effluent used for irrigation were taken. Concentration of various ions of sodium and total concentration of cations (in equivalents per million) of the effluent were 79.5 and 37.2 respectively. Comparable values required for suitable irrigation are 80 and 25, which indicated that this effluent is not particularly suited for irrigation. The effectiveness of the soil and crops to remove nitrogen, phosphorous, potassium, and coliform bacteria from the effluent percolated through the soil is tabulated. (Prodehl-EPA, Corvallis)
W78-00514

EFFECTS OF SLUDGE APPLICATIONS ON SOIL WATER AND VEGETATION IN A NORTHERN HARDWOOD FOREST IN NEW ENGLAND,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-00567

DISCUSSION 'REGIONAL PLANNING FOR LAND DISPOSAL OF WASTEWATER,' BY R.E. MARKLAND, ET AL.,
Meta Systems, Inc., Cambridge, MA.
J. Kuhner, and J. J. Harrington.
Water Resources Bulletin, Vol. 13, No. 4, p 847-852, August 1977. 15 ref.

Descriptors: *Regions, *Planning, *Waste water disposal, *Optimization, *Mathematical models, Land, Equations, Algorithms, Water quality, Decision making, Constraints, Alternative planning, Linear programming, Economic efficiency, Systems analysis.
Identifiers: *Mixed-integer programming.

In the paper by Markland, et al., an interesting application of mixed-integer programming (MIP) to a public planning problem is demonstrated. Large-scale models of this type are rarely used due to the costs involved in setting up the model, acquiring and preparing the input data, and applying the MIP-algorithm. Therefore, a discussion of this paper is presented in which the major concerns are: the set up and relevance of the model; the performance of IBM's MIP-algorithm; the notion of the 'best plan;' and the usefulness of the results. The writers criticize that the authors' model is clearly oversophisticated in the light of the quality of the data used as input. Discussed are aspects which diminish the usefulness of searching for the single best plan. Although Markland, et al., should be comended for tackling this regional planning problem by mathematical programming which yields few useful results and those quite inefficiently, it is concluded. Recommended is an approach which eliminates the notion of 'best plan,' replacing it with 'alternative non-inferior plans' and the concept of 'Pareto Admissibility.' (See also W76-11706) (Bell-Cornell)
W78-00644

WATER QUALITY AND EFFLUENT STANDARDS OF HAWAII,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-00652

DISTRIBUTION OF INJECTED WASTEWATER IN THE SALINE LAVA AQUIFER, WAILUKU-KAHULUI WASTEWATER TREATMENT FACILITY, KAHULUI, MAUI, HAWAII,
Geological Survey, Menlo Park, CA. Water Resources Div.; Geological Survey, Reston VA.; and Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-00814

OCEAN DUMPING -- RESEARCH AND MONITORING OF OCEAN DISPOSAL EFFECTS,
National Oceanic and Atmospheric Administration, Rockville, MD.
For primary bibliographic entry see Field 5C.
W78-00830

ENVIRONMENTAL ASPECTS OF DRILLING FLUID AND DRILL CUTTINGS DISPOSAL,
Exxon Co., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-00833

5F. Water Treatment and Quality Alteration

LEGAL CRITICAL FACTOR ANALYSIS (IN COMPLIANCE WITH THE AREA-WIDE WASTE TREATMENT MANAGEMENT PLANNING PROGRAM).
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-00651

HOW WILL SMALL UTILITIES COMPLY WITH THE SAFE DRINKING WATER ACT,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5G.
W78-00655

REGULATIONS: REACTIONS AND RESOLUTION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00656

5G. Water Quality Control

ATMOSPHERIC REAERATION IN A LAKE,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
S. L. Yu, T. J. Tuffey, and Drun-Sun Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 849, Price codes: A04 in paper copy, A01 in microfiche. Rutgers Water Resources Research Institute, Completion Report, August 1977. 50 p, 17 fig, 5 tab, 38 ref. OWRT A-041-NJ(1). 14-31-0001-5031.

Descriptors: *Reaeration, Wind velocity, *Oxygenation, Hydrodynamics, New Jersey, *Dissolved oxygen, Water quality, Wind, Oxyge, *Turbulence, Estuaries, Lakes, Reservoirs, *Mass transfer, *Boundary layers.
Identifiers: Estuary modeling, *Spruce Run Reservoir(NJ), *Reaeration coefficient.

An investigation of reaeration and its relationship to aerodynamic and hydrodynamic variables was conducted. Mass transfer and boundary layer theories are utilized to formulate a functional relationship between the reaeration coefficient and

pertinent physical parameters. Field work was carried out in Spruce Run Reservoir (located in Central N.J.) to obtain actual measurements of these parameters. Correlation analysis was then performed to yield several best-fit equations. Wind speeds were measured at three different heights above the surface level of the water within the plastic-lined circular pools, which were the apparatus adopted for experimentation. Results show that wind speed is a limiting factor affecting reaeration in a lake. The highest correlation was with the wind speed at the lowest height, indicating that the reaeration coefficient, K2, is a function of surface turbulence created by wind. The prediction equations thus generated assume a linear relationship between the reaeration coefficient and the wind speed. This relationship is considered to be applicable from a critical wind speed where air motion transfers from the hydraulically smooth regime to the transition regime, and then to the wind speed at which waves start breaking. The water depth was inversely proportional to K2. This demonstrates that the overall liquid film coefficient is directly proportional to wind speed. The result showing the existence of a critical wind speed below which reaeration does not significantly vary agrees well with the theoretical consideration and with the results obtained in laboratory tanks by previous researchers. The derived prediction formulas, though of simplistic form, would shed some light on the uncertainties still existing on this subject due to the incorporated wind parameter inherent of stochastic nature. These equations are capable of predicting reaeration coefficients of water systems under the circumstance where the air motion is a predominant source of turbulence.
W78-00561

ADVANTAGES AND DISADVANTAGES OF REGIONAL SEWERAGE SYSTEMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 826, Price codes: A02 in paper copy, A01 in microfiche. Partial Completion Report, presented at 13th Annual Meeting, AWRA, Tucson, Arizona, October 31-November 3, 1977. 13 p, 2 fig, 13 ref. OWRT A-048-NJ(2). 14-34-0001-8032.

Descriptors: *Sewage, *Water quality, *Pipelines, *Interceptor sewers, *Environmental effects, *Land use, *Urbanization, Sewage treatment, Sewerage, Sewage systems, Sewage disposal, Low flow, Regional analysis.
Identifiers: Land use planning, Land use development, *Regional sewerage systems.

A few years ago, many water quality administrators were convinced that large regional sewerage systems, consisting of one large treatment plant and long trunk sewers extending out to various communities, represented the only efficient and economical means of assuring water quality control. In communities favoring rapid development, the provision of sewer service and encouragement of development of new centers along the trunk sewers offered an additional advantage. More recently quite different points of view are arising in certain areas. In parts of New Jersey strong environmental and community resistance has arisen to proposed central plant-trunk sewer systems. The facilitating of new development along the trunk sewers is viewed as a menace by townships which do not want intensive development of these areas. The diversion of effluent flows to trunk sewers rather than septic tanks would dry up the streams which water quality programs are supposed to protect. Both sides to the controversy have mobilized engineering, environmental, economic and legal expertise and some critical policy issues have developed. Reconsideration of regional sewerage management and particularly trunk sewer policy is required. The decision as to extent of sewerage service areas involves complex and sensitive planning issues. Because of potential conflicts of interest, such decisions should not be left to staffs of sewerage authorities and their design engineers.
W78-00562

THE IMPACT OF WATER SAVING DEVICE INSTALLATION PROGRAMS ON RESOURCE CONSERVATION,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 3D.
W78-00563

DISPERSAL AND ALTERATION OF OIL DISCHARGED ON A WATER SURFACE,
Chevron Oil Field Research Co., La Habra, CA.
For primary bibliographic entry see Field 5B.
W78-00575

CRITICAL SPECIES, INCLUDING MAN, WITHIN THE BIOSPHERE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr.
Die Naturwissenschaften, Vol. 62, p 193-199, 1975. 5 fig, 25 ref.

Descriptors: *Ecosystems, *Environmental control, *Protection, *Waste assimilation capacity, Water quality, Industrial wastes, Treatment facilities, Wastes, Monitoring.
Identifiers: *Quality control, *Environmental quality, Critical species.

The protection of critical ecosystems appears to be a sounder management strategy than the protection of critical species. Environmental quality-control systems designed to protect ecosystems are described herein. These quality-control systems will make it possible to optimize the ability of ecosystems to assimilate and transform wastes and protect them from degradation. The article begins with an identification of critical species and discusses the difficulties in establishing an adequate critical-species list. Given is a list of benefits likely to result from the approach recommended herein. Discussed are fundamental assumptions upon which the environmental quality-control systems are based. Considered are an in-plant-early warning system or biological monitoring system for industrial wastes, including in-stream systems. The environmental quality-control assimilative capacity approach is justified in terms of our dependency upon the capacity of the environment to assimilate and transform societies' waste; we must develop organizational and managerial capabilities to insure quality control. Biological-chemical-physical information systems coupled with these capabilities should enable us to optimize our use of assimilative capacity and at the same time protect other qualities on a continuing basis. (Bell-Cornell)
W78-00619

WATER FOR ENERGY: AN APPROACH TO COMPREHENSIVE IMPACT ASSESSMENT,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6G.
W78-00624

A COMPUTER PROGRAM FOR MODELING OF WATER QUALITY PARAMETERS IN STEADY STATE MULTI-DIMENSIONAL NATURAL AQUATIC SYSTEMS, (SECOND EDITION),
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W78-00632

SNSIM1/2 'A COMPUTER PROGRAM FOR THE STEADY-STATE WATER QUALITY SIMULATION OF A STREAM NETWORK,'
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W78-00633

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6A.
W78-00649

LEGAL CRITICAL FACTOR ANALYSIS (IN COMPLIANCE WITH THE AREA-WIDE WASTE TREATMENT MANAGEMENT PLANNING PROGRAM).
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 378, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-208-MVRPC-M7, March 1976. 219 p.

Descriptors: *Ohio, *Water management(Applied), *Water quality, *Water quality control, Waste water treatment, Waste water control, Water pollution, Water quality, Water treatment, Sanitary engineering, Sewage disposal, Sewage treatment, Water pollution control, Water pollution treatment, Water quality standards, Water law, Governments, Administrative agencies, State governments, Governmental interrelations, Municipal wastes.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Miami Valley.

Under the provisions of Section 208 of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, planning agencies, preparing to implement an area-wide water quality plan must first submit a report to the Administrator of the Environmental Protection Agency (EPA) analyzing the legal capacities of any governmental unit which might be engaged in water pollution control activities in the area. The Miami Valley Regional Planning Commission has submitted this report in preparing a water quality management program for a five-county region in Ohio. The legal functions and powers of eleven types of governmental units are analyzed in comparing the statutory powers of each unit with the management agency descriptions provided by the FWPCA and the implementing guidelines issued by the EPA in 1975. The governmental entities reviewed include the Ohio Environmental Protection Agency, the Ohio Water Development Authority, the Ohio Department of Natural Resources, regional water and sewer districts, Regional Planning Commissions, soil and water conservation districts, and certain municipal corporations. (Sloan-Florida)
W78-00651

WATER QUALITY AND EFFLUENT STANDARDS OF HAWAII,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
G. L. Dugan, R. H. F. Young, and L. S. Lau.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 100, No 9, p 1245-58, September, 1974. 19 ref.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Hawaii, *Legislation, *Water quality standards, Oceans, Coasts, Oxygen demand, Eutrophication, Oxygen requirements, Nitrogen, Nitrogen cycle, Nitrification, Sewage disposal, Water Quality Act, Sediment discharge, Outlets, Effluents, Treatment facilities, Waste treatment, Water treatment.
Identifiers: *Coastal waters, *Coastal zone management, *Federal Water Pollution Control Act Amendments of 1972, *Marine ecosystems,

*Marine environment, Effluent guidelines, Effluent limitations, State policy, Non-point sources(Pollution), National Pollution Discharge Elimination System, Ocean outfalls.

The increased population and rapid development taking place in Hawaii have caused concern over environmental degradation and water quality management. Experience obtained from water quality standards in mainland river basin systems is ineffective because of Hawaii's island nature. The problem is the ability of the coastal zone to assimilate increasing waste loads. Present water quality standards in Hawaii are inadequate to protect the state's environmental, esthetic, and economic interests. Attempts to develop standards to meet future problems have been partially successful, and continuing collection of data will add to the efficacy of future standards. Laws modeled on river basin systems have been ineffective in Hawaii where all wastes are disposed of in the coastal zone. The chemistry of waste decomposition differs in the receiving waters of deep ocean outfalls. Federal guidelines based on inland problems do not adequately correct Hawaii's coastal problems. State provisions based on Hawaii's unique geography are necessary for maintenance of effective water quality standards. (Molloy-Florida)
W78-00652

EFFECTS OF NEPA'S REVIEW AND COMMENT PROCESS ON WATER RESOURCE PLANNING (SURVEY RESULTS),
Stanford Univ., Calif. Dept. of Engineering.
For primary bibliographic entry see Field 6G.
W78-00654

HOW WILL SMALL UTILITIES COMPLY WITH THE SAFE DRINKING WATER ACT,
Washington State Dept. of Social and Health Services, Olympia.
J. C. Pluntze.
Water and Sewage Works, Vol 124, No 1, p 50-53, January 1977. 5 tab, 2 ref.

Descriptors: *Potable water, *Utilities, *Water analysis, *Chemical analysis, Water works, Public health, Domestic water, Water purification, Water chemistry, Water pollution, Impaired water quality, Water pollution control, Water quality control, Water treatment, Water pollution treatment, Water sampling, Testing, Water supply, Standards, Monitoring, Turbidity, Economic impact, Heavy metals.
Identifiers: *Safe Drinking Water Act.

Small utilities are most affected by the Safe Drinking Water Act and related Environmental Protection Agency (EPA) regulations. Inadequate financing, planning and management make compliance more difficult for water utilities with less than 1000 service connections. Bacteriological sampling is now mandatory for almost all utility systems. Frequency of monitoring is specified and improvement in water treatment will be required. With the exception of turbidity, small utilities already in compliance with the 1962 Public Health Service Drinking Water Standards will have little extra to do to meet these requirements. However, the financial burden on facilities for the removal of heavy metals, nitrates and pesticides is not yet clear. Among the benefits to small utilities are research grants, training of waterworks operators and a better informed public. EPA suggestions to help small utilities achieve compliance include regionalization to spread cost, development of new sources not requiring treatment, blending of sources, purchasing water from another utility, and development of a satellite system to centralize cost and management. It is suggested that public funds be made available to assist small utilities. Five data tables supplement the article. (Mulligan-Florida)
W78-00655

REGULATIONS: REACTIONS AND RESOLUTION.
Environmental Protection Agency, Washington, DC.
Journal of the American Water Works Association, Vol 68, No 2, p 77-82, February 1976.

Descriptors: *Regulation, *Potable water, *Municipal water, *Water supply, Water law, Safety factors, Water quality control, Water temperature, Utilities, Waste, Sodium, Sulfates, Asbestos, Monitoring, Measurement, Organic pesticides, Organic compounds, Cost analysis, On-site investigations, Administrative agencies, Water consumption.
Identifiers: *Safe Drinking Water Act, Public hearings, Notice.

The Interim Primary Drinking Water Regulations required by the Safe Drinking Water Act were proposed in March 1975 to be effective 18 months later. The Environmental Protection Agency (EPA) requested public comments on the proposed regulations. This article is a survey of the issues raised by the public's comments and an explanation of the agency's response. Of public concern was the proposed definition of a 'public water system' and how, under that definition, the interim regulations would affect small community and noncommunity water systems. Other comments involved the selection of substances for establishing Maximum Contaminant Levels, what the proper contaminant levels should be, where they should be measured and what safety factors should be introduced. The author also discusses the issue of proper public notice, the value of adequate record keeping and the results of the EPA's economic and cost analysis of the regulations. Although there are technical problems in implementing the Safe Drinking Water Act, the cooperation of members of the professional community can make the legislation work. (Curran-Florida)
W78-00656

SUCCESS STORIES IN MULTIPLE USE,
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Region Office.
For primary bibliographic entry see Field 6B.
W78-00660

FARRUGIA V. FREDERICK (DENIAL OF CANAL PERMIT BASED ON ADVERSE EFFECTS UPON WATER QUALITY).
For primary bibliographic entry see Field 6E.
W78-00670

THE VELUWE ARTIFICIAL RECHARGE PLAN WATER QUALITY ASPECTS,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
B. C. J. Zoeteman, I. J. Hrubec, and F. J. J. Brinkmann.
Journal of the Institution of Water Engineers and Scientists, Vol. 30, No. 3, p 123-137, May 1976. 11 fig, 2 tab.

Descriptors: *Groundwater recharge, *Artificial recharge, *Pre-treatment(Water), *Water quality, Water treatment, Clogging, Tunnels, Aquifers, Recharge ponds, Canals, Pilot plants, Laboratory tests, Evaluation, Coagulation, Sedimentation, Filtration, Chlorination, Foreign research, Foreign countries.
Identifiers: *Netherlands.

Water quality aspects were discussed considering two types of artificial recharge systems: (1) underground tunnels; and (2) open canals or ponds. Both systems were studied in a pilot plant located at Leiduin, the dune area near Amsterdam, The Netherlands. Effects of different grades of water treatment on performance of both types of recharge systems were determined. A pretreatment system was proposed that consists of at least coagulation, sedimentation, ozonisation, secondary coagulation, biological filtration, breakpoint chlorination, and acuivated carbon filtration. In this way it is expected that high recharge rates of approximately 10 m/day and long recharge runs of several years in case of exclusion of light can be realized. As the quality of the water to be recharged is comparable to that of drinking water, contamination of the soil and pollution of local water resources by eventual losses of recharged water will be very limited. Those substances that are accumulated in the soil are concentrated mostly in the top-layer of the recharge medium, and practically all will be removed during cleaning of mechanically clogged sand layers. Underground storage of water gives different advantages over open storage in reservoirs, like reduction of temperature fluctuations, exclusion of light, limited claim on space, and better protection of the stored water, e.g., against pollution from the atmosphere. The advantages make artificial recharge a preferable water storage technique to open reservoirs in case of a free choice between the two techniques can be made. (Humphreys-ISWS)
W78-00690

AERATION OF HYDRO RELEASES AT FT. PATRICK HENRY DAM,
Tennessee Valley Authority, Chattanooga. Water Quality and Ecology Branch.
R. J. Ruane, S. Vigander, and W. R. Nicholas.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY10, Proceedings Paper 13291, p 1135-1145, October 1977. 7 fig, 2 tab, 5 ref, 1 append.

Descriptors: *Aeration, *Oxygenation, *Tennessee, *Dissolved oxygen, *Hydroelectric plants, Powerplants, Diffusion, Bubbles, Oxygen, Water quality, Reservoirs, Turbines, Hydraulic turbines, Dams, Discharge(Water).
Identifiers: *Ft. Patrick Henry Dam(Tenn), Diffusers.

A method was developed for increasing dissolved oxygen concentrations in the turbine releases from hydroelectric power plants. A systematic procedure was used for evaluating promising solutions to low DO concentrations. The method selected for development at Fort Patrick Henry Dam was oxygen injection by use of small pore diffusers located upstream from the turbine intakes. Laboratory tests included determination of bubble sizes and oxygen transfer efficiency. Field tests for oxygen transfer efficiency were performed for 2 different diffusers. Additional tests were performed to assess the effect of spacing between diffusers on oxygen transfer efficiency. (Sims-ISWS)
W78-00711

INLAND LAKE PROTECTION IN NORTHERN MICHIGAN (NORTHERN MICHIGAN ENVIRONMENTAL RESEARCH PROGRAM EDUCATIONAL SERIES: PUBLICATION NO. 1),
Michigan Univ., Ann Arbor, Biological Station.
For primary bibliographic entry see Field 6G.
W78-00716

AN ASSESSMENT METHODOLOGY FOR THE ENVIRONMENTAL IMPACT OF WATER RESOURCE PROJECTS,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 6G.
W78-00750

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME I-SUMMARY REPORT,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 6G.
W78-00753

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME II-DETAILED ANALYSES AND SUPPORTING MATERIALS,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-00754

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME III-PRELIMINARY POLICY ANALYSIS,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-00755

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME IV-APPENDICES,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 6G.
W78-00756

APPLICATION OF NUMERICAL CLASSIFICATION IN ECOLOGICAL INVESTIGATIONS OF WATER POLLUTION,
Virginia Inst. of Marine Sciences, Gloucester Point, VA.
For primary bibliographic entry see Field 6G.
W78-00771

IMPLEMENTATION PLAN FOR THE COST OF A CLEAN ENVIRONMENT REPORT.
Control Data Corp., Rockville, MD. Professional Services Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 911, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Washington Environmental Research Center, U.S. Environmental Protection Agency, Washington, D.C., July 29, 1974, 46 p, 9 fig. 68-01-2013.

Descriptors: *Cost analysis, *Cost comparisons, *Environmental control, *Environmental effects, Pollutants, Pollution abatement, Treatment facilities, Annual costs, Basic data collections, Air pollution effects, Water pollution, Water pollution effects, Water pollution sources, Federal Water Pollution Control Act, Clean Air Act.
Identifiers: *Cost of a Clean Environment(CCE).

This report describes the approach used to develop the 1975 Cost of a Clean Environment (CCE) report. The study begins with the effects of pollution and works toward identifying the sources and technologies that apply to those sources. A literature search was conducted to document the effects of pollution. Pollutant sources were categorized by sector, and then detailed studies for specific source categories within the sectors were conducted. Alternate control technologies are identified for specific source categories, along with associated cost functions and sufficient treatment data to determine annual costs for each alternative. This information is then expanded to give national data by sector. The information and analysis produced by the detailed source studies were used to estimate control costs. Cost functions and associated treatment data from these studies were used to forecast abatement costs for selected years. Standard analysis summary sheets can provide information aggregated to state, federal region or national levels, and can be sorted by pollutant type or by sector. The CCE report is compiled in order to provide Congress with information regarding the cost of pollution controls necessary to achieve legislated air and water quality standards. This report explains how the cost study has been streamlined. (Nessa-NC)
W78-00772

ENVIRONMENTAL ASSESSMENT PERSPECTIVES,
GCA Corp., Bedford, MA. GCA Technology Div.
P. F. Fennelly, M. T. Mills, S. M. Weinstein, D. F. Durocher, and A. S. Werner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 911, Price codes: A11 in paper copy, A01 in microfiche. Report EPA 600/2-76-069, March 1976. 238 p, 27 tab, 26 fig, 5 append. 68-02-1316, Task 13.

Descriptors: *Assessments, *Energy, Pollutant identification, *Data acquisition, *Methodology, *Environmental effects, Standards, Basic data collections, Model studies, Regulation, Monitoring, Sampling, Analytical techniques, Mathematical models, Testing.
Identifiers: *Environmental assessment, *Energy system development.

The purpose of this study is to define the environmental assessment (EA) process in relation to energy system development. The report defines EA programs and their roles in energy system development; indicates data requirements of an EA; outlines methodologies for acquiring the necessary data; serves as a technology transfer vehicle by providing background information on environmental monitoring and modeling which can be used in EA's; summarizes the extent, quality, applications, and location of existing information resources which can be used in planning of EA's; and summarizes existing or proposed standards and criteria for evaluating air, water, and land based pollution. Included in the report are: waste stream characterization and pollution identification; identification of indirect pollution associated with energy system development; evaluation of environmental impact; estimating the sphere of influence of an energy system; mehtodology for conducting source tests; use of dispersion models; available data banks and information sources; and existing and proposed environmental regulations. Each topic is explored to the extent necessary to acquaint the user with current standards, sampling and analytical techniques, and environmental models. General discussions are supplemented with specific examples. (Nessa-NC)
W78-00773

INTERNATIONAL OCEAN INSTITUTE,
Center for the Study of Democratic Institutions, Santa Barbara, CA.
For primary bibliographic entry see Field 6E.
W78-00780

SOUTHERN DISCOMFORT - LEARNING TO LIVE WITH THE WATER ACT,
L. Popovich.
Journal of Forestry, Vol. 74, No. 8, p. 532-38, August 1976.

Descriptors: *Forest management, *Forestry, *Water quality control, *Permits, Governmental interrelations, Stagnant waters, Standing waters, Running waters, Wet-lands, Aquatic vegetation, Standards, Water quality standards, Water pollution control, Pulp and paper industry, Land management, State governments, Water quality, Administrative agencies, Adoption of practices, Administration, Administrative decisions.
Identifiers: *Nonpoint sources(Pollution), *Corps of Engineers, *Federal Water Pollution Control Act Amendments of 1972, *Environmental Protection Agency, Point sources(Pollution), Administrative regulations.

Phase III of the Corps of Engineers water quality regulations under Section 404 of the Federal Water Pollution Act Amendments of 1972 extended the Corps' permit authority to include all of the waters of the United States. Forestry interests were wary that the Corps would institute a one-permit-per-culvert approach, which would result in high costs and delays in obtaining permits. They also feared that the Corps' definition of 'aquatic vegetation' would require them to get wetland permits for areas which, up unitl now, had been considered standing water. The Environmental Protection Agency (EPA) concern lies with state regulation under Section 208 of the Act, the program for controlling nonpoint pollution. Of the Acknowledged sources of water pollution from forestry practices, very few are considered point sources subject to permits. The EPA's 'best management practices' program for achieving water quality standards is difficult to comply with since few best management practices have been identified. Cooperation between foresters, the EPA and the Corps will make implementation of water quality standards easier for everyone. (Kastner-Florida)
W78-00781

WATER QUALITY WORKSHOPS: TALKING IT OVER WITH EPA,
American Forestry Association, Washington, DC.
R. Paido.
Journal of Forestry, Vol. 74, No. 8, p. 539-40, 545, August 1976.

Descriptors: *Forest management, *Regulation, *Water quality control, *Forestry, Water quality standards, Standards, Administrative agencies, Water pollution control, Legislation, Farms, Land management, Pulp and paper industry, Governmental interrelations, Water quality, State governments, Watershed management.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *Nonpoint sources(Pollution), Point sources(Pollution), Administrative regulations.

Section 304 of the Water Pollution Control Act Amendments of 1972 directed the Environmental Protection Agency (EPA) to issue guidelines to the states to control nonpoint sources of pollution including 'silvicultural activities', which has been interpreted to cover forestry practices and production. The EPA, following the 'best management practices' approach, instructed each state to develop a '208 program' which would assure that the operation of private farms and forestlands minimized the chances of water pollution. The forestry interests reacted strongly to the EPA's model state forestry practices act. Recognizing its lack of forestry knowledge, and the need for forestry interests to know more about the EPA, nonpoint source pollution and the Water Pollution Control Act, the EPA provided a grant for nationwide workshops on forest practices and water quality. The consensus of the workshops was that federal regulation of forestry practices was not needed to comply with the Federal Water Pollution Regulations and that the coordination of the activities of the EPA under the Water Pollution Control Act, and the Forest Service, under the Resources Planning Act, would produce more effective results. (Kastner-Florida)
W78-00782

U.S. INDUSTRY AND STATES URGE A RETHINK OF WATER QUALITY LAW.
Chemical Engineering, Vol. 83, No. 6, p. 76, 78, March 1, 1976.

Descriptors: *Federal Water Pollution Control Act, *Industries, *Economic impact, *Cost-benefit analysis, Economic feasibility, Economic justification, Economic evaluation, Legislation, Water pollution, Water quality act, Federal jurisdiction, State jurisdiction, Federal government, Administrative agencies, Benefits, Costs, Decision making, Investigations, Economic predictions, Annual benefits, Annual costs, Pollution abatement, Water pollution control.
Identifiers: Environmental policy, National Commission on Water Quality, Administrative regula-

tions, Effluent limitations, Effluent guidelines, Environmental Protection Agency, State policy, Best Practicable Technology, Best Available Technology, Public hearings.

Witnesses from private industry as well as from several state pollution-control agencies criticized the Federal Water Pollution Control Act at hearings held throughout the country by the National Commission on Water Quality (NCWQ) in January of 1976. The concensus at the hearings, held to discuss NCWQ's 2-1/2 year study of the Act, was that while the Act's 1977 goals are realistic, those set for 1983 are not cost-effective. Witnesses strongly contested NCWQ's estimates that the Act would provide the nation $3.4 billion in annual economic benefits by 1980, and $7.8 billion per year by the turn of the century. The Environmental Protection Agency was also attacked for not being flexible in its administration of the Act. Only environmental-action groups generally felt that the Act's deadlines should not be extended. In response to the suggestion that a freeze be put on the Act after the 1977 improvement levels are reached, environmental groups claimed that increasingly stricter controls were necessary to safeguard gains in water quality made by 1977. NCWQ was expected to issue a final report on its study, including input from the hearings, in March of 1976. (Malefatto-Florida)
W78-00785

PRESIDENT ANNOUNCES MEASURES TO CONTROL MARINE OIL POLLUTION,
Executive Office of the President, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-00786

THE ROLE OF INSURANCE IN ENVIRONMENTAL LITIGATION,
McKenna, Storer, Rowe, White and Farrug, Chicago, IL.
For primary bibliographic entry see Field 6F.
W78-00789

OIL POLLUTION OF COASTAL AND INLAND WATERS UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
Mendes and Mount, New York.
A. A. Lohne.
Insurance Counsel Journal, Vol. 38, No. 1, p 49-62, January 1971.

Descriptors: *Oil spills, *Federal jurisdiction, *Oil pollution, *Water pollution control, Water pollution sources, Water quality standards, Law enforcement, Legislation, Rivers and Harbors Act, Oily water, Water law, Oil wastes, Waste water(Pollution), Navigable waters, Oceans, Beaches, Legal aspects, Coasts, Compensation, Inland waterways.
Identifiers: Liability, *Water Quality Improvement Act, Nuisance(Legal aspects), Absolute liability, Oil-spill cleanup, Outer continental shelf, Coastal waters, Vessels, Tankers.

Oil spillage is causing increasing damage to this country's waters. To combat water pollution in general and oil pollution in particular, Congress has passed many laws including the Water Polltion Act of 1886, the River and Harbor Act of 1899, the Oil Pollution Act of 1924, the Oil Pollution Act of 1961 and the 1966 Clean Water Restoration Act. The Water Quality Improvement Act of 1970 made many changes to help prevent oil pollution and to control it after it has occurred. The Act prohibits the discharge of oil in harmful quantities into navigable waters. It provides for a plan to remove oil and makes the owner of any vessel discharging oil liable for actual costs unless the spillage falls under one of the stated exceptions. It requires proof of financial stability to the extent of liability. The Act allows government forces to control and clean up oil already on the beaches. In addition beach front property owners affected by oil spills are helped because the National Contingency Plan which calls for immediate clean up includes private property. The Act also provides for enforcement of its provision by the Coast Guard. (Maass-Florida)
W78-00790

CLEAN WATER PROGRESS - YES, SPEED - NO,
Committee on Public Works and Transportation (U.S. House).
J. Wright.
Water and Sewage Works, Vol 123, No 4, p cover, 4, 63, April 1976.

Descriptors: *Future planning(Projected), *Waste water(Pollution), *Water pollution control, *Federal Water Pollution Control Act, Water quality, Water quality control, Sewage treatment, Industrial wastes, Municipal wastes, Water treatment, Water pollution, Water pollution treatment, Water quality standards, Discharge(Water), Pretreatment(Water), Treatment facilities, Construction, Construction costs, Legislation.
Identifiers: Effluent guidelines, Environmental policy, Federal Water Pollution Control Act Amendments of 1972, *National Pollution Discharge Elimination System, Effluent limitations, Non-point sources(Pollution), Point sources(Pollution).

It is becoming obvious that the deadlines set by the Federal Water Pollution Control Act Amendments of 1972 cannot be met. Half the municipal wstes will not meet Environmental Protection Agency (EPA) standards for secondary treatment, while storm run-off from non-point sources will pollute streams far beyond legal levels. the Act was unrealistic regarding deadlines and the overly dominant role of the Federal Government. Surprisingly few projects are being constructed under the Act because of the voluminous regulations of the EPA, the inability of municipalities to fund their twenty-five percent share, the controversy and uncertainty over environmental issues,the issue of pretreatment of industrial wastes, the unpopularity and unworkability of certain requirements, and the lack of personnel in the EPA and in the States to process grant applications. Congressional attempts to remedy the problems include bills to enable local certification of compliance with the construction grants, to authorize local ad valorem taxes to fund plants, and to authorize the EPA to adjust deadlines on a case-by-case basis. Public support is crucial for the water pollution program to sustain its forward momentum. (Jones-Florida)
W78-00791

REPUBLIC STEEL CORPORATION V. TRAIN (ENVIRONMENTAL PROTECTION AGENCY PERMIT OBJECTION IMPROPER WHERE NO GUIDELINES AVAILABLE).
For primary bibliographic entry see Field 6E.
W78-00792

CONTROL OF WATER POLLUTION IN NEW YORK CITY,
New York City Dept. of Water Resources.
For primary bibliographic entry see Field 6E.
W78-00796

UNITED STATES V. HAMEL (GASOLINE AS A POLLUTANT UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-00797

JURISDICTIONAL EXPANSION OF THE ARMY CORPS OF ENGINEERS UNDER FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
M. G. Ehrilch.
Houston Law Review, Vol. 13, No. 1, p. 135-52, October, 1975.

Descriptors: *Permits, *Federal jurisdiction, *Dredging, *Wetlands, Landfills, Federal Water Pollution Control Act, Administrative agencies, Navigable waters, Boundaries(Property), Rivers and Harbors Act, Wildlife conservation, Judicial decisions, Water pollution, Legislation, Protection, Federal government, Administrative decisions, Legal aspects, High water mark, Regulation.
Identifiers: Fill permits, *Federal Water Pollution Control Act Amendments of 1972, Environmental policy, Administrative regulations, Coastal waters, Hazardous substances(Pollution), Property interests, Territorial waters.

Under the Rivers and Harbors Act the jurisdiction of the Corps of Engineers extended only to the mean high tide line. Since the passage of the Federal Water Pollution Control Act Amendments of 1972, this jurisdiction was extended to 'the waters of the United States'. The refusal of the Corps to recognize its expanded responsibilities prompted federal court action. One court placed dredge and fill operations in the wetlands under federal jurisdiction. Further inaction on the Corps' part resulted in another court order to promulgate dredge and fill regulations for the wetlands. The Corps has developed a three-stage program for expanding its regulating discharges into primary tributaries of navigable waters, and finally expanding its operation to all waters. These expanded powers will surely create jurisdictional disputes with state regulatory agencies and private landowners. However, the Corps and the Congress should maintain jurisdiction over the wetlands to protect the future water needs of the country. (Cocheu-Florida)
W78-00799

THE PROPOSED OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1976: AN INADEQUATE GUIDE TO OUTER CONTINENTAL SHELF DEVELOPMENT,
Harvard Law School, Cambridge, MA.
For primary bibliographic entry see Field 6E.
W78-00800

OCEANS '77 CONFERENCE RECORD.
Institute of Electrical and Electronics Engineers, Inc., New York.; and Marine Technology Society, Washington, DC.
Proceedings of 3rd Annual Conference, 'Oceans '77', held in Los Angeles, CA on October 17-19, 1977. 2 Volumes, 800 p. Reference publication No. 77CH1272-4 OEC.

Descriptors: *Oceans, *Oceanography, *Technology, *Conferences, Equipment, Engineering structures, Instrumentation, Resources development, Water pollution, Baseline studies, Environmental effects, Waste disposal, Oil pollution.
Identifiers: *Outer Continental Shelf, Ocean dumping, Hydrocarbons, Offshore platforms, Ocean mining.

Oceans '77 is the third conference in a series jointly sponsored by the Marine Technology Society and the Institute of Electrical and Elctronic Engineers and was held in Los Angeles, CA on October 17-19, 1977. The conference presented nearly 200 papers covering all aspects of man's activity in the seas and is described as an international conference to discuss and explore developing technology and its impact on public policy and education. In addition to the usual technical sessions, the scope of the conference was expanded to include presentations and papers on law, public policy, and education. (See also W78-00828 thru W78-00839) (Sinha-OEIS)
W78-00827

PALAU: NATIVE PARADISE OR PETROLEUM SUPERPORT,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W78-00828

PORT PLANNING TO MINIMIZE RISK TO HAZARDOUS MATERIAL VESSEL MOVEMENT,
Coast Guard, Washington, DC. Office of Marine Environment and Systems.
J. H. Lancaster.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 1, p 13D-1 - 13D-6, 1977. 1 tab, 4 fig, 7 ref.

Descriptors: *Harbors, *Planning, *Water pollution control, *Pollution abatement, Hazards.
Identifiers: *Outer Continental Shelf, Hazardous materials, Marine transportation.

Trends in recent years in marine transportation and the nature of cargoes handled have placed increasing demands for improved safety and efficiency not only on ships but on the waterways and ports they utilize. Port planning must consider the impact of larger ships, increasing volumes of hazardous cargoes, increasing traffic, increasing industrial and population density, and increased concern for the environment. The problems generally cannot be dealt with on an isolated basis and must be considered within the framework of systematic analysis. Within the marine transportation system, cargo movement (ship movement), cargo transfer, and cargo storage all complement and affect one another. Decisions as to port configuration, site location, vessel traffic, pilotage, surveying and mapping, dredging, aids-to-navigation, tug assistant - all need to be reached on as systematic a basis as is possible. Criteria for and practices in several of the foregoing areas are discussed. (See also W78-00827) (Sinha-OEIS)
W78-00829

OCEAN DUMPING -- RESEARCH AND MONITORING OF OCEAN DISPOSAL EFFECTS,
National Oceanic and Atmospheric Administration, Rockville, MD.
For primary bibliographic entry see Field 5C.
W78-00830

TECHNIQUES FOR MEASURING THE EFFECTS OF NUCLEAR POWER PLANTS ON LOCAL FISH,
Washington Univ., Seattle. Applied Physics Lab.
For primary bibliographic entry see Field 5C.
W78-00831

A TECHNIQUE FOR MEASURING INDUSTRIAL WASTE DISPERSION RESULTING FROM OCEAN DUMPING,
EG and G Environmental Consultants, Waltham, MA.
For primary bibliographic entry see Field 5B.
W78-00832

ENVIRONMENTAL ASPECTS OF DRILLING FLUID AND DRILL CUTTINGS DISPOSAL,
Exxon Co., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-00833

EFFECTS OF PRODUCED WATERS ON THE MARINE ENVIRONMENT,
Shell Development Co., Houston, TX; and Exxon Production Research Co., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-00834

FATE OF PETROLEUM HYDROCARBONS IN MARINE ANIMALS,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5B.
W78-00835

WEATHERING OF SPILLED OIL AND METHODS OF ACCELERATING,
Chevron Oil Field Research Co., La Habra, CA.
For primary bibliographic entry see Field 5B.
W78-00836

CEPEX HARDWARE: (NOW AND IN THE FUTURE),
Case Existological Labs. Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5C.
W78-00837

PHYSICAL FACTORS AFFECTING THE SITING OF DREDGED MATERIAL ISLANDS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W78-00838

HAWAII AND THE MANGANESE NODULE INDUSTRY,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6G.
W78-00839

1974 FLOATING BREAKWATERS CONFERENCE PAPERS.
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 8B.
W78-00840

WORKSHOP I: FUTURE USES OF FLOATING BREAKWATERS.
For primary bibliographic entry see Field 8B.
W78-00856

PREDICTION OF ARCTIC ICE CONDITIONS FOR OPERATIONS,
Washington Univ., Seattle. Arctic Ice Dynamics Joint Experiment Office.
M. D. Coon, R. T. Hall, and R. S. Pritchard.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 4, (of 4), p 307-314, OTC 3004, 1977. 10 fig, 1 tab, 25 ref.

Descriptors: *Sea ice, *Forecasting, *Mathematical models, *Resources development, *Environmental effects, *Baseline studies, *Hazards, Drilling, Transportation, Arctic Ocean.
Identifiers: *Outer Continental Shelf, Ice conditions.

A mathematical model is presented as an aid to forecasting of ice conditions for operations in ice-infested waters. The sea ice model interacts with the atmosphere and ocean. The importance of knowledge of ice velocity, thickness distribution, and stress for short-term forecasting of ice conditions is explained. A sample calculation is shown to demonstrate and clarify the results. As a test of the performance of the model, observations during the Arctic Ice Dynamics Joint Experiment (AIDJEX) and Landsat imagery in April 1975 are used to compare with simulated conditions. The response of the model to these conditions is qualitatively reasonable, but insufficient data on barometric pressures and boundary motion affects the comparison. The model is too weak to match the observed motions as accurately as desired. Efforts to eliminate these problems should allow the model to be used as an operational tool to aid in short-term forecasting of sea ice conditions. Planning and conducting activities in waters that are partly or completely covered by ice for part of the year are greatly facilitated by the ability to predict ice conditions. Short-term forecasts are helpful to shipping operations, since they could affect both the selection of a route and the timing of a transit, and to fixed-point operations such as drilling sites or harbors. (Sinha-OEIS)
W78-00860

SEA ICE THICKNESS PROFILING AND UNDER-ICE OIL ENTRAPMENT,
Cold Regions Research and Engineering Lab., Fairbanks, AK.
A. Kovacs.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 3 (of 4), p 547-554, OTC 2949, 1977. 10 fig, 1 tab, 3 ref.

Descriptors: *Sea ice, *Oil pollution, *Water pollution sources, *Blowouts, *Resources development, *Environmental effects, Baseline studies, Alaska.
Identifiers: *Outer Continental Shelf, *Prudoe Bay, Oil entrapment, Oil production.

Results obtained with a unique dual-antenna impulse radar system used to profile first- and multi-year sea ice near Prudhoe Bay, Alaska, are discussed. A description of the radar system is given along with representative field data. Continuous ice thickness profiles are required for studies related to modeling and understanding the dynamics of the sea ice cover, heat exchange between the ocean and the atmosphere to determine the quantity of oil that would be trapped in the undulating bottom relief of first-year and multi-year ice should an oil blowout occur in an ice-covered sea. Calculations are presented that indicate a significant amount of oil could be trapped within this bottom relief should the oil be released under the ice from a sea-floor oil-production system. (Sinha-OEIS)
W78-00861

ENVIRONMENTAL CONDITIONS ON THE CONTINENTAL SHELF OFF WEST GREENLAND,
Danish Inst. of Applied Hydraulics, Copenhagen.
H. A. Nielsen, J. Dietrich, and J. Fabricius.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 3 (of 4), p 533-546, OTC 2948, 1977. 27 fig, 4 tab.

Descriptors: *Continental Shelf, *Meteorological data, *Resources development, *Environmental effects, *Weather data, *Baseline studies, *Oil spills, Ice cover, Icebergs, Drilling.
Identifiers: *Outer Continental Shelf, *Greenland, Davis Strait, Weather conditions.

To provide data on currents, icebergs, ice drift and weather conditions on the Greenland Continental Shelf, comprehensive environmental data collection programs were carried out in 1975 and 1976 both by the Concessionaires (with Chevron Petroleum of Greenland as operator) and by the Ministry for Greenland. The programs of the Concessionaires aimed primarily at providing sufficient data for planning and execution of drilling operations was concentrated on the concession areas. The programs of the Ministry were executed by the Danish Hydraulic Institute and emphasized the effects of possible oil spills upon the sensitive arctic environment. (Sinha-OEIS)
W78-00862

ALONG-SHORE COHERENCE OF WINDS ALONG THE NORTH ALASKAN COAST FOR OIL SPILL ANALYSIS,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5C.

W78-00863

CHEMISTRY OF MARINE PETROLEUM SEEPS IN RELATION TO EXPLORATION AND POLLUTION,
For primary bibliographic entry see Field 5B.
W78-00864

NATURAL OIL SEEP DETECTION IN MARINE ENVIRONMENTS,
For primary bibliographic entry see Field 5B.
W78-00865

MODELING OF OIL SPILL TRAJECTORIES USING SEQUENTIAL SATELLITE IMAGERY,
W. R. McLeod, J. H. Kennedy, and D. T. Hodder.
In: Proceedings of the 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 319-324, OTC 2764, 1977. 9 fig, 8 ref.

Descriptors: *Oil spills, *Alaska, *Baseline studies, *Resources development, *Water quality control, *Environmental effects, Models.
Identifiers: *Outer continental shelf, Gulf of Alaska, Satellite imagery, Trajectories prediction, Prediction.

The Gulf of Alaska waters, eddy patterns appear in enhanced LANDSAT imagery and are stable for months. The eddy patterns themselves extend some 50 miles offshore, and show surface drift complexity, not predicted by present models. These results lead us to alternative ideas of how to predict spill trajectories in a quasi empirical way using satellite data. This detailed level of information is required if one is to control spills on a lease block or platform basis. (Sinha-OEIS)
W78-00866

INTEGRATED ENVIRONMENTAL STUDIES, SOUTH TEXAS OUTER CONTINENTAL SHELF: APPROACH, TECHNIQUES, RESULTS,
H. L. Berryhill, Jr.
In: Proceedings of 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 239-249, OTC 2754, 1977. 3 fig, 1 tab, 3 ref.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Exploration, *Water quality, *Methane, *Texas, Nutrients, Productivity, Biology, Metals Runoff.
Identifiers: *Outer continental shelf, Hydrocarbons.

The environmental studied of the South Texas Outer Continental Shelf are part of a national program of environmental studies under the sponsorship of the Bureau of Land Management. The general purpose of the studies is to provide a base of environmental data and an understanding of marine processes for use in managing offshore exploration and development. The results of the first year's effort indicate a strong correlation, both geographically and seasonally, between the various aspects of the marine environment. Biological activity generally is greatest along the shallow waters of the inner shelf where nutrients are introduced by continental runoff. The biological productivity is greatest in the spring when the amount of runoff reaching the ocean is largest. Increased amounts of nutrients at the outer edge of the shelf in the bottom water plus hydrographic characteristics suggest a movement of deeper water onto the outer shelf. Chemically, the region does not differ significantly from other shelf areas in the Gulf of Mexico. Amounts of both trace metals and hydrocarbons are average for shelf areas, and no anomalously large amounts were detected with but one exception. Methane content of the water from mid shelf seaward to the edge of the shelf at mid and near-bottom depths is locally very high and a super-saturated condition is indicated. Geologically, the shelf has undergone seaward tilting or subsidence as a continuing process. The subsidence has been accompanied by extensive faulting, predominantly of the growth type; areally the faulting has migrated basinward through time. (Sinha-OEIS)
W78-00869

EVALUATION OF GEOLOGIC HAZARDS IN OCS PETROLEUM LEASE AREAS, SOUTHERN CALIFORNIA CONTINENTAL BORDERLAND,
M. E. Field, S. H. Clarke, Jr., and H. G. Greene.
In: Proceeding of 9th Annual Offshore Technology Conference, held in Houston, TX, May 2-5, 1977, Vol 1 (of 4), p 69-78, OTC 2736, 1977.

Descriptors: *Hazards, *Geological surveys, *Water pollution, *Seepage, *Resources development, California, Exploration.
Identifiers: *Outer Continental Shelf, Petroleum leases.

Studies to characterize the tectonic and sedimentary environments of potential petroleum lease areas in the southern California continental borderland are being carried out by the U.S. Geological Survey. Major objectives are to identify and develop an understanding of features and processes that may be hazardous to petroleum exploration and development. Geologic phenomena investigated include faulting, seismicity, sediment erosion, mass movement, and hydrocarbon seepage. Data are collected principally by high resolution (0.2-0.8 kJ; 800-200Hz) seismic reflection profiling and sediment sampling with ancillary data from side-scan sonography, underwater television coverage and deep-penetration (120-160 kJ; 40-125 Hz) single-channel seismic reflection profiles. (Sinha-OEIS)
W78-00870

AN EVALUATION OF LOUISIANA SUPERPORT STUDIES AND IMPLICATIONS FOR COASTAL ZONE MANAGEMENT,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
J. H. Stone.
Coastal Zone Management Journal, Vol 3, no 1, p 7-37, 1976. 2 fig, 3 tab, 30 ref.

Descriptors: *Louisiana, *Environmental effects, Water quality, Resources development.
Identifiers: *Outer Continental Shelf, *Superports, Coastal zone management.

The economic and environmental consequences of a proposed Louisiana superport have been studied by researchers during the last three years. These studies provided technical information and management alternatives. Management alternatives included state control to avoid multiple superport developments, details for an Environmental Protection Plan, comparisons of onshore and offshore sites, and planning for ancillary development. Policy decisions which resulted include many of the recommendations of the research. It is suggested that environmental research can influence policy decisions and limit the options available to a decision maker provided some legal structure is created, quality control is implemented, and technological and environmental problems are recognized. Various analytical tools, such as energy cost accounting, group critique, and simulation models, have wide application for use in coastal zone management. (Sinha-OEIS)
W78-00871

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE VIRGIN RIVER BASIN STUDY: A REGIONAL APPROACH TO MULTIOBJECTIVE PLANNING FOR WATER AND RELATED RESOURCES,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W78-00551

A WATERSHED PLANNING AND MANAGEMENT SYSTEM: DESIGN AND SYNTHESIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems; and Virginia Polytechnic Inst. and State Univ., Blackburg. School of Forestry and Wildlife Resources.
For primary bibliographic entry see Field 4D.
W78-00560

HYDROLOGIC MODELING OF THE DEVILS LAKE BASIN WATERSHEDS,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 4D.
W78-00569

SYSTEMATIC DEVELOPMENT OF METHODOLOGIES IN PLANNING URBAN WATER RESOURCES FOR MEDIUM SIZE COMMUNITIES: APPLICATION OF LINEAR SYSTEMS ANALYSIS TO GROUND WATER EVALUATION STUDIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W78-00570

MARKOVIAN PROGRAMMING FOR FLOW REGULATION,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 4A.
W78-00621

WATER FOR ENERGY: AN APPROACH TO COMPREHENSIVE IMPACT ASSESSMENT,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
For primary bibliographic entry see Field 6G.
W78-00624

RESERVOIR YIELD: AN IMPORTANT ENVIRONMENTAL PARAMETER,
Illinois State Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 4A.
W78-00627

FEASIBILITY OF INTERBASIN WATER TRANSFER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-00628

AN ARCHETYPAL LINEAR PROGRAMMING MODEL FOR OPTIMAL INTERTEMPORAL ALLOCATION OF GROUNDWATER TO AGRICULTURAL ACTIVITIES,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4B.

W78-00629

HEURISTIC ALGORITHM FOR WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W78-00630

MODELS FOR OPTIMIZING THE MULTIPURPOSE OPERATION OF A RESERVOIR SYSTEM,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W78-00634

MULTIPURPOSE USE OF CATCHMENT MODELS FOR OPERATIONAL FORECASTING AND PLANNING STUDIES,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 2A.
W78-00635

SOME WATER RESOURCE SYSTEM STUDIES IN THE UK,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W78-00636

HYDROLOGICAL SYSTEM RELIABILITY AT THE CONFLUENCE OF RIVERS,
Water Resources Centre, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W78-00637

SIMULATION MODELS OF THE VELIKA MORAVA BASIN FOR DESIGN OF A MULTIPURPOSE RESERVOIR SYSTEM,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 4A.
W78-00639

THE CALCULATION OF WATER SHORTAGE INDICES BY USING INFORMATION ABOUT THE CONCOMITANCE OF WATER RESOURCES AND DEMANDS,
Research Inst. for Water Resources Development. Budapest (Hungary).
For primary bibliographic entry see Field 6D.
W78-00640

CHANCE CONSTRAINED MODEL OF WATER RESOURCES SYSTEMS,
Water Resources Development and Construction, Prague (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W78-00641

GENERAL MARKOV MODEL FOR OPTIMAL CONTROL RESERVOIRS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 4A.
W78-00642

A WORK-HELP FOR THE CALCULATION OF WATER RESTRICTION INDICES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6D.
W78-00643

DISCUSSION 'REGIONAL PLANNING FOR LAND DISPOSAL OF WASTEWATER,' BY R.E. MARKLAND, ET AL.,
Meta Systems, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W78-00644

MULTIPLE OBJECTIVE OPTIMIZATION MODEL FOR REAL-TIME OPERATION OF A WATER SUPPLY SYSTEM,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 4A.
W78-00645

HIERARCHICAL MULTIPLE OBJECTIVE ANALYSIS OF LAND AND WATER RESOURCE UTILIZATION FOR A SYSTEM OF LAKES,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 4A.
W78-00646

LARGE WASTE TREATMENT SYSTEMS: DESIGN FOR BOTH EFFICIENCY AND INFLOW LEVEL OF EACH PROCESS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 5D.
W78-00647

MODELLING FOR WATER RESOURCE SYSTEMS PLANNING,
Cornell University, Ithaca, NY. Dept. of Environmental Engineering.
D. P. Loucks.
In: Large Engineering Systems: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, Aug. 9-12, 1976. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, p 589-595, 1977.

Descriptors: *Water resources, *Planning, *Mathematical models, Evaluation, Alternative planning, Water resources development, Multiple purpose, Methodology, Engineering, Management, Optimal development plans, Decision making, System analysis.
Identifiers: *Multiple objectives.

Considerable experience has been gained in the management of water quantity and quality. Present-day water resources planning involves not only multiple purposes and expertise from many different disciplines, but it also entails multiple objectives. Issues of equity and environmental quality may have as much importance as economic efficiency, no longer the primary goal of water resources development programs. The numerous planning objectives and the increased public involvement in the planning process have changed the manner in which engineers approach the task. Politicians and elected public officials have taken much of the responsibility for the decision making from the engineers. Today large water systems are studied with a greater awareness of their complexity. Modeling methodologies can define and evaluate alternatives which represent various compromises among conflicting management objectives; however, they cannot guarantee optimal plans. The success of any quantitative systems study is whether or not it has an impact in the planning and decision-making process. After introducing the problem, Loucks considers: defining and evaluating alternative plans; water resource systems studies and their use; some applications of water resource systems studies, focusing on studies done at Cornell University; the education of water resource systems analysts; and research needs or better systems planning. (Bell-Cornell)
W78-00648

AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
G. W. Reid, J. F. Lawrence, and S. S. Y. Law.
In: Large Engineering Systems: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, Aug. 9-12, 1976. Alvin Wexler (Ed.), Pergamon Press, Inc., Oxford, United Kingdom, p 610-624, 1977. 8 fig, 7 ref.

Descriptors: *Urbanization, Analytical techniques, *Mathematical models, *Planning, Human population, Land use, Air pollution, Transportation, Water supply, Sewerage, Solid wastes, Drainage, Decision making, Evaluation, Systems analysis.
Identifiers: *Urban growth policy, Housing, Submodels.

An urban model can be a very large and complex system representing many sectors of the urban environments. Herein, an urban model, which includes several components or sub-models of the urban system, is presented. These sub-models are in the areas of population, housing, land use, air pollution, transportation, water supply, sewerage, solid waste, and drainage. Various modeling or system analysis techniques were used in the development of these sub-models. Cohorts-survival and disaggregation techniques were used for the population model. Input-output matrix and double cohort-survival technique was used for the housing model. The land use model was a heuristic model, designated as a spatial structured model, usng Delphi and gaming techniques. The network system transportation model was based on a goal-directed/backward-seeking model system using mathematical programming. The water supply, sewerage, and solid waste models are multi-staged and multi-structured and mathematical programming was used here also. Regression analysis was used in the drainage model and correlation analysis in the air pollution model. These models provide planners or decision makers with a more systematic method for assistance in the evaluation of urban growth policies. (Bell-Cornell)
W78-00649

6B. Evaluation Process

EVALUATION OF ALTERNATIVE USES OF WETLANDS, (PART II),
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
T. Hertsgaard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 650, Price codes: A06 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report, No. WI-221-035-76, May 1976. 115 p, 4 fig, 40 tab, 26 ref, 2 append. OWRT A-039-NDAK(2), 14-31-0001-4034.

Descriptors: *Wetlands, Crop response, Drainage, Waterfowl, *Benefits, *Costs, Value, *Evaluation, *North Dakota, Surveys, *Attitudes, *Hunting, Small game, Economic impact, Wildlife, Deer.
Identifiers: Stutsman County(N Dak).

Selected benefits and costs were evaluated of wetlands in cropland areas of North Dakota that accrue to farmers and other members of society. Estimates of these benefits and costs were based on data obtained from a mail survey of farmers and hunters. The state as a whole was the study area in collecting hunting expenditure data and Stutsman County was the study area in collecting drainage and crop depredation losses data. Three hunting activities were considered in estimating hunter expenditures. They were: waterfowl, small game and deer hunting. The average of reported expenditures for waterfowl, small game, and deer hunting in 1973 was $181.45, $89.49 and $159.34, respectively. The economic inpact of these

average expenditures was estimated by the application of input-output (interdependence) coefficients. It was estimated that hunter expenditures generate approximately $54.3 million of gross business volume in the state's economy. It was estimated that approximately 56 percent of this gross business volume can be attributed to the existence of wetlands. (See also W76-06900)
W78-00503

THE POTENTIAL IMPACT OF COAL-ENERGY DEVELOPMENT ON AGRICULTURE LAND RESOURCES IN WYOMING'S POWDER RIVER BASIN,
Wyoming Univ., Laramie. Water Resources Research Inst.
D. Janis, J. Carlson, and C. Phillips.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 607, Price codes: A04 in paper copy, A01 in microfiche. Project Completion Report, June 1977. 46 p, 19 tab, 1 fig, 3 maps. OWRT A-021-WYO(1), 14-34-0001-6053.

Descriptors: *Wyoming, Land use, Land development, *Economic impact, *Energy, Coal, Agriculture, Industrial production, Land resources, Projections, Forecasting.
Identifiers: *Powder River Basin(Wyo), *Coal-energy development, Development impacts.

The range of impacts that could occur to agriculture and the adjustments that might occur as land resources in Wyoming's Powder River Basin are shifted from agricultural production to coal-energy production are discussed. The impacts are analyzed in terms of acres of land withdrawn from agricultural production, the types of crops which would be on that land, and the economic loss to the Basin (in dollars of production lost) associated with the withdrawal of this agricultural production. Analysis of potential crop losses was made primarily by using remote-sensor data with follow-up cross-checking against land use maps, agriculture officials and field checks. Once the agricultural land was located, documented, and mapped, areas of existing and proposed coal-energy activity were overlaid on the agricultural maps. Areas of conflict between agriculture and coal-energy production were thus determined.
W78-00505

THE VIRGIN RIVER BASIN STUDY: A REGIONAL APPROACH TO MULTIOBJECTIVE PLANNING FOR WATER AND RELATED RESOURCES,
Nevada Univ. System, Reno. Water Resources Center.
J. E. Keith, J. Mulder, T. C. Hughes, V. A. Narasimhan, and L. Rovig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 647, Price codes: A08 in paper copy, A01 in microfiche. Utah State University, Logan, Utah Water Research Laboratory, Report PRWG146-1, June 1977. 150 p, 16 fig, 45 tab, 4 append. OWRT B-084-NEV(1), 14-31-0001-5090.

Descriptors: Water resources, *Planning, *Regional analysis, Colorado River Basin, *Model studies, Nevada, Utah, Arizona, Attitudes, Optimization, Methodology, Political aspects, Institutional constraints.
Identifiers: *Multiobjective planning, *Virgin River Basin(Utah-Ariz-Nev), *Surrogate Worth Trade-off method, *PROPDEMM model, Social models.

Two multiobjective planning models were applied to the Virgin River Basin in order to test the efficiency and practicality of applying such tools in water resources planning. The Surrogate Worth Trade-Off (SWT) method couples mathematical optimization to quantify tradeoffs among noncommensurable objectives with interviews to compare public preferences with respect to these tradeoffs. PROPDEMM uses information on interest group objectives, values, willingness to pay, influence, level of information, etc. to compare the political feasibility of alternative courses of action. Both models were applied to assess the difficulties in doing so and the usefulness of the results. The tradeoffs identified by the SWT method showed agricultural water use to be so dominant in the basin that slight adjustments in irrigation efficiency could supply all foreseeable needs for additional water for other uses. PROPDEMM showed the politically most controversial tradeoff was between construction of energy generating facilities and life support for a rare species of minnow, a controversy that would probably be decided in favor of the environmentalists because of their power and non-openness to change. Improvements to the model to do a better job of interfacing environmental with social data were recommended. Social modeling in such low population areas was restricted by laws against disclosure of private information. (Fallon-Nevada)
W78-00551

A WATERSHED PLANNING AND MANAGEMENT SYSTEM: DESIGN AND SYNTHESIS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems; and Virginia Polytechnic Inst. and State Univ., Blackburg. School of Forestry and Wildlife Resources.
For primary bibliographic entry see Field 4D.
W78-00560

INTEGRATING SOCIAL ANALYSIS INTO WATER RESOURCES PLANNING: SOME EMERGING TRENDS IN THE CORPS OF ENGINEERS,
Institute for Water Resources (Army), Fort Belvoir, VA.
J. D. Priscoli.
Water Resources Bulletin, Vol. 13, No. 5, p 953-958, October 1977. 10 ref.

Descriptors: *Water resources development, *Social impacts, *Water policy, Legislation, Regulation, *Planning, Social aspects.
Identifiers: *Social analysis, Social effects, Interdisciplinary planning, Data gathering.

While Federal water resources laws and regulations require social analysis, no one workable formula exists for integrating it into water resources planning. Two primary problems in integrating social analysis into planning are examined: making trade-offs between policy acceptability and theoretical competence, and managing social analysis in planning. For illustration, the article builds on emerging trends within the U.S. Army Corps of Engineers. It concludes by observing that creative application of social theory to policy problems along with innovative data gathering techniques are the primary routes to managing these problems. (Bell-Cornell)
W78-00625

HEURISTIC ALGORITHM FOR WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W78-00630

MODELLING FOR WATER RESOURCE SYSTEMS PLANNING,
Cornell University, Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-00648

OMNIBUS WATER RESOURCES DEVELOPMENT ACT OF 1976.
For primary bibliographic entry see Field 6E.
W78-00650

SUCCESS STORIES IN MULTIPLE USE,
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Region Office.
T. L. Gilbert.
Parks and Recreation, Vol. 12, No. 2, p. 22a-27a, February 1977.

Descriptors: *Recreation facilities, Waste water treatment, Water pollution treatment, *Sewage treatment, *Coordination, Recreation waste, Federal Water Pollution Control Act, Parks, Management, Resources, Project planning, Optimum development plans, Multiple purpose, Disposal, Farms, Recreation, Environment, Environmental effects, Land reclamation, Sludge treatment, Sludge disposal, Waste disposal, Treatment facilities.
Identifiers: Environmental Protection Agency, Environmental policy, Federal Water Pollution Control Act Amendments of 1972.

Many recreational opportunities are afforded to communities through construction of wastewater treatment facilities and sewage treatment plants. The Bureau of Outdoor Recreation and the Environmental Protection Agency have joined in efforts to encourage the combination of open space and recreational considerations with waste treatment management. These efforts have resulted in coordinated recreation and water quality programs which provide opportunities for obtaining recreational benefits from water cleanup schemes. Such benefits include environmental awareness centers, neighborhood parks, playgrounds, wildlife reserves, and irrigation of large farming areas. Examples are given of communities which have coordinated their recreation and water quality programs. These include Franklin, Ohio; Miamisburg, Ohio; Napierville, Illinois; Muskegon County, Michigan; Cook County, Illinois; Fulton County, Illinois; and Bellevue, Washington. The author urges multiple-use of existing water pollution control facilities and the reclamation of abandoned facilities for recreational purposes. The park and recreation profession should support water pollution control programs since clean water and outdoor recreation go hand-in-hand. (Howard-Florida)
W78-00660

EMERGING TECHNOLOGY AND ADMINISTRATIVE ORGANIZATION FOR WATER DEVELOPMENT,
For primary bibliographic entry see Field 6E.
W78-00661

LAND DRAINAGE IN ENGLAND AND WALES,
Ministry of Agriculture, Fisheries and Food, London (England).
For primary bibliographic entry see Field 4A.
W78-00691

NEW ENGLAND RIVER BASINS COMMISSION FINDINGS AND RECOMMENDATIONS ON THE CONNECTICUT RIVER BASIN COMPREHENSIVE WATER AND RELATED LAND RESOURCES INVESTIGATION.
New England River Basins Commission, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 263, Price codes: A09 in paper copy, A01 in microfiche. Final Report, January 1, 1972, 145 p.

Descriptors: *Watershed management, *River basin development, *Planning, *Water resources development, *Water management(Applied), Land management, Water quality, Powerplants, Recreation, Flood protection, Water supply, Anadromous fish, Costs, Economic impact.
Identifiers: *Connecticut River Basin, *Flood plain management, *Resource management, New England River Basins Commission.

A federal-state Coordinating Committee studied means of meeting water and related land resource management needs of the Connecticut River Basin to 1980 and 2020. The New England River Basin Commission (NERBC) 1980 basin plan, based on a review of the coordinating committee report, contains a five-part proposal for supplemental environmental and basin flood management studies and presents findings and recommendations on water quality, power, outdoor recreation, preservation of sites, anadromous fisheries restoration, resident fish and wildlife, water supply, navigation, upstream watershed management, flood control, and plan implementation, costs and priorities. Comments by interested parties on the Coordinating Committee and draft NERBC reports are summarized. The plan's goal is the development of natural resouces in the basin to meet economic and environmental needs, including the need for jobs, housing, protection from natural catastrophes, and other human essentials, where development is reconcilable with preservation and enhancement of the Basin environment. The premise that the Basin's environmental quality is its primary economic asset underlies every recommendation for resource development. Implementation of the plan requires sound management of population and economic growth throughout New England to provide balanced distribution of demands upon natural resources in accordance with their character and availability. (Nessa-NC)
W78-00746

INTERIM GUIDE FOR ENVIRONMENTAL ASSESSMENT: HUD FIELD OFFICE EDITION.
Voorhees (Alan M.) and Associates, Inc., McLean, VA.
For primary bibliographic entry see Field 6G.
W78-00749

AN ASSESSMENT METHODOLOGY FOR THE ENVIRONMENTAL IMPACT OF WATER RESOURCE PROJECTS,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 6G.
W78-00750

IMPLEMENTATION PLAN FOR THE COST OF A CLEAN ENVIRONMENT REPORT.
Control Data Corp., Rockville, MD. Professional Services Div.
For primary bibliographic entry see Field 5G.
W78-00772

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE IMPACT OF WATER SAVING DEVICE INSTALLATION PROGRAMS ON RESOURCE CONSERVATION,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 3D.
W78-00563

A MODEL FOR ACHIEVING CONSISTENCY FOR COST SHARING IN WATER RESOURCE PROGRAMS,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, and W. P. Neely.
Water Resources Bulletin, Vol. 13, No. 5, p 995-1005, October 1977. 1 tab, 12 ref.

Descriptors: *Water resources, *Water policy, *Cost sharing, *Cost allocation, *Economic efficiency, *Federal project policy, Programs, Computer models, Equations, Operation and maintenance, Costs, Systems analysis.
Identifiers: User charges, Reimbursement.

Three basic principles of responsibility have influenced the Federal/non-Federal cost sharing rates for water resources programs: (1) full payment by benefiaries; (2) exclusive Federal assumption of costs; and (3) joint Federal/non-Federal sharing. The efforts to determine appropriate cost sharing rates have resulted in several hundred complex arrangements involving contributions, user charges and direct sales based on many variations of payment terms. This is expressed in a basic present value model developed to determine the non-Federal water resources programs and projects for both implementation and OMR stages. The model introduces the concept of a composite (implementation plus OMR) cost share as a focus for developing appropriate resources investments. The model can be used as a focus for policy decisions on cost sharing which seek to achieve consistent and equitable cost shares for purposes provided while maintaining an efficient allocation of resources within water programs. (Bell-Cornell)
W78-00626

FEASIBILITY OF INTERBASIN WATER TRANSFER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-00628

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME IV-APPENDICES,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 6G.
W78-00756

IMPLEMENTATION PLAN FOR THE COST OF A CLEAN ENVIRONMENT REPORT.
Control Data Corp., Rockville, MD. Professional Services Div.
For primary bibliographic entry see Field 5G.
W78-00772

6D. Water Demand

THE CALCULATION OF WATER SHORTAGE INDICES BY USING INFORMATION ABOUT THE CONCOMITANCE OF WATER RESOURCES AND DEMANDS,
Research Inst. for Water Resources Development. Budapest (Hungary).
M. Domokos, J. Weber, and M. M. Fogel.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975, p 94-103. 5 fig, 7 ref.

Descriptors: *Water resources, *Water demand, *Water shortage, Economics, Value, Relaibility, Probability, Methodology, Stochastic processes, Equations.
Identifiers: *Concomitance.

One of the simple ways of aiding water resources management decisions is to calculate the actual or expected values of so-called water shortage indices (measures of shortfall or deficit in satisfying water demand) and to compare them with their limit values prescribed on the basis of economic considerations. Methods have been known for the calculation of water shortage indices in the case of constant water demand. Presented are new methods for their calculations under less special conditions, that is, when the relationship between water resources and demands has either a stochastic or deterministic character. The main conditions for the large-scale practical use of the proposed methods are the extension and higher reliability of water consumption data and the economic establishment of tolerated limit values of water shortage indices. (See also W77-10419) (Bell-Cornell)
W78-00640

A WORK-HELP FOR THE CALCULATION OF WATER RESTRICTION INDICES,
Research Inst. for Water Resources Development, Budapest (Hungary).
J. Tokar.
In: Application of Mathematical Models in Hydrology and Water Resources Systems, Proceedings of the Bratislava Symposium, Czechoslovakia, September 1975. IAHS-AISH Publication No. 115, p 238-246, 1975.

Descriptors: *Rivers, *Measurement, *Water shortage, *Water demand, *Water resources, Probability, Analytical techniques, Discharge(Water), Hydrology, Equations, Systems analysis.
Identifiers: *Water restriction index, Calculation, Hungary, Approximation method.

A calculation work-help is proposed to facilitate the measurement of the average relative water shortage index, which is a quotient of the water demand in the period under consideration and of the total water demand. To determine such work-helps, the fact that the water restriction index can be defined by the area below the discharge distribution function is considered. From the investigations made, 14 discharge registration sections with long and reliable records have been chosen. Used as basic data are discharge values, generated from several years of daily data for the month under consideration by ranging them into discharge intervals. For each of the 14 sections and for each month of the reference year, the so-called equalizing functions have been generated, yielding so-called group-universal functions. An example of a practical application to a river in Hungary is given. (See also W77-10419) (Bell-Cornell)
W78-00643

THE ROLE OF STATE LEGISLATION IN GROUND WATER MANAGEMENT,
Arizona Univ., Tucson. School of Law.
For primary bibliographic entry see Field 4B.
W78-00658

6E. Water Law and Institutions

A COMPARISON OF INTERORGANIZATIONAL RELATIONSHIPS WITHIN TWO CONTIGUOUS WATERSHED DISTRICTS,
Mississippi State Univ., Mississippi State. Dept. of Sociology.
G. D. Hampe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 763, Price codes: A04 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, September 1977. 53 p, 4 fig, 4 tab, 5 ref. OWRT A-101-MISS(1), 14-34-0001-7052.

Descriptors: Watershed management, River basin development, *Institutions, *Water districts, *Mississippi, *Organizations, History, Political aspects.
Identifiers: *Watershed districts(Miss).

A case analysis of the history, growth and organizational structure was made of the Pearl River Basin Development District and the Pat Harrison Waterway District in Mississippi. Interorganizational differences in the type of organizations with which the watershed district had contact and the frequency of that contact were both related directly to the particular history of the district, its political structure and the needs and long-range-

goals of the district. It was concluded that when a watershed district, just like any other public organization, is directly responsible to its constituency and is relatively stable over time in terms of personnel, the workings of that district are more efficient, less conflict engendering and generally more accessible to the public.
W78-00559

INTEGRATING SOCIAL ANALYSIS INTO WATER RESOURCES PLANNING: SOME EMERGING TRENDS IN THE CORPS OF ENGINEERS,
Institute for Water Resources (Army), Fort Belvoir, VA.
For primary bibliographic entry see Field 6B.
W78-00625

OMNIBUS WATER RESOURCES DEVELOPMENT ACT OF 1976.
Hearings--Subcomm. on Water Resources--Comm. on Public Works, US Senate, April-August, 1976. Serial No 94-H38. 2267 p.

Descriptors: *Water resources development, *Legislation, *Flood control, *Hydroelectric plants, Structures, Subsidence, Damages, Water control, Dams, Hydraulic structures, Hydrologic data, Water management(Applied), Conservation, Engineering, Legal aspects, Water law, Project feasibility, Cost-benefit ratio.
Identifiers: *Coastal Zone Management Act of 1972, *Congressional hearings, Class action suits, Federal Water Pollution Control Act Amendments of 1972, Navigability, Dam effects, Property interests.

Hearings were held dealing with pending water resources legislation and related matters. Approximately 36 pieces of legislation involving as many states, including Puerto Rico, were discussed and debated by public representatives, private citizens, businessmen, and other interested parties. One series of hearings was devoted to testimony from the Corps of Engineers on projects in various stages of approval, according to geographical area. The projects discussed ranged from expanding navigation facilities on the Ohio River to authorizing power plants on the Columbia River. The most frequently recurring concern, however, was that of controlling the increased urban flooding being caused by the urbanization processes in out cities. Pictures of such flooding in many areas are included. (Jones-Florida)
W78-00650

LEGAL CRITICAL FACTOR ANALYSIS (IN COMPLIANCE WITH THE AREA-WIDE WASTE TREATMENT MANAGEMENT PLANNING PROGRAM).
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-00651

WATER QUALITY AND EFFLUENT STANDARDS OF HAWAII,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-00652

EFFECTS OF NEPA'S REVIEW AND COMMENT PROCESS ON WATER RESOURCE PLANNING (SURVEY RESULTS),
Stanford Univ., Calif. Dept. of Engineering.
For primary bibliographic entry see Field 6G.
W78-00654

HOW WILL SMALL UTILITIES COMPLY WITH THE SAFE DRINKING WATER ACT,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5G.
W78-00655

REGULATIONS: REACTIONS AND RESOLUTION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00656

COASTAL ZONE LEGAL REFERENCES, 1976.
State Univ. of New York at Buffalo, Amherst. Sea Grant Law Center.
Published by New York Sea Grant Institute, State University of New York, Albany, 382 p. September 1976.

Descriptors: *Bibliographies, *Judicial decisions, *Coasts, Libraries, Reviews, Documentation, Information exchange, Data collections, Surveys, Regulation, Indexing, Water law, Legislation, Zoning, Land tenure, Wetlands, Exploitation, Land development, Shores, Pollution.
Identifiers: *Coastal zones, *Coastal zone management, Coastal waters, Marine ecosystem, Marine environment, Marine resources, Minerals.

The legal literature surveyed for this working bibliography is organized under broad categories of the coastal zone. Components of the coastal zone are divided into the general area of coastal zone resources and specific elements such as wetlands, tidelands, estuaries, marches, submerged lands and beaches. References on competing interests in coastal zone development are subdivided into sections on exploitation of mineral and living resources and on shoreline and waterway use and development. Materials covering the impact of development on coastal zone dynamics are included in sections on natural shoreline dynamics and on a variety of pollution sources. Methods, objectives and underlying policies of federal, state, and local regulatory power in the coastal zone are the focus of a fourth category. Publications on procedural and constitutional issues are also listed. Within each category references are organized under the general heading as well as under related Federal and state cases and legislation. General materials on coastal zone states complete the bibliography. (Mulligan-Florida)
W78-00657

THE ROLE OF STATE LEGISLATION IN GROUND WATER MANAGEMENT,
Arizona Univ., Tucson. School of Law.
For primary bibliographic entry see Field 4B.
W78-00658

THE EFFECTS OF THE 200 MILE UNITED STATES FISHING ZONE,
S. W. Hays.
Louisiana Law Review, Vol 37, No 4, p 852-74, Spring 1977.

Descriptors: *Regulation, *Fish conservation, *Fish, *Commercial fishing, *Oceans, Fisheries, Administration, Anadromous fish, Commercial fish, Fish management, Permits, Migration, Fish migration, Movement, Migration patterns, Law of the Sea, Technology, Economic impact, Treaties, Foreign countries, Jurisdiction, Boats, Legislation.
Identifiers: *Territorial seas(Jurisdiction), *Territorial waters, *Coastal waters, *Outer Continental Shelf, Law of the Sea Conference, International agreements, Administrative regulations, 200-mile zone, Exclusive economic zone, Tuna.

Increased consumer demand and new technological developments, such as processing and freezing at sea, improved synthetic webbing in net fishing, and new frozen fish products have created the need for fisheries conservation. Four United Nations Law of the Sea Conferences have failed to decide the breadth of the territorial sea and the interests of coastal states in the fishery resources off their coasts. To hasten negotiations the Fourth Conference adopted a negotiating text which advocated a 200-mile exclusive economic zone. Recognizing that any fishery management treaty would provide some type of economic zone. Congress passed the Fishery Conservation and Management Act which established a 200-mile fishery conservation zone around the United States. Foreign nations began enacting their own 200-mile zones, implicitly ratifying the United States' action. The author assesses the impact of the Act on the anadromous sedentary and highly migratory fish species, and on the coastal fishing industry and the Gulf Coast fishing industry. The act finally provides the United States with a statutory basis from which to develop and enforce a unified fishery management plan. (Kastner-Florida)
W78-00659

SUCCESS STORIES IN MULTIPLE USE,
Bureau of Outdoor Recreation, Ann Arbor, MI. Lake Central Region Office.
For primary bibliographic entry see Field 6B.
W78-00660

EMERGING TECHNOLOGY AND ADMINISTRATIVE ORGANIZATION FOR WATER DEVELOPMENT,
E. A. Ackerman, and G. O. Lof.
In: Technology in American Water Development, p. 628-57, Johns Hopkins Press, Baltimore, Md. 1959.

Descriptors: *Water management(Applied), *Water resources development, *Administrative agencies, *Water utilization, *Technology, Weather modification, Evaporation control, Water transfer, Tennessee Valley Authority, Desalination, Aquifers, Federal government, Saline water, Water distribution(Applied), Water allocation(Policy), Groundwater resources, Water supply development, Water control, Water sources, Water storage.
Identifiers: *Administrative regulations, Multiple resource management, Groundwater management.

Administrative means are needed for using new technology in a co-ordinated manner to aid in efficient water resources development and management. The authors strongly urge creation of regional administrative units which would be co-ordinated where necessary by an overriding national body. The most appropriate technical aids will differ from region to region. Among those discussed are: (1) weather modification; (2) desalting; (3) reuse of industrial and municipal water; (4) evaporation control; (5) water transfer; and (6) mining ground water. Numerous administrative problems that have resulted from increased technology are explored, but the most pressing is the need for co-ordination and centralization of water management among federal, state, local, and private sectors. Co-ordination is essential because of: (1) the increasing differentiation of water problems among the regions; (2) the need for different techniques among the regions; and (3) the eminent feasibility of administering water development on a regional basis. In addition, the federal establishment may be a better technical leader if it is less of an entrepreneur. By having both national and regional agencies, the most appropriate body is able to handle a particular management problem as it occurs. (Quarles-Florida)
W78-00661

CONGRESS RECEIVES COMPREHENSIVE GROUND WATER REPORT.
For primary bibliographic entry see Field 4B.
W78-00662

WESTWIDE STUDY (CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES).
Bureau of Reclamation, Washington, DC.
For primary bibliographic entry see Field 4A.
W78-00663

COALITION FOR LOWER BEAUFORT COUNTY V. ALEXANDER (COASTAL CONSTRUCTION PERMITS AND THE NATIONAL ENVIRONMENTAL POLICY ACT).
434 F. Supp. 293-96 (D.C. 1977).

Descriptors: *Permits, *Piers, *Environmental effects, *Economic impact, Coastal engineering, South Carolina, Economic justification, Economic feasibility, Ecological distribution, Coasts, Pollution abatement, Water pollution, Legislation, Employment, Employment opportunities, Administrative decisions, Structures.
Identifiers: *National Environmental Policy Act, *Deep water ports, Environmental impact statements, Citizen suits.

The plaintiffs, an association of local residents, sought to set aside a pier construction permit granted by the Secretary of the Army at the instance of the Corps of Engineers. Envisioning injury to endangered species, ecological integrity, and the pleasures of simple coastal living, the residents claimed the defendant had failed to comply with the National Environmental Policy Act. The State of South Carolina stressed the necessity for limited development of the area as a deep water industrial port to improve its employment and economy. The permit applicant has established a buffer zone around its plant to help preserve the ecology. In addition, the plant will be free from air and water pollution. The United States District Court found no procedural irregularities with only a technical deviation in procedure. Stating that there were no concrete indications of secondary ramifications, the rejection of an alternative site was nonarbitrary and all relevant environmental factors had been continuously and meticulously considered, the court held that no violation of the Act had been shown. (Steger-Florida)
W78-00664

PERMITS FOR DIVERSION, TRANSFER, APPROPRIATION OF WATER FROM INTERSTATE STREAMS; STORED WATER; WASTE WATER.
Nev. Rev. Stat. secs 533.515 thru 533.540.

Descriptors: *Nevada, *Legislation, *Interstate rivers, *Diversion, *Water permits, Alteration of flow, Irrigation practices, Relative rights, Water utilization, State governments, Water law, Governments, Water resources development, Equitable apportionment, Permits, Reservoirs, Beneficial use, Water districts, Water policy.
Identifiers: Licenses, State policy.

A permit for water appropriation may be granted in Nevada when the point of diversion lies outside the state if the other state authorizes the diversion of its water for use in Nevada. No permit will be issued to change the use or to transfer water or water rights of any water appropriated for beneficial use in Nevada for use beyond the state borders. Waters from interstate streams may be diverted within Nevada for beneficial use in another state only when state has a reciprocal water diversion agreement. It is a misdemeanor to divert and not use or to waste water of any river, stream, or creek during the irrigation season. Lake Tahoe may be used by the United States for reservoir purposes to aid the Truckee-Carson reclamation project. Guidelines and procedures are provided for the refunding of water district funds from county treasuries to water users and calimants of rights to waters of the Carson River or its forks. (Mulligan-Florida)
W78-00665

USE OF WATER FOR WATERING LIVESTOCK.
Nev. Rev. Stat. secs 533.485 thru 533.510 (1975).

Descriptors: *Nevada, *Legislation, *Stock water, *Livestock, *Ranges, Cattle, Farm management, Farms, Beneficial use, Farm ponds, Water utilization, Natural use, Water allocation(Policy), Water consumption(Except consumptive use), Water supply, Range management, Legal aspects, Preferences(Water rights), Permits, Water control, Water requirements, Prior appropriation.
Identifiers: State policy.

All lands in Nevada on which livestock are permitted to graze constitute the public range; livestock which subsist mainly by grazing on the public range are called range livestock. The use of water for watering livestock is declared a beneficial use; rights to use water for livestock may be acquired by application to the state engineer stating the number and kind on animals to be watered. If one person has a subsisting right to water range livestock at a particular place, no further appropriation of water from that place will be granted when it interferes with the grazing use of that portion of the public range. Furthermore, the state engineer may reject an application if the water source lies along an established route for moving livestock, and the state engineer determines that the public interest will best be served by reserving the water for livestock being driven. It is unlawful to water more than 50 head of livestock on two or more separate days, or within three miles of, a watering place at which another person has a subsisting right to water more than 50 livestock. (Mulligan-Florida)
W78-00666

RESERVOIRS.
Nev. Rev. Stat. secs 533.440 thru 533.445 (1975).

Descriptors: *Nevada, *Legislation, *Reservoirs, *Water permits, Reservoir operation, Routing, Supply, Underground storage, Water sources, Water supply, Beneficial use, Retention, Permits, Water control, Regulation, Reservoir storage, Water storage, Water management(Applied), Water reuse.
Identifiers: *Groundwater management, *Reservoir permits, Licenses.

Persons in Nevada applying for reservoir permits who propose to apply the stored water to a beneficial use must apply for a permit known as a secondary permit. The application must show that an agreement has been reached with the reservoir owner to impound sufficient water for the purpose stated. Effluents discharged from sewage treatment systems after final treatment are considered water subject to appropriation for beneficial use under the secondary permit program. When the beneficial use has been completed and proof thereof submitted, a final certificate of appropriation will be issued. If a reservoir owner desires to use a stream bed or other watercourse to carry water to consumers, he must give written notification to the state engineer and district water commissioner of the proposed date of discharge from the reservoir, its volume and the names of persons and ditches entitled to its use. The state engineer regulates the headgates of ditches not entitled to such use. The reservoir owner must reimburse the state for the time spent by the state engineer on these duties. (Mulligan-Florida)
W78-00667

CAPTAIN SOMA BOAT LINE V. CITY OF WISCONSIN DELLS (REASONABLE OBSTRUCTIONS TO NAVIGABLE STREAMS).
255 N.W. 441-46 (Wis. 1977).

Descriptors: *Wisconsin, *Bridges, *Boats, *Navigable waters, Financial feasibility, Recreation facilities, Riparian rights, Riparian land, Legal aspects, Navigation, Relative rights, Water law, Barriers, Structures, Boat-launching ramps, Marinas, High water mark, Cities, Streams, Economic impact.
Identifiers: *Nuisance(Legal aspects), Injunctive relief, Liability.

Plaintiff riparian landowner brought action against defendant city to abate a nuisance. The plaintiff contended that the defendant had obstructed a navigable stream by the maintenance of a highway bridge. The plaintiff operates boat tours and his only access to points of interest is through a small stream over which the disputed bridge runs. The city acknowledged that the bridge is an obstruction but contended that it was necessary and reasonable under the circumstances. Affirming the trial court's dismissal of the complaint, the Wisconsin Supreme Court noted that municipalities have the delegated powers to construct and maintain bridges. The court found that the bridge was necessary; the opening under the bridge was large enough at the time it was constructed; the plaintiff knew of the bridge's limitation prior to purchasing his land and tour operation; the city provided a floating dock on the river side free of charge; and the city had explored the possibility of building a new bridge but found the cost prohibitive. Under these circumstances, the court held that the city did not act unreasonably and would not be required to abate the nuisance even if it was one. (Curran-Florida)
W78-00668

UNITED STATES V. BOWEN (INTENT REQUIREMENT FOR PROSECUTION UNDER 1899 RIVERS AND HARBORS ACT).
428 F. Supp. 754-57 (D. Md. 1976).

Descriptors: *Rivers and Harbors Act, *Navigable waters, *Penalties(Legal), *Piers, *Permits, Constitutional law, Legislation, Legal aspects, Navigation, Regulation, Common law, Negligence, Judicial decisions, Water law, Bulkheads, Navigable rivers, Piles(Foundations), Structures.
Identifiers: Evidence, *Navigation obstructions, Property interests.

The federal government charged the defendant with two violations of the 1899 Rivers and Harbors Act which prohibits unauthorized obstructions to the navigable waters of the United States. The defendant had constructed a bulkhead, pier extensions, catwalk and mooring piles into navigable waterways. The defendant claimed that in order to convict him under the Act the government must prove that he had deliberately intended to obstruct the navigable waters. The government argued that the Act does not contain any reference to the element of intent. The United States District Court held that proof of the specific intent to obstruct was not necessary to convict. The court said it was sufficient to prove that the defendant intentionally built the structures which did in fact obstruct the navigable waters. The court fount that since the Act omitted mention of intent, the penalties for violation of the Act were minimal, conviction would not injure the defendant's reputation, and the statutory crime was not brought over from the common law, the statue could be construed as not requiring criminal intent. (Curran-Florida)
W78-00669

FARRUGIA V. FREDERICK (DENIAL OF CANAL PERMIT BASED ON ADVERSE EFFECTS UPON WATER QUALITY).
344 So2d 921-23 (Fla.App.1977).

Descriptors: *Florida, *Canal construction, *Water quality, *Permits, *Environmental control, Gases, Weeds, Environmental effects, Fish establishment, Basins, Boating, Channels, Odor, Construction, Compensation, Water law, Legal aspects, Judicial decisions.
Identifiers: *Environmental policy, Administrative decisions, State policy.

Petitioner was a developer of land located on Vaca Key seeking a permit to construct a proposed boat basin and access channel and to excavate a canal. The state agencies involved recommended denial of the permits. A hearing examiner appointed in the matter recommended denial only of the basin and channel permits based on evidence that the dead-end upland canal and its construction process would have an adverse effect on water quality. These findings were upheld by the full environmental commission. The First District Court of Appeals of Florida affirmed the permit denial finding that the waters in the canal would lack oxygen thus acquiring a foul odor from the accumulation of noxious gases, and that fish life could not exist in those conditions. Moreover, the ill effects could possibly be spread from the canal to outside waters. The court further found that denial of the canal permits would not deprive petitioner of his property but merely restrict the profit he could make on it. (Jones-Florida)
W78-00670

SIERRA CLUB V. MORTON (REQUIREMENTS OF FINAL ENVIRONMENTAL IMPACT STATEMENTS FOR DAM PROJECTS).
431 F.Supp. 11-25 (S.D. Tex. 1975).

Descriptors: *Texas, *Water structure, *Dams, *Dam construction, *Reservoir construction, Federal project policy, Environment, Environmental effects, River basin development, Cost-benefit analysis, Cost-benefit theory, Cost-benefit ratio, Environmental engineering, Reservoirs, Reservoir sites, River regulation, Estuaries, Estuarine environment, Wildlife conservation, Fish conservation, Legal aspects, River systems.
Identifiers: *National Environmental Policy Act, *Environmental impact statement, Archaeological impact, Legal requirements.

Plaintiffs, a national conservation organization, a citizens' association and an affected landowner sought to enjoin governmental officials and agencies from further development of a Texas dam and reservoir construction project. The plaintiffs alleged that the final environmental impact statement (FEIS) failed to comply with the requirements of the National Environmental Policy Act (NEPA). The United States District Court denied injunctive relief holding that the FEIS was sufficient even though it did not cover all relevant contingencies. It did adequately cover such areas as alternative water sources to the project; impact on riverine and estuarine systems during operation of the dam; damage to fish and wildlife and mitigation measures; preservation techniques for historical archaeological sites; and problems associated with recreation management. The court further found that a cost/benefit ratio analysis was unnecessary and that the FEIS was in compliance with the requirements of NEPA. The court held that it would not examine the substantive aspects of the project but only whether the NEPA procedures had been met. (Denker-Florida)
W78-00671

WATER AND LAND DEVELOPMENT--WELLS.
Hawaii Rev. Stat. secs 178-1 thru -11 (Supp 1975).

Descriptors: *Hawaii, *Wells, *Well regulations, *Aquifers, *Water conservation, Runoff, Water wells, Drainage wells, Casings, Drilling, Excavation, Well casings, Legal aspects, Regulation, Water law, Logging(Recording), Beneficial use, Porous media, Subsurface runoff, Surface runoff, Legislation.
Identifiers: Nuisance(Legal aspects).

A well, which has been legislatively defined as any excavation constructed into the ground or penetrating an aquifer or basin whether or not intended for acquisition or disposal of any liquid, shall be capped and equipped so as to prevent waste. A well not so equipped through which water flows to the surface into a porous substratum by natural pressure is declared a common nuisance. The owner or occupant of the land on which such a well is located is guilty of a misdemeanor if such a nuisance is allowed to continue. Beneficial use, to the extent allowed by the board of land and natural resources, is not considered 'waste' which is defined as causing or permitting water in any well to reach a porous substratum or to flow upon the land, into a natural watercourse, or onto any road. A notice shall be filed prior to the drilling of any new well and detailed records kept during its construction. In addition, the well shall be kept accessible for inspection. Such inspection is authorized without a warrant. Any well owner may relieve himself of responsibility for possible waste by transferring to the county the exclusive right to develop water on his property. (Moorhouse-Florida)
W78-00672

NETTLETON V. HIGGINSON (CONSTITUTIONALITY OF WATER DISTRIBUTION PRIORITIES IN TIMES OF SCARCITY).
558 p.2d 1048-63 (Idaho Sup. Ct. 1977).

Descriptors: *Idaho, *Preference(Water rights), *Appropriation, *Water districts, Water shortage, Beneficial use, Diversion, Legislation, Permits, Priorities, Unappropriated water, Natural streams, Eminent domain, Compensation, Water law, Legal aspects, Constitutional law, Water rights, Water allocation(Policy).

The plaintiff was the owner of property located in an upper stream water district, and held water rights therein created by the diversion of unappropriated waters for beneficial use. These rights were unadjudicated 'constitutional use' rights. The defendant Department of Water Resources, which controlled distribution of all waters of both the upper and lower stream, ordered its watermaster to distribute the waters from the stream as if the two districts were one. This action resulted in priority, in times of scarcity, to certain landowners in the lower district whose rights had already been adjudicated. In his suit, the plaintiff contended that: (1) the action constituted a taking without due process; (2) it was a denial of equal protection; and (3) just compensation was due from the taking of property for public use. The Idaho Supreme Court rejected these grounds holding that, for purposes of water administration in times of scarcity, a proper delivery can only be effected when the watermaster is guided by a specific schedule of water users and their priorities. The court then reversed the lower court and ordered the department to hold hearings on consolidation of the two water districts. (Jones-Florida)
W78-00673

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION V. INTAKE WATER COMPANY (INCHOATE RIGHT TO APPROPRIATE WATER DESPITE DELAY OF ACTUAL CONSTRUCTION).
558 P.2d 1110-23 (Mont. Sup. Ct. 1977).

Descriptors: *Montana, *Prior appropriation, *Water rights, *Diversion structures, Administrative decisions, Administrative agencies, Appropriation, Beneficial use, Preferences(Water rights), Priorities, Land reclamation, Coal mines, Wildlife conservation, Water works, Water utilization, Pumping, Reservoirs, Water demand, Water law, Judicial decisions, Legal aspects.
Identifiers: *Environmental impact statement, *Declaratory judgment.

Plaintiff department of natural resources sought a declaratory judgment that defendant water company did not have a valid appropriation of waters of the Yellowstone River. The subject matter of litigation was a multi-million dollar corporation project involving construction of a diversion facility to pump appropriated water from the river to storage reservoirs for distribution by pipelines to the service area. Following the required posting of notice of appropriation, the defendant engaged in environmental studies, legal and administrative work, and planning for the diversion works. The department claimed that the defendant did not own any rights because actual construction of the project was not commenced within forty days of posting notice. The Supreme Court of Montana held actual construction need not have begun where there had been a diligent effort to prosecute construction of the project. The court found that defendant corporation was the owner of an 'existing right' of priority of appropriation which would ripen into a valid appropriation when all statutory requirements were met. The court also rejected the department's argument that the defendant could not claim an inchoate right to appropriate for public policy reasons. (Jones-Florida)
W78-00674

STATE LEGISLATIVE RESPONSE TO THE CENTRAL ARIZONA PROJECT,
Georgia Univ., Athens.
V. L. Marando, and R. D. Thomas.
Water Resources Bulletin, Vol. 8, No. 6, p 1211-1218, December 1972. 2 tab, 11 ref. OWRT A-021-ARIZ(1).

Descriptors: *Water management(Applied), *Political aspects, *Water policy, *Legal aspects, *Arizona, State governments, Decision making, Projects, Environment, Legislation.
Identifiers: *Central Arizona Project.

This research deals with the manner in which Arizona Legislature handled the issue of the Central Arizona Project. Due to the massive costs and impact, the Central Arizona Project was dealt with by the Legislature in a nonroutinized manner. There was no Legislative precedent for handling such a major public work project. Given the Legislature's annual program concerns and priorities, it is neither structurally nor psychologically geared to respond to the Central Arizona Project in terms of placing it within an agenda of priorities even for discussion. (Bell-Cornell)
W78-00707

THE NATIONAL FLOOD INSURANCE PROGRAM: SOME MIDSTREAM PERSPECTIVES,
Massachusetts Univ., Amherst. Dept. of Geography; and Massachusetts Univ., Amherst. Dept. of Law.
For primary bibliographic entry see Field 6F.
W78-00747

INTERIM GUIDE FOR ENVIRONMENTAL ASSESSMENT: HUD FIELD OFFICE EDITION.
Voorhees (Alan M.) and Associates, Inc., McLean, VA.
For primary bibliographic entry see Field 6G.
W78-00749

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME III-PRELIMINARY POLICY ANALYSIS,
Oklahoma Univ., Norman. Science and Public Policy Program.
For primary bibliographic entry see Field 6G.
W78-00755

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANTS.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 2L.
W78-00777

FOUR MONOGRAPHS FOR THE GENERAL READER (WORLD OCEANS, LAW OF THE OCEANS, INSTITUTIONAL ARRANGEMENTS FOR THE LAW OF THE SEA, WORK OF THE THIRD UNITED NATIONS LAW OF THE SEA),
Miami Univ., FL. School of Law.
T. A. Clingan, Jr.
Sea Grant Special Report No. 10, February, 1977. 67 p, $3.00.

Descriptors: *Continental shelf, *International commission, *International law, *Law of the Sea, *Treaties, Mineral industry, Continental margin, Continental slope, Anadromous fish, Marine fish, Fish conservation, Fish management, International waters, Mining, Manganese, Navigation, Oceans, Oil, Political constraints, United Nations, United States, Water law.
Identifiers: Coastal zones, *Seabed mining, Territorial waters, Law of the Sea Conference, Coastal waters, International agreement, Mineral rights, Outer continental shelf, 200-mile economic zone.

Man has just begun to utilize the natural resources of the sea. These four monographs examine the physical and political difficulties involved in the use of oceanic resources and the international law that must deal with these problems. The old international law based on custom, combined with the unilateral actions and bilateral agreements of some nations, was often unable to deal with modern problems. In an effort to resolve these conflicts, the United Nations held a series of three Law of the Sea Conferences. The first, held in 1958, resulted in four Geneva Conventions dealing with high seas, territorial sea, continental shelf, and fishing and conservation. None has been widely ratified. The second, in 1960, resolved nothing. The third conference, to be held soon, must deal with the peaceful exploitation of living and nonliving resources, and the preservation of the marine environment. The principle of the 'common heritage of mankind' must compete with the rights of States and individuals to have access to oceanic resources. The author believes that a treaty will emerge from the conference only if each country is willing to make some extremely painful decisions. (Jordan-Florida)
W78-00778

MARINE SCIENTIFIC RESEARCH AND THE LAW OF THE SEA CONFERENCE: SOME PROPOSED AMENDMENTS TO THE REVISED TEXT,
Woods Hole Oceanographic Institution, MA.
R. Winner.
Technical Report WHOI 76-80, September 1976. 54 p.

Descriptors: *Law of the Sea, *International law, *International waters, Research and development, Research priorities, Marine biology, Coasts, Water law, Oceans, Seashores, Continental shelf, Treaties, Negotiations, Oceanography, Technology, Resources development, Marine geology, Legal aspects.
Identifiers: *International agreements, Law of the Sea Conference, Coastal waters, Sovereign immunity, Marine environment, Outer continental shelf, Marine resources, Coastal zones, Territorial seas(Jurisdiction), Seabed mining.

International treaty provisions and negotiations affecting marine scientific research are under consideration by the fifth session of the Law of the Sea Conference. The author addresses those aspects of the negotiations that directly affect marine scientific research. He bases his analysis principally upon a study of the first single negotiating text produced in the third session, contrasting this with the revised single negotiating text produced by the fourth session of the conference. Topics discussed include: (1) the nature of the divergent interests the treaty negotiations are trying to conciliate; (2) the treaty provisions and international law dealing with marine research before the third conference; (3) the direction indicated by the third session negotiations; and (4) recommended amendments to the revised text. Particularly examined are the texts of the three committees on the conference. Committee I deals with the law of the deep seabed beyond the claims of national sovereignty. Committee II has responsibility for defining the geographic limits of, and substantive rights within, the territorial sea, economic zone, and high sea. Committee III is concerned with marine environmental protection and preservation, marine scientific research, and technology transfer. (Howard-Florida)
W78-00779

INTERNATIONAL OCEAN INSTITUTE,
Center for the Study of Democratic Institutions, Santa Barbara, CA.
E. M. Borgese.
Oceans, Vol. 10, No. 1, p. 52-57, January 1977.

Descriptors: *Treaties, *International waters, *International law, *United Nations, *Exploitation, Exploration, Natural resources, Environmental effects, Water pollution, Pollution abatement, Ecological distribution, Technology, Foreign countries, Oceans, Water law, Economic prediction, Law of the Sea, Institutions, Planning.
Identifiers: *Mediterranean Ocean, *Territorial waters, Territorial seas(Jurisdiction).

Increased accessibility to the ocean's vast resources made possible by the technological revolution makes an international race for exploitation with consequent conflict and pollution inevitable. Since the old law of the sea based on the sovereignty of coastal states within a 3-mile territorial limit is adequate, a new concept, the common heritage of mankind, should take its place. The United Nations helped to found the International Ocean Institute at the University of Malta. The purpose of the Institute is to study the establishment of a new international order in the oceans and to propose new approaches and solutions. The Institute held a seminar on pollution of the Mediterranean and examined the existing pollution control legislation in all the Mediterranean states. The Institute's three-step plan for the Mediterranean area includes: (1) strengthening of existing regional bodies and institutions; (2) creating new bodies for regulating unregulated uses of marine areas; and (3) coordination of the policies of the various agencies and governments involved. The Institute's work is not limited to the Mediterranean. Studies of a new international economic order and of the Law of the Sea Convention are also underway. (Steger-Florida)
W78-00780

SOUTHERN DISCOMFORT - LEARNING TO LIVE WITH THE WATER ACT,
For primary bibliographic entry see Field 5G.
W78-00781

WATER QUALITY WORKSHOPS: TALKING IT OVER WITH EPA,
American Forestry Association, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00782

NINETEENTH CENTURY DAMS AND TWENTIETH CENTURY PROBLEMS: COMMENTARY ON A STATUTORY SOLUTION,
Catholic Univ. of America, Washington, DC. Law School.
G. G. Waite.
Maine Law Review, Vol. 28, No. 2, p. 419-34, 1977.

Descriptors: *Impoundments, *Water level fluctuations, *Riparian rights, *Operation and maintenance, *Maine, Dams, Easements, Taxes, Retaining walls, Barriers, Watercourses(Legal aspects), Property values, Legislation, Compensation, Regulated flow, Obstruction to flow, Streamflow.
Identifiers: *Dam effects, Property interests.

It is difficult to adjust the rights of dam owners, other shoreline owners, and the public so that watercourses may be maintained in a condition compatible with the needs of watercourse users without laying an undue financial burden on individual landowners. The state of Maine has enacted a statute to adjust such rights. The statute regulates many old, unused dams and stablizes water levels in their impoundments, but it makes only limited reference to abandonment of commercially worthless dams. Since the primary public concern is the effect of abandonment of dam operations on streams and shoreline owners, the author finds such limited reference unsatisfactory. The statute may also be unconstitutional, either as a tax or as an oppressive form of police power, because of the provisions of the statute that impose heavy maintenance and operation costs on the dam owner and other provisions that regulate transfer of title. The statute could possibly be salvaged through revisions such as expanding the definition of a dam, making transfer more equitable, and dealing with abandonment in detail. (Thomas-Florida)
W78-00783

THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA: THE 1976 NEW YORK SESSIONS,
Bureau of Oceans and International Environmental and Scientific Affairs, Washington, DC.
B. H. Oxman.
The American Journal of International Law, Vol. 71, p. 247-69, April 1977.

Descriptors: *International law, *Law of the Sea, *United Nations, *Treaties, *International waters, Exploitation, Continental shelf, Mining, Regulation, International commissions, Legal aspects, Foreign trade, Commercial fishing, Navigation, Oceans, Water law, Ownership of beds, Beds under water, Governments, Regulation, Political aspects, Political constraints.
Identifiers: Seabed mining, 200-mile economic zone, United Nations Conference on the Law of the Sea, Deep seabeds, International regimes, Mineral resources, Minerals, Outer continental shelf.

The purpose of the United Nations Conference on the Law of the Sea was to formulate an international treaty. There are two major problem areas which must be resolved before any treaty can be finalized. The first problem is the dispute between the industrialized and developing nations over exploitation of deep seabed mineral resources. The author indicates this is largely symbolic since each nation has individual interests. Ultimately, what must be settled is how the seabeds will be partitioned while preserving a universal right to their use. The second problem is the proposed creation of 200-mile economic zones surrounding coastal states. Concern here centers on whether these states will attempt to assert power beyond the areas allowed, i.e., fishing rights, vessel pollution, some scientific research. For most purposes, the economic zone would retain the same status as high seas. The author concludes that a settling of these problems and final passage of the treaty will contribute not only to agreement concerning the sea, but also to increasing worldwide stability and consequently to a decreasing in international tensions. (Malefatto-Florida)
W78-00784

U.S. INDUSTRY AND STATES URGE A RETHINK OF WATER QUALITY LAW.
For primary bibliographic entry see Field 5G.
W78-00785

PRESIDENT ANNOUNCES MEASURES TO CONTROL MARINE OIL POLLUTION,
Executive Office of the President, Washington, DC.

J. Carter.
Department of State Bulletin, Vol. 76, No. 1974, p. 422-23, April 25, 1977.

Descriptors: *Oil spills, *Oil pollution, *Oceans, *International commissions, Disasters, Beaches, Coast Guard regulations, Coasts, Conferences, Ecology, Compensation, Environmental engineering, Foreign countries, International waters, Leakage, Negligence, Oil, United States, Water pollution control, Ships, Transportation.
Identifiers: Tankers, Marine environment, Coastal waters, Environmental policy, Environmental Protection Agency, International agreements, Liability, Vessels, Supertankers.

Oil pollution of the oceans is a serious problem requiring concentrated and prompt action by the Environmental Protection Agency and the United States Coast Guard. The objectives of the federal government are to reduce marine oil pollution, improve the government's ability to deal with spills, and provide dependable compensation to victims. In an effort to coordinate an effective program to control pollution of the oceans the President offers several recommendations. These include ratification of the International Convection for the Prevention of Pollution from Ships, reform of ship construction and equipment standards on new tankers, and improvement of crew standards and training. He also suggests the development of a Tanker Boarding Program and a Marine Safety Information System, approval of Comprehensive Oil Pollution Liability and Compensation Legislation, and improvement of federal ability to respond to oil pollution emergencies. Though the risks involved in marine transportation of oil cannot be entirely eradicated, they may be reduced by an effective control program. (Spector-Florida)
W78-00786

OCEANOGRAPHY AND THE LAW OF THE SEA,
Portugese, State Secretariat for Fisheries, Lisbon.
M. Ruivo.
UNESCO Courier, Vol. 30, p. 10-13, January 1977.

Descriptors: *Law of the Sea, *Foreign countries, *Water resources development, *International waters, Oceans, Research and development, Legal aspects, Water control, Water resources, Federal government, Natural resources, Political aspects, Planning, Resources, Water policy, Conferences, International law, Foreign waters, Continental shelf.
Identifiers: Marine resources, International agreements, Seabed mining, Marine environment, Minerals, Outer continental shelf, Territorial waters, Water rights(Non-riparians).

As marine science is increasingly applied for peaceful as well as military and security purposes, contradictions arise between maritime practice and traditional maritime law. To resolve such conflicts two conferences on the Law of the Sea developed provisions for regulation of scientific research. The guidelines maintained the prinicple of freedom of the seas except for the Continental Shelf area and provided that Coastal States should not normally withhold consent to a legitimate research request as long as that State could participate. However, newly independent nations question the equity of the proposals. Recently, through agencies such as Unesco's Intergovernmental Oceanographic Commission, cooperation in oceanographic research, although still dominated by industrialized countries, has increased by all continents. Developing countries remain uneasy about research regulations because they are convinced of their need to control and benefit from the information derived from research activities to protect their interests, including national defense. Success of the new rules for oceanographic research depends upon negotiation and compromise in a spirit of international cooperation. (Mulligan-Florida)
W78-00787

THOU SHALT NOT FILL PUBLIC WATERS WITHOUT PUBLIC PERMISSION - WASHINGTON'S LAKE CHELAN DECISION,
Washington Univ., Seattle. School of Law.
C. E. Corker.
Washington Law Review, Vol. 45, No. 1, p. 65-93, March 1970.

Descriptors: *Washington, *Riparian rights, *Lake shores, *Boundary disputes, Banks, Judicial decisions, Navigation, Legal aspects, Navigable waters, Riparian waters, Shores, Lakes, Water utilization, Shallow water, Boundaries(Property), Littoral, Water law, Prescriptive rights, Water level fluctuations, Riparian land.
Identifiers: *Submerged lands, Navigability, Property, Property interests, Real property law, State policy, Navigation obstructions.

A Washington Supreme Court decision ordered defendants whose lands were seasonally inundated by the waters of Lake Chelan to remove fill because it obstructed the rights of plaintiffs and public to swim, boat, fish, play and navigate in the waters of the lake. The author supports the holding that ownership of lands beneath navigable waters does not give the owner a right to restrict use of those waters for all the public purposes to which they are suited even though the lands were above the natural high water level of the lake before construction of a hydroelectric project. The dissent relied upon that fact in deciding that defendants' lots were not subject to public navigation rights. Unresolved questions discussed include: (1) whether all fills in navigable waters must be abated; (2) which waters are navigable'; (3) whether prescription is a better doctrine than navigation to achieve similar results; and (4) whether there is a protected right to view the water. The author concludes that this decision may curtail sale of tide- and shore-lands. He recommneds legislation asserting public ownership of such lands, as well as planning for conservation and utilization of these assets. (Mulligan-Florida)
W78-00788

THE ROLE OF INSURANCE IN ENVIRONMENTAL LITIGATION,
McKenna, Storer, Rowe, White and Farrug, Chicago, IL.
For primary bibliographic entry see Field 6F.
W78-00789

OIL POLLUTION OF COASTAL AND INLAND WATERS UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
Mendes and Mount, New York.
For primary bibliographic entry see Field 5G.
W78-00790

CLEAN WATER PROGRESS - YES, SPEED - NO,
Committee on Public Works and Transportation (U.S. House).
For primary bibliographic entry see Field 5G.
W78-00791

REPUBLIC STEEL CORPORATION V. TRAIN (ENVIRONMENTAL PROTECTION AGENCY PERMIT OBJECTION IMPROPER WHERE NO GUIDELINES AVAILABLE).
557 F.2d 91-8 (6th Cir. 1977).

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *State jurisdiction, *Permits, Legislation, Industries, Water pollution control, Pollution abatement, Administrative agencies, Effluents, Water pollution sources, Legal aspects, State governments, Discharges(Water), Industrial wastes, *Ohio, Regulation, Water law, Navigable waterways, Industrial wastes, Industrial plants.
Identifiers: National Poilution Discharge Elimination System, Federal Water Pollution Control Act Amendments of 1972, Effluent limitations, Effluent guidelines, Administrative regulations, Best practicable control technology.

Petitioner steel company sought a National Discharge Elimination System permit which was granted by the State of Ohio but blocked by the federal Environmental Protection Agency (EPA). The EPA blocked the permit because it extended the date for the petitioner's compliance with effluent control standards beyond that prescribed in the Water Pollution Control Act Amendments. The petitioner maintained that since the EPA had failed to establish standards for the steel industry, as it was supposed to, the extension should have been granted. The United States Sixth Circuit Court of Appeals stated, in answer to the EPA's contrary arguments, that the Act and its legislative history made clear that Congress did not intend to subject polluters to sanctions before the EPA had established guidelines. The court also rejected the EPA's contention that it had implicitly ratified the Ohio effluent limitations. This could only be done under a statute mandating it, and none exists. The court allowed the EPA thirty days to review other sections of the Ohio permit for full compliance with the provisions of the Water Pollution Control Act. If it complied, the permit was to be granted. (Malefatto-Florida)
W78-00792

CONNECTICUT LIGHT AND POWER COMPANY V. FEDERAL POWER COMMISSION (NAVIGABILITY - DEFINED FOR LICENSING OF HYDROELECTRIC PROJECTS).
557 F.2d 349-58 (2d Cir. 1977).

Descriptors: *Federal Power Act, *Hydroelectric project licensing, *Navigable rivers, *Utilities, *Administrative decisions, Legislation, Hydroelectric, Jurisdiction, Plants, Transportation, Public works, Water utilization, *Connecticut, Administrative agencies, Regulation, Water law, Navigable waters, Rivers, Electric power, Legal aspects.
Identifiers: *Administrative regulations, Licenses, Housatonic River, Navigability tests.

Petitioner electric utility challenged a decision by the Federal Power Commission in the United States Second Circuit Court of Appeals. The decision required the licensing of petitioner's four hydroelectric projects on the Housatonic River in Connecticut, under the authority of the Federal Power Act. The Act requires the Commission to license all such projects built on navigable rivers. The petitioner maintained that the Housatonic is not navigable. The court first found that a 1952 decision by the Commission not to license a project on the river was not applicable since administrative decisions are confined to particular cases. To support its present licensing decision, the Commission offered much historical data showing the Housatonic had been used for transportation purposes, including the transport of logs. The court accepted the logging data as evidence of navigability holding that term to refer to uses by anything from logs to ocean liners. Though conceding the Housatonic's importance as a navigable waterway had declined, the court maintained that once a waterway was found to be navigable, it remained so. Thus, the Commission's licensing decision was upheld. (Malefatto-Florida)
W78-00793

INTERSTATE WATERS - BOULDER CANYON PROJECT.
Nev. Rev. Stat. secs. 538.010 thru 538.030 (1975).

Descriptors: *Nevada, *Colorado River Compact, *Legislation, *Boulder Canyon Project Act, Water control, Water resources development, Water law, Dams, Legal aspects, Governmental interrelations, State governments, Water policy, Water rights, Governments, State governments, Payment, Projects, Compensation.

The Nevada legislature has approved revised provisions of the Colorado River Compact which will become binding whenever six signatory states have ratified it and Congress approves. Guidelines are set forth under which Nevada will receive payments in commutation and in lieu of payments now provided by section 4(b) of the Boulder Canyon Project Act. The guidelines depend upon enactment of Congressional legislation providing for such payments. The amount of the annual payment, the date due and the minimum number of years for payment are established. The Nevada attorney general is authorized to determine whether there is substantial conformity between the provisions of the Congressional legislation and the provisions of this section and to communicate that to the Secretary of the Interior through the Governor. Any payments received under this Boulder Canyon Project Adjustment Act shall be placed by the state treasurer in the state's general fund. This legislation becomes effective immediately upon the effective data of such Congressional legislation. If none is passed, the enactment of this section in no way diminishes rights under the Boulder Canyon Project Act. (Mulligan-Florida)
W78-00794

STATE V. MIZRAHI (AUTHORITY OF MUNICIPALITY TO CHARGE PUBLIC FOR USE OF BEACH).
373 A.2d 433-34 (N.J. Super. Ct. 1977).

Descriptors: *New Jersey, *Public rights, *Beaches, *Permits, *Recreation facilities, Legal aspects, Recreation, Atlantic Ocean, Littoral, Permits, Public access, Regulation, Local governments, Legislation, Coasts, Shores, Boundary disputes, Intertidal areas, Law enforcement.
Identifiers: Municipal ordinance, Licenses, Public Trust Doctrine, Due process, Equal protection, Foreshore, User charges.

The defendant was convicted of using the beach without a beach badge required by a city ordinance. The defendant was lying on the foreshore, or seaward side of the mean high tide line, without the required badge and he refused to leave when asked to do so by the beach patrol. The defendant contended that the city had no power to charge a fee for the use of the beach since it is owned by the state. He also argued that the ordinance was unconstitutionally vague in defining the littoral boundaries of the paid beaches. His final contention was that the ordinance violated the Equal Protection Clause because it infringed on the public's legal right to use the beach without the burden of municipal fees. The Superior Court of New Jersey, Appellate Division, took notice that the ordinance applied equally to both residents and nonresidents. The court found defendant's contentions to be without merit. The right merely to pass along the foreshore was distinguished from the right to use beach facilities with the benefit of municipal services, such as the cleaning and maintaining of the beach and lifeguard services. (Quarles-Florida)
W78-00795

CONTROL OF WATER POLLUTION IN NEW YORK CITY,
New York City Dept. of Water Resources.
M. Lang, C. Samowitz, and M. Jethwani.
Water Research, Vol. 9, No. 11, p. 981-91, November 1975. 10 fig.

Descriptors: *Long-term planning, *New York, *Water pollution control, *Sludge treatment, Pollutants, Water pollution, Water treatment, Waste treatment, Impaired water quality, Pollution(Water), Activated sludge, Wastes, Sludge disposal, Water pollution treatment, Water resources, Development, Aeration, Water purification.
Identifiers: Environmental policy.

Implementation of a water pollution control program in a major metropolis requires three stages: (1) a period of education to convince the public and elected representatives of the need for a program; (2) continuing fiscal commitment and budgetary negotiations; (3) actual design and construction. Adherence to a master plan for long-term pollution control is complicated by uncertainty of the projected effluent requirements, population concentration and technological improvements at the completion time. The New York City water pollution control program is an example of a successful experience with long-range planning. The adjustment of oxygen deficiencies in inner waterways are the research and development of improved aeration facilities for the activated sludge process are discussed in depth. The focus of the New York program was to preserve and enhance the receiving waters. Its success depended upon incorporation of new processes, a continuing ability to negotiate with regulatory agencies, groups controlling funding, and the growing number of persons concerned with potential damage to the environment. (Mulligan-Florida)
W78-00796

UNITED STATES V. HAMEL (GASOLINE AS A POLLUTANT UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
551 F.2d 107-13 (6th Cir. 1977).

Descriptors: *Pollutants, *Federal Water Pollution Control Act, *Oil pollution, *Gasoline, Michigan, Oil wastes, Judicial decisions, Penalties(Legal), Pollutant identification, Wastes, Rivers and Harbors Act, Legal aspects, Water pollution, Navigable waters, Oil, Oil spills, Organic compounds, United States, Lakes, Legislation, Water pollution sources.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Liability.

The defendant's conviction of willfully discharging gasoline into a navigable waterway in violation of the Federal Water Pollution Control Act (FWPCA) was affirmed. Defendant contented that gasoline is not a pollutant within the definitional criteria set forth in the FWPCA. He also insisted that the Federal Water Pollution Control Act Amendments of 1972 were not intended to provide criminal penalties for gasoline spills because criminal sanctions were already available under the Refuse Act. The plaintiff federal government had successfully contended at trial that gasoline could be subsumed under 'biological materials' category for pollutants. In affirming the conviction, the Sixth Circuit Court of Appeals scrutinized the ligislative intent and history of the FWPCA. The court observed that Congress intended the FWPCA to encompass at the minimum what was covered under the Refuse Act of 1899. Using this legislative background coupled with the fact that water pollution legislation is given a generous construction in the Sixth Circuit, the court found gasoline to be a pollutant under the FWPCA. (Quarles-Florida)
W78-00797

DEEDS: DESCRIPTION OF LAND CONVEYED BY REFERENCE TO RIVER OR STREAM AS CARRYING TO THREAD OR CENTER OR ONLY TO BANK THEREOF - MODERN STATUS,
G. A. Locke.
78 ALR3d 604-18 (1977).

Descriptors: *Watercourses(Legal aspects), *Boundary disputes, *Boundaries(Property), *Land tenure, Water law, Rivers, Streams, Judicial decisions, Legal aspects, Legal review, Ownership of beds, Low water mark, Banks, River beds, Non-navigable waters, Navigable waters.
Identifiers: Property interests, Real property law, Presumptions(Legal).

In general, when land is conveyed by reference to a river or stream, the boundary carries only to the thread or center thereof. This principle, used when the deed does not specifically contradict it, is considered a presumption in some jurisdictions and a rule of construction in others. The author discusses the application or limitation of the principle in several court decisions. Where the reference in a deed was solely to the river or stream itself as a boundary, the conveyance included the bed of the river as far as the thread. Where the deed referred to the bank of a river as a boundary, there has been a split of authority as to whether title was conveyed to the center of the waterway. A deed which refers to the low-water mark of a river as the boundary was held not to convey the bed of the river unless a contrary intention was shown on the part of the grantor. If a deed refers to both the river and the bank, conveyance is allowed to the center; if it refers to the river itself and the other side of the river, the entire bed is conveyed. (Jones-Florida)
W78-00798

JURISDICTIONAL EXPANSION OF THE ARMY CORPS OF ENGINEERS UNDER FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
For primary bibliographic entry see Field 5G.
W78-00799

THE PROPOSED OUTER CONTINENTAL SHELF LANDS ACT AMENDMENTS OF 1976: AN INADEQUATE GUIDE TO OUTER CONTINENTAL SHELF DEVELOPMENT,
Harvard Law School, Cambridge, MA.
J. S. Cole.
Harvard Journal on Legislation, Vol 14, No 2, p. 358-94, April 1977.

Descriptors: *Continental shelf, *Energy, *Oil pollution, *Exploration, *Legislation, Fuels, Federal government, Oil industry, Oil spills, Oceans, Oil wells, Ecology, Exploitation, Bids, Offshore platforms, Pollutants, Water pollution control, Compensation, Leases.
Identifiers: Coastal waters, Oil spill cleanup, *Outer Continental Shelf, Liability, Marine environment, Energy crisis, Environmental policy, Hazardous substances(Pollution).

Major revisions of the Outer Continental Shelf Lands Act of 1953 (OCSLA) are under consideration by Congress. The author's analysis of the revisions includes: (1) the method proposed for determining where oil and gas development will occur on the continental shelf; (2) the provision for alternative bidding methods to allocate development rights among oil and gas companies; and (3) the provisions concerning compensation and imposition of liability when damage from oil spills occurs. While the amendments reflect a strong congressional desire to promote oil and gas developments, the proposals lack any guuidance regarding the weight to be given to interests in uses of the outer continental shelf other than for oil and gas exploitation so that these other uses may be virtually excluded. Although the author criticizes the new leasing procedure bidding techniques under the proposed amendments as ineffective to answer the charges of production inefficiency and lack of competitiveness leveled against the present OCSLA bidding system, he fells that the remedy for the OCSLA's failure to impose liability for oil spills will be adequate to compensate damaged parties and deter behavior which causes spills. (Howard-Florida)
W78-00800

PROBLEMS OF COASTAL MANAGEMENT,
Florida Dept. of Natural Resources, Tallahassee. Bureau of Beaches and Shores.
W. M. Sensabaugh.
Shore and Beach, Vol 44, No 1, p. 6, April 1976.

Descriptors: *Florida, *Shore protection, *Beaches, *Beach erosion, Land management, Dunes, Legal aspects, State jurisdiction, Coastal engineering, Hurricanes, Land use, Protection, Erosion, State governments, Administrative agencies, Permits, High water mark, Atlantic Ocean, Gulf of Mexico, Coastal structures, Boundaries(Property).
Identifiers: Coastal zone management, State policy, Coastal zones, Environmental policy, Property interests, Real property law, Setback lines, Beach nourishment.

Although the Florida Bureau of Beaches and Shores of the Department of Natural Resources was not the primary administrator of Coastal Zone management, its efforts provided valuable coastline protection. Three major programs of the Bureau served to preserve the sandy beaches along the state's coasts. The first, a regulatory project, involved permit issuance for beach erosion control structures such as groins, jetties and breakwaters built seaward of the mean high water line. The second program entailed channeling state funds to the localities on a matching basis for beach nourishment and erosion control projects. The most significant function of the Bureau has been regulation of beach front construction through setback lines established on a county by county basis for both the Atlantic and Gulf Coast beaches. Before the setback line is established, a comprehensive coastal engineering study must be done to show the line is needed to prevent beach erosion and protect upland development. Although the setback line law provides for variances to allow construction seaward of the line, this provision has not yet proved to have weakened the law. (Cocheu-Florida)
W78-00801

6F. Nonstructural Alternatives

COSTS OF ERRORS IN DEFINING A COMMUNITY'S FLOOD PLAIN,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
D. L. Daniel, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 762, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University, Mississippi State, Water Resources Research Institute, Completion Report, September 1977. 44 p, 4 fig, 4 tab. OWRT A-104-MISS(1), 14-34-0001-7052.

Descriptors: Flood plains, Insurance, Zoning, Regulation, *Costs, *Flood plain insurance, *Flood plain zoning, *Flood protection, Risks, Estimating, Social aspects.
Identifiers: *Flood risk.

Under the National Flood Insurance Act of 1968, as expanded by the Flood Disaster Protection Act of 1973, flood insurance is made available to flood-prone areas. In addition, new construction and substantial improvements of existing structures must, for most practical purposes, be constructed so as to be flood proof with respect to a 100-year flood. Obviously, construction requirements as well as actuarial rates for the flood insurance on structures in a flood-prone area. However, risk estimates can never be completely free of error. The relationship between erroneous estimates of flood risk and the economic consequences of those errors was analyzed. The variables upon which the costs of errors depend are presented. An analysis is included as to who bears the costs arising out of these errors and the social as well as private consequences of the errors.
W78-00558

THE NATIONAL FLOOD INSURANCE PROGRAM: SOME MIDSTREAM PERSPECTIVES,
Massachusetts Univ., Amherst. Dept. of Geography; and Massachusetts Univ., Amherst. Dept. of Law.
R. H. Platt.
Journal of the American Institute of Planners, Vol 43, No 3, July 1976. p 303-313, 4 fig, 1 tab, 25 ref.

Descriptors: *Flood Plain Insurance, *Management, *Planning, *Legal aspects, *Regulation, *Mapping, *Rates, Non-structural alternatives, Flood data, Building codes, Flood plain zoning.
Identifiers: *National Flood Insurance Program, *Flood plain management, *Premium rates, Flood insurance rates.

The history of flood plain regulation and an overview of the National Flood Insurance Program (NFIP) are presented as background to a discussion of implementation of the NFIP. Four issues of flood plain management and the NFIP stand in the way of final implementation--the constitutional issue, the mapping issue, the rate issue, and the regulatory issue. The constitutional issue hinges on the fear that flood plain regulations may constitute a 'taking without just compensation'. The validity of this fear is discounted via an analysis of relevant judicial decisions. This analysis also provides insight into how to design legally valid regulations. The mapping issue stems from the need for and lack of accurate floodplain maps at scales suitable for land use controls. Methods for designating interim flood plain boundaries are suggested. The rate issue involves the question of which of two authorized flood insurance rates to charge. The choice of rates will influence the amount of construction in the floodplain. The regulatory issue is whether federal policy encourages reduction of flood losses through control of the location of new development or its design, or both. The accepted resolution of this problem is presented and analyzed. (Nessa-NC)
W78-00747

FLOOD PLAIN INFORMATION: COTTONWOOD CREEK, EL PASO COUNTY, COLORADO.
Army Engineer District, Albuquerque, NM.
For primary bibliographic entry see Field 4A.
W78-00757

SPECIAL FLOOD HAZARD INFORMATION REPORT: CONGAREE RIVER, BROAD RIVER, AND SALUDA RIVER, RICHLAND AND LEXINGTON COUNTIES, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 4A.
W78-00758

FLOOD PLAIN INFORMATION: STONEY BRANCH AND TRIBUTARIES, ROCK HILL, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 4A.
W78-00760

FLOOD PLAIN INFORMATION: EAST RIVER AND TRIBUTARIES, CITY OF GREEN BAY AND BROWN COUNTY, WISCONSIN.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-00761

FLOOD PLAIN INFORMATION: MENOMINEE RIVER--GREEN BAY, MARINETTE COUNTY, WI, MENOMINEE COUNTY, MI, CITIES OF MARINETTE, WI--MENOMINEE, MI.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-00762

FLOOD PLAIN INFORMATION: BEAVER CREEK AND TRIBUTARIES, VICINITY OF HUNTINGTON, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00763

NORTH FORK OBION RIVER, HOOSIER CREEK, AND GROVE CREEK, UNION CITY, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00764

FLOOD PLAIN INFORMATION: SUGAR CREEK, LITTLE NIXON CREEK, AND TRIBUTARIES, VICINITY OF BROWNSVILLE, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00765

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, ASHLAND CITY, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00766

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, CANEY FORK RIVER, CARTHAGE, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00767

FLOOD PLAIN INFORMATION: SULPHUR FORK, SPRINGFIELD, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00768

FLOOD PLAIN INFORMATION: BLACK EARTH CREEK, DANE COUNTY, WI-VILLAGES OF MAZOMANIE, BLACK EARTH, AND CROSS PLAINS.
Army Engineer District, St. Paul, MN.
For primary bibliographic entry see Field 4A.
W78-00769

FLOOD PLAIN INFORMATION: NORTH NASHUA RIVER, FITCHBURG, AND LEOMINSTER, MASSACHUSETTS.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W78-00770

CONNECTICUT RIVER BASIN SUPPLEMENTAL STUDY, NEW HAMPSHIRE, VERMONT, MASSACHUSETTS AND CONNECTICUT. THE RIVER'S REACH. PHASE I. SOME ENVIRONMENTAL AND FLOOD PLAIN MANAGEMENT IMPLICATIONS OF THE CHANGING ROLE OF AGRICULTURE,
Economic Research Service, Broomall, PA.
For primary bibliographic entry see Field 4A.
W78-00774

THE ROLE OF INSURANCE IN ENVIRONMENTAL LITIGATION,
McKenna, Storer, Rowe, White and Farrug, Chicago, IL.
R. S. Soderstrom.
Forum, Vol. 11, No. 3, p. 762-77, Spring 1976.

Descriptors: *Insurance, *Negligence, *Water pollution, *Damages, Air pollution, Soil contamination, Compensation, Legal aspects, Protection, Risks, Environmental effects, Environment, Judicial decisions, Oil pollution, Pollution abatement.
Identifiers: *Liability.

The rise in environmental litigation has generated changes in insurance coverage. In 1966 general lia-

bility policies covered injuries caused by 'occurrences'. An occurrence was defined as an accident, including continuous or repeated exposure to conditions, which results in injury neither expected nor intended. Because courts construed this phrase to include coverage for injury resulting from pollution caused by violation of environmental responsibilities, insurance companies began to limit coverage to sudden and accidental pollution and to exclude coverage for willful, intentional or expected violations of environmental regulations. Later, damage from oil spillage was excluded entirely. The author suggests that specific pollution coverage is not only desirable but also necessary. The creation of a facility for the underwriting of legal liability arising from environmental impairment whether sudden, unintended or unexpected has been recommended. This would help solve one of the most vexing problems, that of coverage for residual pollution. The author discusses the specific provisions and benefits of environmental impairment liability coverage. The conclusion is that the transition of this type of insurance is almost inevitable because of coverage and defense problems of pollution exclusion. (Maass-Florida)
W78-00789

6G. Ecologic Impact Of Water Development

EVALUATION OF STREAMSIDE BUFFERSTRIPS FOR PROTECTING AQUATIC ORGANISMS,
California Univ., Berkeley. Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 4C.
W78-00553

FATE AND EFFECTS OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS AND ECOSYSTEMS.
For primary bibliographic entry see Field 5C.
W78-00572

CRITICAL SPECIES, INCLUDING MAN, WITHIN THE BIOSPHERE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-00619

WATER FOR ENERGY: AN APPROACH TO COMPREHENSIVE IMPACT ASSESSMENT,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Business.
J. A. Diemer, and N. Wengert.
Water Resources Bulletin, Vol. 13, No. 5, p 885-893, October 1977. 22 ref.

Descriptors: *Water allocation(Policy), *Decision making, *Mathematical models, *Energy, *Alternative planning, *Comprehensive planning, *Colorado River, *Great Basin, Regional analysis, Economics, Water resources, Analytical techniques, Optimization, Simulation analysis, Assessment, Systems analysis.
Identifiers: Water use patterns, Sub-models, Policy making, Impact analysis, Water/energy systems analysis, Decision models.

The effects of energy development on the water resources of the Colorado River and Great Basin regions are expected to be substantial. Complex physical, economic and institutional interactions may be expected. Most research on these impacts appears single purpose, fragmented, uncoordinated, and often inaccessible to potential users, particularly to those with responsibility for energy/water policy and program decisions. A comprehensive, integrative framework for assessing alternative water allocation decisions is outlined, with a heuristic decision making model for evaluating impacts on maximization of gross (or net) regional product and regional social welfare, and for assessing the region's contribution to national economic objectives. The suggested model provides a structure for application and integration of data of various kinds to a range of situations arising from possible impacts from energy proposals. The focus is on water/energy relationships but the model may provide a framework for comprehensive analysis of a variety of environmental actions and resulting system perturbations and effects. (Bell-Cornell)
W78-00624

EFFECTS OF NEPA'S REVIEW AND COMMENT PROCESS ON WATER RESOURCE PLANNING (SURVEY RESULTS),
Stanford Univ., Calif. Dept. of Engineering.
W. W. Hill, and L. Ortolano.
Water Resources Research, Vol 12, No 5, p 1093-1100, December 1976. 1 fig, 1 tab, 16 ref.

Descriptors: *Planning, *Coordination, *Water resources development, *Decision making, Management, Comprehensive planning, Environment, Environmental effects, Watershed management, Administration, Resource allocation, Water management(Applied), Administrative agencies, Administrative decisions, Alternative planning, Project planning, Evaluation, Economics, Social aspects.
Identifiers: *Environmental impact statement, National Environmental Policy Act, Administrative regulations.

The guidelines of the Council on Environmental Quality for implementing the National Environmental Policy Act require that environmental impact statements be circulated to other agencies and to the public for review and comment. The effects of the review and comment process spawned by this requirement are assessed in the context of water resources planning by the U.S. Army Corps of Engineers and the Soil Conservation Service (SCS). The evaluation relies on data from in-depth questionnaire surveys mailed to personnel in all Corps districts and SCS state offices during 1974. The study addresses the extent to which increased coordination and exchange of information between agencies were affected by the comment process. Additionally, the consideration given to environmental information in agency decision-making is discussed. Lack of man-hour resources, late return of critiques and political and institutional constraints are noted as obstacles to the effective functioning of the review and comment process. It is suggested that an informal review and comment process should be instituted allowing for review before planning has narrowed to consideration of a single alternative. (Mulligan-Florida)
W78-00654

SIERRA CLUB V. MORTON (REQUIREMENTS OF FINAL ENVIRONMENTAL IMPACT STATEMENTS FOR DAM PROJECTS).
For primary bibliographic entry see Field 6E.
W78-00671

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION V. INTAKE WATER COMPANY (INCHOATE RIGHT TO APPROPRIATE WATER DESPITE DELAY OF ACTUAL CONSTRUCTION).
For primary bibliographic entry see Field 6E.
W78-00674

INLAND LAKE PROTECTION IN NORTHERN MICHIGAN (NORTHERN MICHIGAN ENVIRONMENTAL RESEARCH PROGRAM EDUCATIONAL SERIES: PUBLICATION NO. 1),
Michigan Univ., Ann Arbor, Biological Station.
E. W. Say, M. W. Paddock, J. E. Gannon, and W. L. Foster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 705, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-046, September 1975. 43 p.

Descriptors: *Lakes, *Ecology, *Ecosystems, *Michigan, Water quality, Watersheds(Basins), Rivers, Stratification, Eutrophication, Nutrients, Photosynthesis, Environment, Lake stages, Succession, Limnology.
Identifiers: Northern Michigan, *Inland Water Route Region(Mich).

The book was an in-depth ecological look at the area of northern Michigan known as the Inland Water Route region. the lakes, rivers, and wetlands of this area, as well as those which are closely related to it, encompass 1,461 sq mi (3,783 sq km), 7 counties, and include 46 major lakes and 18 rivers and streams. The attributes of this area-its scenic beauty, abundance of wilderness and wildlife areas, inland lakes, rolling hills, and agricultural countryside- are important to the economy, providing tourism appeal for seasonal visitors from across the midwest as well as a livelihood for year-round residents. To further understand northern Michigan's uniqueness, one need only compare it to other parts of the country where inland lakes occur. Unfortunately, many lake and river properties in regions surrounding Michigan's north have become over-developed. Crowded urban and suburban conditions near open inland lakes have often turned over unpolluted waters into 'sinks' for a collection of silt, residential sewage, and industrial waste. This handbook explored the workings of inland lake ecosystems and the aquatic, terrestrial, and social interrelationships involved. Through a basic understanding of problems lakeland environments may face, concerned citizens can do much to protect and preserve the existing excellent quality of their environment. (Sims-ISWS)
W78-00716

INTERIM GUIDE FOR ENVIRONMENTAL ASSESSMENT: HUD FIELD OFFICE EDITION.
Voorhees (Alan M.) and Associates, Inc., McLean, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 231, Price codes: A20 in paper copy, A01 in microfiche. Prepared for U.S. Department of Housing and Urban Development, Washington, D.C., Interim Guide, June 1975. 446 p, 94 fig. H-2080 R.

Descriptors: *Environmental effects, *Community development, Social impact, Administrative decisions, Urban planning.
Identifiers: *National Environmental Policy Act, *Environmental assessment, *Community Development Block Grant Program, Urban development.

The five major functions for which this guide was developed include: providing an overview of the philosophy and basic approach to comprehensive environmental assessment suggested for all HUD projects; providing an efficient, comprehensive technical environmental assessment process; providing substantive technical guidance regarding what to look at, what to look for, and how to do it; providing general guidance in conducting a comprehensive environmental assessment under HUD Handbook 1390.1; and providing general guidance in assessing significant environmental impacts of a project. The guide covers the broad range of concerns encountered in the environmental assessment of urban development projects required for compliance with the National Environmental Policy Act under the Community Development Block Grant Program. The guide is designed to follow a standard technical assessment process which may be utilized to support any administrative processing sequence. It supplements the administrative procedures provided in HUD Handbook

1390.1. The guide is a reference document, performing a function analogous to a dictionary or encyclopedia. It is not intended to replace more technical information required when problems arise, or to usurp the freedom of judgment of the person responsible for decision-making. It does not replace HUD Handbook 1390.1 or other HUD policy material. (Nessa-NC)
W78-00749

AN ASSESSMENT METHODOLOGY FOR THE ENVIRONMENTAL IMPACT OF WATER RESOURCE PROJECTS,
Battelle Columbus Labs., OH.
M. L. Warner, J. L. Moore, S. Chatterjee, D. C. Cooper, and C. Ifeadi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 002, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-600/5-74-016. July 1974. 221 p, 7 fig, 14 tab. 68-01-1871.

Descriptors: *Environmental effects, *Reservoir construction, *Water quality, *Water resources, Planning, Reservoir operation, Social impacts, Economic impacts, Aesthetics, Methodology, Reservoir sites, Mathematical models.
Identifiers: *Environmental Impact Statements, *Ecological impacts.

This report presents technical materials intended for use in reviewing environmental impact statements (EIS) on major reservoir construction projects. Methods and materials for determining the completeness and accuracy of an EIS are discussed, with special emphasis on water quality and ecological impacts. The report contains six related but individually referenced discussions that address: (1) reservoir project planning, construction, and operation activities; (2) water quality impacts of reservoir construction; (3) ecological impacts of reservoir construction; (4) economic, social, and aesthetic impacts of reservoir construction; (5) review criteria for assessing general statement completeness and accuracy; and (6) a review of impact assessment methodologies. Important issues or potential impacts that might be found in an adequate EIS are presented. In addition, the water quality and ecological impacts sections discuss the site-specific conditions under which a given potential impact may or may not occur. The section on water quality impacts also presents a detailed comparison of mathematical models for predicting impacts on water temperature, dissolved oxygen levels, and some chemical constituents of surface waters. The sections dealing with water quality, ecological, and economic-social-aesthetic impacts include extensive citations to relevant literature. This study is applicable to the full range of environmental conditions in which reservoirs may be constructed. (Nessa-NC)
W78-00750

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME I-SUMMARY REPORT,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
I. L. White, F. S. LaGrone, M. A. Chartock, C. P. Bartosh, and R. L. Leonard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 752, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/7-77-072a, June 1977. 153 p. 3 fig, 31 tab. 68-01-1916.

Descriptors: *Energy, *Technology, *Electric power, *Environmental effects, *Economic impact, *Social impact, Power plants, Powerline carriers, Coal, Coal mines, Uranium, Oil, Oil shales, Geothermal studies, Natural gas, Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, Wyoming, Methodology.
Identifiers: *Technology assessment, Secondary impacts, Impact analysis, Western energy resource development.

This four volume study constitutes a progress report of a three year technology assessment (TA) of the development of coal, geothermal, natural gas, oil, oil shale and uranium resources. The study area includes Arizona, Colorado, Montana, North Dakota, New Mexico, South Dakota, Utah and Wyoming. The time frame extends from the present to the year 2000. The program's purpose is to identify economically, environmentally, and socially acceptable energy development alternatives. The TA identifies and analyzes a broad range of consequences of energy resource development in the western U.S. It evaluates and compares alternative courses of action for enhancing desirable consequences and mitigating or eliminating undesirable ones. The general description of the TA results found in this volume include: a description of the context and methodological framework; a summary description of the impact analysis; a summary of some policy implications of these results, although the TA is in the early stages of policy analysis; and a description of what the second phase of the project will entail. Volume II contains site-specific analyses; Volume III details alternative policies and implementation strategies; Volume IV discusses air quality modeling alternatives and cost comparisons of energy transporation costs. (See also W78-00754, W78-00755, and W78-00756) (Nessa-NC)
W78-00753

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME II-DETAILED ANALYSES AND SUPPORTING MATERIALS,
Oklahoma Univ., Norman. Science and Public Policy Program.
I. L. White, F. S. La Grove, M. A. Chartock, C. P. Bartosh, and R. L. Leonard.
Available from the National Technical Information Service, Springfield, VA as PB-271 753, Price codes: A99 in paper copy, A01 in microfiche. Report EPA-600/7-77-0726, July 1977. 960 p, 74 fig, 325 tab. 68-01-1916.

Descriptors: *Energy, *Technology, *Research and development, *Environmental effects, Social impact, Aesthetics, Coal, Coal mines, Uranium, Oil, Oil shales, Geothermal studies, Natural gas, Arizona, North Dakota, Colorado, Montana, New Mexico, South Dakota, Utah, Wyoming, Transportation, Transportation impacts, Ecology, Air pollution effects, Water pollution effects.
Identifiers: *Technology assessment, Kaiparowits(UT), Escalante(UT), Navajo(NM), Farmington(NM), Rifle(CO), Gillette(WY), Colstrip(MT), Beulah(ND), Noise, Health effects, Western energy resource development.

This study is one part of a four volume progress report of a technology assessment of Western Energy resources development. The study area includes Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah and Wyoming. The energy resources evaluated include coal, oil, oil shale, geothermal, natural gas, and uranium. The time frame extends from the present to the year 2000. The likely impacts of deploying typical energy resource development technologies at sites representative of the kinds of conditions likely to be encountered in the eight state study area are analyzed. The impacts likely to occur if western energy resources are developed at three different levels of intensity are also analyzed. Site specific analyses are presented for the following areas: Kaiparowits/Escalante, UT; Navajo/Farmington, NM; Rifle, CO; Gillette, WY; Colstrip, MT; and Beulah, ND. Site specific air, water, socio-economic, and ecological impacts are discussed. A regional analysis was also conducted in which transportation, health, noise and aesthetic impacts are evaluated. Volume I provides a general description of the assessment results; Volume III represents a first step in the identification, evaluation and comparison of alternative policies and implementation strategies; Volume IV contains two technical appendices, one covering alternative approaches to modeling air quality in areas with complex terrain, and one on energy transportation cost comparisons. (See also W78-00753, W78-00755, and W78-00756) (Nessa-NC)
W78-00754

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME III-PRELIMINARY POLICY ANALYSIS,
Oklahoma Univ., Norman. Science and Public Policy Program.
I. L. White, F. S. La Grove, M. A. Chartock, C. P. Bartosh, and R. L. Leonard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 754, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/7-77-072c, July 1977. 176 p, 1 fig, 7 tab. 68-01-1916.

Descriptors: *Energy, *Technology, *Water quality, *Water supply, Air quality, Community development, Indian reservations, Reclamation, Coal, Oil, Oil shales, Geothermal studies, Natural gas, Uranium, Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, Wyoming, Evaluation, Assessments.
Identifiers: *Energy policy, *Policy alternatives, Technology assessment, Western energy resource development.

This study is one part of a four volume progress report. The study area includes Arizona, Colorado, New Mexico, Montana, North Dakota, South Dakota, Utah, and Wyoming. The energy resources evaluated include coal, geothermal, natural gas, oil, oil shale, and uranium. The time frame extends from the present to the year 2000. This volume represents a first step in the identification, evaluation, and comparison of alternative policies and implementation strategies. The history of the U.S. energy policy system is reviewed, some major public and private sector participants are identified, and four energy policy subsystems are discussed. The principal problems and issues that public policymakers will be called on to resolve are discussed. Selected alternative policies are described, but a comprehensive evaluation of alternatives is left for the final report. The problems and issues singled out for attention are: water availability and quality; community services and facilities; air quality; Indians; and reclamation. Volume I provides a general description of the assessment results. Volume II presents more detailed analytical results on a site specific and regional basis. Volume IV contains two technical appendices, one covering alternative approaches to modeling air quality in areas with complex terrain, and one on energy transportation cost comparisons. (See also W78-00753, W78-00754, and W78-00756) (Nessa-NC)
W78-00755

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY DEVELOPMENT. VOLUME IV-APPENDICES,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
I. L. White, M. Rieber, S. L. Soo, F. S. La Grone, and M. A. Chatock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 243, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/7-77-072d, July 1977. 125 p. 68-01-1916.

Descriptors: *Energy, *Technology, *Research and development, *Model studies, *Environmental effects, *Air pollution effects, *Coal, *Pipelines, *Cost comparisons, *Transportation, Statistical models, Analytical techniques, Terrain analysis, Economics, Extra

high voltage, Transmission(Electrical), Utah, Wyoming, South Dakota, North Dakota, New Mexico, Montana, Colorado, Arizona.
Identifiers: *Coal slurry pipelines, *Unit trains, *Extra high voltage transmission, *Gaussian Dispersion Model, Farmington(NM), Gillette(WY), Colstrip(MT), Kaiparowits(UT), Beulah(ND), Western energy resource development.

This study is one part of a four volume progress report. The study area include Arizona, Colorado, New Mexico, Montana, North Dakota, South Dakota, Utah, and Wyoming. The energy resources evaluated include, coal, geothermal, natural gas, oil, oil shale, and uranium. The time frame extends from the present to the year 2000. This volume consists of two technical appendices. The first addresses alternative approaches to modeling air quality in areas with complex terrain. Certain complex terrain modeling options for Steady State Gaussian dispersion equations were found to be the most suitable. The model used corrects for the problems caused by elevated, rugged terrain. It is also recognized that variability in topography and local dispersion meteorology among sites make it difficult to transfer modeling treatments from site to site. The second appendix assesses the comparative economics of three modes of coal energy transport. These include: unit trains, coal slurry pipelines, and extra high voltage transmission from mine mouth generating plants. Nine routes are analyzed, including Farmington, NM to Los Angeles, CA; Gillette, WY to Chicago, IL; Gillette, WY to houston, TX; Colstrip, MT to Houston, TX; Colstrip, MT to Seattle, WA; Colstrip, MT to Chicago, IL; Beulah, ND to Chicago, IL; and Kaiparowits, UT to Los Angeles, CA. (See also W78-00753, W78-00754, and W78-00755) (Nessa-NC)
W78-00756

APPLICATION OF NUMERICAL CLASSIFICATION IN ECOLOGICAL INVESTIGATIONS OF WATER POLLUTION,
Virginia Inst. of Marine Sciences, Gloucester Point, VA.
D. F. Boesch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 604, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/3-77-033. March 1977, 114 p, 16 fig, 4 tab. R803599-01-1.

Descriptors: *Classification, *Systematics, *Water pollution, *Ecological distribution, *Analytical techniques, Methodology, Biological communities, Bioindicators, Water pollution effects, Aquatic environment, Distribution.
Identifiers: *Clustering, *Resemblance measures, *Species classification, *Species distribution, Numerical classification.

Numerical classification encompasses a variety of techniques for grouping entities based on the resemblance of their attributes according to mathematically stated criteria. In ecology this involves classification of collections representing sites or sampling periods, or classification of species. Classification can simplify patterns of collection resemblance or species distribution patterns. Procedures of numerical classification are reviewed, including data manipulations, computation of resemblance measures and clustering methods. The importance and effects of transformations and standardization are discussed. It is critical to choose an appropriate resemblance measure which best corresponds with the investigator's concept of ecological resemblance. Clustering methods form groups on the basis of patterns of inter-entity similarity. Various types of clustering methods exist but the most useful and best developed are those which are exclusive, intrinsic, hierarchical and agglomerative. Agglomerative clustering methods which distort spatial relationhisps and intensely cluster are frequently most useful with ecological data. The usefulness of numerical classification is demonstrated for objective analysis of the data sets resulting from field surveys and monitoring studies conducted for the assessment of pollution effects. Few pollution biologists have applied the more powerful classificatory techniques and post-clustering analyses. (Nessa-NC)
W78-00771

ENVIRONMENTAL ASSESSMENT PERSPECTIVES,
GCA Corp., Bedford, MA. GCA Technology Div.
For primary bibliographic entry see Field 5G.
W78-00773

CONNECTICUT RIVER BASIN SUPPLEMENTAL STUDY, NEW HAMPSHIRE, VERMONT, MASSACHUSETTS AND CONNECTICUT. THE RIVER'S REACH. PHASE I. SOME ENVIRONMENTAL AND FLOOD PLAIN MANAGEMENT IMPLICATIONS OF THE CHANGING ROLE OF AGRICULTURE,
Economic Research Service, Broomall, PA.
For primary bibliographic entry see Field 4A.
W78-00774

OCEANS '77 CONFERENCE RECORD.
Institute of Electrical and Electronics Engineers, Inc., New York.; and Marine Technology Society, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-00827

PALAU: NATIVE PARADISE OR PETROLEUM SUPERPORT,
University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W78-00828

CEPEX HARDWARE: (NOW AND IN THE FUTURE),
Case Existological Labs. Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5C.
W78-00837

PHYSICAL FACTORS AFFECTING THE SITING OF DREDGED MATERIAL ISLANDS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W78-00838

HAWAII AND THE MANGANESE NODULE INDUSTRY,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
Q. D. Stephen-Hassard, and E. M. Grabbe.
In: 'Oceans '77', Proceedings of 3rd Annual Conference held in Los Angeles, CA on October 17-19, 1977, Vol 2 p HAWAII-B-1 - HAWAII-B-3, 1977. 4 ref.

Descriptors: *Manganese, *Mining, *Resources development, *Environmental effects, Waste disposal, Hawaii, Economical impact.
Identifiers: *Outer Continental Shelf, *Manganese nodule industry, Metal processing.

The State of Hawaii is located near the center of rich manganese nodule deposits containing nickel, copper and cobalt of commercial value. The State has followed early research, exploration and pilot mining activities of various companies and late in 1976 began a project to determine the economic feasibility and the socio-economic and environmental impacts of establishing a manganese nodule industry in Hawaii. The project will address the concerns of the people of Hawaii in these impact areas and will recommend a course of action. The University of Hawaii has been engaged in research, exploration, deep ocean mining tests and ocean environmental studies of manganese nodules during the past decade. The common interests of the State, the University of Hawaii and industry have led to several joint assessments. The project includes the following tasks: economic impact assessment, analysis of ocean transportation systems, analysis of processing systems, physical criteria and description of processing activities, metals extraction process chemistry, manpower supply and training, environmental law analysis, environmental evaluation, and waste disposal on land and agricultural potential of manganese nodule tailings. (See also W78-00827) (Sinha-OEIS)
W78-00839

OUTER CONTINENTAL SHELF DEVELOPMENT IN THE SANTA BARBARA CHANNEL: LACK OF DETECTABLE IMPACT ON FISHERIES,
For primary bibliographic entry see Field 5C.
W78-00867

ENVIRONMENTAL ASPECTS OF DRILLING MUDS AND CUTTINGS FROM OIL AND GAS EXTRACTION OPERATIONS IN OFFSHORE AND COASTAL WATERS,
Exxon Production Research Co., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-00868

INTEGRATED ENVIRONMENTAL STUDIES, SOUTH TEXAS OUTER CONTINENTAL SHELF: APPROACH, TECHNIQUES, RESULTS,
For primary bibliographic entry see Field 5G.
W78-00869

EVALUATION OF GEOLOGIC HAZARDS IN OCS PETROLEUM LEASE AREAS, SOUTHERN CALIFORNIA CONTINENTAL BORDERLAND,
For primary bibliographic entry see Field 5G.
W78-00870

AN EVALUATION OF LOUISIANA SUPERPORT STUDIES AND IMPLICATIONS FOR COASTAL ZONE MANAGEMENT,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-00871

7. RESOURCES DATA

7A. Network Design

DESIGN OF TREND MONITORING NETWORKS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5A.
W78-00695

A BICENTENNIAL REFLECTION: STREAMGAUGING IN THE UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
N. C. Matalas, and H. H. Barnes, Jr.
Hydrological Sciences Bulletin, Vol 22, No 1, p 41-59, March 1977. 11 fig, 5 tab, 4 ref.

Descriptors: *Streamflow, *Gaging stations, *Networks, *History, *Water resources development, *United States, Reviews, Programs, Projects, Network design, Data collections, Cost analysis, Spatial distribution.
Identifiers: Optimal gaging strategies.

A brief history of water-resources development in the United States is followed by a discussion of trends in the Geological Survey's gaging program. Operating stations increased from 200 in 1900 to about 8,000 in 1975 with a corresponding decrease in areal coverage per gage from 28,500 sq km to about 620 sq km. The dominance of complete gaging of streams over partial gaging stations declined from 95 percent to about 58 percent during this period. Effectively, the information yielded by the network is less than that measured by the accumulation of station years of record. Major floods and droughts, wars, fluctuations in the national economy, and other events which may be considered as random, have had a persistent impact on the program. Selection of gaging policy and strategy as an integral part of program planning (network design) is abetted by benefit-cost analysis. (Woodard-USGS)
W78-00809

7B. Data Acquisition

A POROUS CUP SOIL-WATER SAMPLER WITH VOLUME CONTROL,
Newfoundland Forest Research Centre, St. John's.
For primary bibliographic entry see Field 2G.
W78-00529

COMPARISON OF METHODS OF CALIBRATION OF A NEUTRON PROBE BY GRAVIMETRY OR NEUTRON-CAPTURE MODEL,
Grenoble-1 Univ. (France). Inst. de Mecanique.
For primary bibliographic entry see Field 2G.
W78-00679

A REGISTRATION UNIT FOR DRAIN OUTFLOW, GROUNDWATER DEPTH AND PRECIPITATION,
Institute for Land and Water Manage Research, Wageningen (Netherlands).
B. Van Der Weerd.
Journal of Hydrology, Vol. 34, No. 3/4, p 383-388, August 1977. 3 fig, 2 ref.

Descriptors: *Instrumentation, *Gages, *Equipment, Rain gages, Rainfall, Flowmeters, Flow measurement, Groundwater, Depth, Drainage, Surface drainage, Tile drainage, Discharge(Water), Data collection, On-site investigations.

A description was given of an operational field registration unit for open and submerged drain outflow, groundwater depth, and ranfall. The drain outflow meter has a measuring range from 20 to 400 cu cm/s, with a mean error in recorded sediment free outflow of 15% at flow rates below 60 cu cm/s and 1.5% at higher flow rates. Its weight is 6-8 kg, depending on the drain outlet it is adapted to, and it has a length of 90 cm and a height of 50 cm. The groundwater level meter has a measuring range of 1.25 m, but it can be adapted to deeper levels. Its accuracy is 0.5 cm when a float of 4.5 cm in a 5 cm diameter piezometer tube is used. Larger floats give higher accuracies. The transmission mechanism is housed in a 15 x 15 x 22 cm case to be placed on top of the piezometer tube. The raingage is a commercial pluviograph changed from mechanical to electrical registration. Rainfall is automatically syphoned off after every 10 mm of rainfall. The recorder is a commercial 6-point resistance recorder adapted to battery power (15 V from two wire-fence batteries). To save power, the electric registration paper transport system was replaced by a hand-wound 14-day clock. The channels normally are activated during 1 min each, giving one sweep in 6 min, but an added scanning system gives a choice in recording intervals. Recorder, power supply, and scanning system is built in a dust- and waterproof box. The maximum distance between meters and recorder is about 150 m. When larger distances are involved, the unit (total weight 37 kg) must be moved. (Sims-ISWS)
W78-00682

LIDAR OBSERVATIONS OF HIGH PLAINS THUNDERSTORM PRECIPITATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W78-00687

SIGNIFICANCE OF VEGETATION IN INTERPRETING THERMAL RADIATION FROM A TERRESTRIAL SURFACE,
Florida Univ., Gainesville. Dept. of Fruit Crops.
R. A. Sutherland, and J. F. Bartholic.
Journal of Applied Meteorology, Vol. 16, No. 8, p 759-763, August 1977. 6 fig, 13 ref. NASA NAS10-8774.

Descriptors: *Remote sensing, *Temperature, *Radiation, *Vegetation, *Florida, Model studies, Mathematical models, Crops, Fruit crops, Soils, Aerial photography, Aircraft, Infrared radiation, Measurement.
Identifiers: Row crops, Thermal images, Emissivity, Cavity emissivity.

The regions between crop rows were modeled as infinitely long diffuse cavities. Geometrical view factors were calculated, accounting for reflected radiation emanating internal to the cavity and from the background sky. A 'cavity' emissivity dependent on local geometry was defined to allow for correcting apparent temperatures to true temperatures. The total emissivity appropriate for correcting aircraft thermal data was calculated then by averaging all emissivity components to account for soil, crop, and background. It was shown that even for the lowest crop and vegetation emissivity is greatly increased, giving rise to a decreased error in remotely sensed temperature data. (Sims-ISWS)
W78-00694

UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT AND WATER MANAGEMENT IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Geosciences.
C. W. Welby, and J. O. Lammi.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18606, Price codes: A10 in paper copy, A01 in microfiche. Final Report, October 1975. 209 p, 42 fig, 16 tab, 32 ref. NASA NAS9-13321.

Descriptors: *Remote sensing, *Forests, *Land use, *Water resources, *North Carolina, Satellites(Artificial), Photography, Data processing, Agriculture, Vegetation, Hydrology, Geology, Evaluation, Analytical techniques.
Identifiers: *Skylab data.

S190A and S190B photographs of North Carolina taken during passes of SKYLAB-2 and SKYLAB-3 were studied as were data from the Multispectral Scanner, S192. Visual and optical techniques were employed during the investigation. Studies concentrated on the usefulness of the photography for land use inventories, for urban forestry studies, and for special problems related to land use. A skilled photo-interpreter can achieve a 90% or better accuracy for vegetative and land use interpretation, and for many problems the interpretation can be accomplished within a day or two. Acquisition of the data by other means can be much more time consuming. Agricultural monitoring in the coastal region may be accomplished more accurately and with greater facility than is presently possible if space-acquired imagery of SKYLAB detail were available consistently. Evaluation of the photographs showed limited usefulness of this data for geologic interpretation. Studies of the coastal inlets showed some potential usefulness in updating navigational charts and in developing understanding of the dynamics of the inlets. (Sims-ISWS)
W78-00715

RELATION BETWEEN EARTHQUAKES, WEATHER, AND SOIL TILT,
Geological Survey, Reston, VA. Geologic Div.
M. D. Wood, and N. E. King.
Science, Vol 197, No 4299, p 154-156, July 8, 1977. 3 fig, 24 ref.

Descriptors: *Earthquakes, *Forecasting, *Analytical techniques, *Numerical analysis, *Correlation analysis, Least squares method, Regression analysis, Weather, Rainfall, Temperature, Soils, Evaluation.
Identifiers: *Soil tilt.

Two years of local earthquake, temperature, and rainfall data taken near a tiltmeter site were used in a study of the numerical relation between these phenomena and the recorded tilt response. A least-squares shaping and predictive error filter approach was used. The relations were ranked in part according to the root mean square (r.m.s.) error of fit across the entire sample space. The tilt data with an annual range of tilt approximately 10 microradians were fitted to the combined weather data of temperature and rainfall with a 0.75-microradian r.m.s. error. The best fit of earthquakes to these same tilt data is the subclass of events with magnitude > 2.5 within 30 kilometers of the tilt site. The filter that mapped earthquakes to tilt yielded a 1.03-microradian r.m.s. error. The most unusual tilt anomaly over the entire 2-year period has the best fit of rainfall to the data for any single month of the entire data set. This unusual anomaly was the basis of an erroneously predicted earthquakes with magnitude about 5. These data indicate that if there are premonitory earthquake signals, they are buried in local meteorlogical noise. Separating an earthquake anomaly from the response to surface phenomena becomes more difficult as the earthquake anomaly lead time approaches the rise time of the soil to weather and seasonal variations. (Woodard-USGS)
W78-00823

7C. Evaluation, Processing and Publication

SUBROUTINE FOR SETTLING VELOCITIES OF SPHERES,
Water Resources Engineers, Inc., Walnut Creek, CA.
For primary bibliographic entry see Field 2J.
W78-00528

WATER CONDITIONS IN CALIFORNIA, BASIC DATA SUPPLEMENT.
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 2B.
W78-00545

PRECIPITATION (RADAR) PROJECT OF THE IFYGL LAKE METEOROLOGY PROGRAM,
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 2B.
W78-00546

MONTHLY RAINFALL IN THE UPPSALA-FIELD,
Uppsala Univ. (Sweden). Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W78-00548

BAYESIAN MODEL DISCRIMINATION FOR BOD ANALYSIS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-00620

WATER QUALITY MODELING OF A HIGH MOUNTAIN STREAM,
California Univ., Los Angeles. Office of Environmental Science and Engineering.
For primary bibliographic entry see Field 5B.
W78-00623

A MODEL FOR ACHIEVING CONSISTENCY FOR COST SHARING IN WATER RESOURCE PROGRAMS,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 6C.
W78-00626

AN ARCHETYPAL LINEAR PROGRAMMING MODEL FOR OPTIMAL INTERTEMPORAL ALLOCATION OF GROUNDWATER TO AGRICULTURAL ACTIVITIES,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4B.
W78-00629

HEURISTIC ALGORITHM FOR WASTE-WATER PLANNING,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W78-00630

A COMPUTER PROGRAM FOR MODELING OF WATER QUALITY PARAMETERS IN STEADY STATE MULTI-DIMENSIONAL NATURAL AQUATIC SYSTEMS, (SECOND EDITION),
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W78-00632

SNSIM1/2 'A COMPUTER PROGRAM FOR THE STEADY-STATE WATER QUALITY SIMULATION OF A STREAM NETWORK,'
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5B.
W78-00633

SIMULATION MODELS OF THE VELIKA MORAVA BASIN FOR DESIGN OF A MULTIPURPOSE RESERVOIR SYSTEM,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 4A.
W78-00639

CHANCE CONSTRAINED MODEL OF WATER RESOURCES SYSTEMS,
Water Resources Development and Construction, Prague (Czechoslovakia).
For primary bibliographic entry see Field 4A.
W78-00641

GENERAL MARKOV MODEL FOR OPTIMAL CONTROL RESERVOIRS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 4A.
W78-00642

MULTIPLE OBJECTIVE OPTIMIZATION MODEL FOR REAL-TIME OPERATION OF A WATER SUPPLY SYSTEM,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 4A.
W78-00645

FLOOD PLAIN INFORMATION: COTTONWOOD CREEK, EL PASO COUNTY, COLORADO.
Army Engineer District, Albuquerque, NM.
For primary bibliographic entry see Field 4A.
W78-00757

SPECIAL FLOOD HAZARD INFORMATION REPORT: CONGAREE RIVER, BROAD RIVER, AND SALUDA RIVER, RICHLAND AND LEXINGTON COUNTIES, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 4A.
W78-00758

FLOOD PLAIN INFORMATION: STONEY BRANCH AND TRIBUTARIES, ROCK HILL, SOUTH CAROLINA.
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 4A.
W78-00760

FLOOD PLAIN INFORMATION: EAST RIVER AND TRIBUTARIES, CITY OF GREEN BAY AND BROWN COUNTY, WISCONSIN.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-00761

FLOOD PLAIN INFORMATION: MENOMINEE RIVER--GREEN BAY, MARINETTE COUNTY, WI, MENOMINEE COUNTY, MI, CITIES OF MARINETTE, WI--MENOMINEE, MI.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-00762

FLOOD PLAIN INFORMATION: BEAVER CREEK AND TRIBUTARIES, VICINITY OF HUNTINGTON, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00763

NORTH FORK OBION RIVER, HOOSIER CREEK, AND GROVE CREEK, UNION CITY, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00764

FLOOD PLAIN INFORMATION: SUGAR CREEK, LITTLE NIXON CREEK, AND TRIBUTARIES, VICINITY OF BROWNSVILLE, TENNESSEE.
Army Engineer District, Memphis, TN.
For primary bibliographic entry see Field 4A.
W78-00765

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, ASHLAND CITY, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00766

FLOOD PLAIN INFORMATION: CUMBERLAND RIVER, CANEY FORK RIVER, CARTHAGE, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00767

FLOOD PLAIN INFORMATION: SULPHUR FORK, SPRINGFIELD, TENNESSEE.
Army Engineer District, Nashville, TN.
For primary bibliographic entry see Field 4A.
W78-00768

FLOOD PLAIN INFORMATION: BLACK EARTH CREEK, DANE COUNTY, WI-VILLAGES OF MAZOMANIE, BLACK EARTH, AND CROSS PLAINS.
Army Engineer District, St. Paul, MN.
For primary bibliographic entry see Field 4A.
W78-00769

FLOOD PLAIN INFORMATION: NORTH NASHUA RIVER, FITCHBURG, AND LEOMINSTER, MASSACHUSETTS.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W78-00770

MAPS SHOWING GROUND-WATER CONDITIONS IN THE NORTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
G. W. Levings, and C. D. Farrar.
Water-Resources Investigations 77-35 (open-file report), April 1977. 2 sheets, 7 ref.

Descriptors: *Groundwater resources, *Maps, *Aquifers, *Water table, *Water quality, Hydrogeology, Arizona.
Identifiers: *Navajo Indian Reservation(Ariz), *Apache County.

The northern part of the Chinle area includes about 3,000 sq mi in northeastern Arizona and is entirely in the Navajo Indian Reservation. The main source of water is from the several aquifers that are made up of one or more formations. The aquifers are stacked one on the other and generally are not hydraulically connected. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water. Scale 1:125,000. (Woodard-USGS)
W78-00802

MAPS SHOWING GROUND-WATER CONDITIONS IN THE MONUMENT VALLEY AND NORTHERN PART OF THE BLACK MESA AREAS, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
G. W. Levings, and C. D. Farrar.
Water-Resources Investigations 77-44 (open-file report), May 1977. 3 sheets, 7 ref.

Descriptors: *Groundwater resources, *Maps, *Aquifers, *Water table, *Water quality, Hydrogeology, Indian reservations, Arizona.
Identifiers: *Northern Black Mesa area(Ariz), Navajo County, Apache County, Coconino County.

The Monument Valley and the northern part of the Black Mesa areas include about 2,700 sq mi in northeastern Arizona and are entirely in the Navajo and Hopi Indian Reservations. The main source of water is from the several aquifers that are made up of one or more formations. The aquifers are stacked one on the other and generally are not hydraulically connected. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water. Scale 1:125,000. (Woodard-USGS)
W78-00803

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE

BLACK MESA AREA, NAVAJO, APACHE, AND COCONINO COUNTIES, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
G. W. Levings, and C. D. Farrar.
Water-Resources Investigations 77-41 (open-file report), May 1977. 3 sheets, 7 ref.

Descriptors: *Groundwater resources, *Maps, *Aquifers, *Water table, *Water quality, Hydrogeology, Indian reservations, Arizona.
Identifiers: *Southern Black Mesa area(Ariz), Navajo County, Apache County, Coconino County.

The southern part of the Black Mesa area includes about 2,500 sq mi in northeastern Arizona and is entirely in the Navajo and Hopi Indian Reservations. The main source of water is from the several aquifers are stacked one on the other and generally are not hydraulically connected. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water. Scale 1:125,000. (Woodard-USGS)
W78-00804

JARRETTSVILLE QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
L. J. Nutter.
Maryland Geological Survey, (Baltimore), Quadrangle Atlas No 5, 1977. 4 maps, 2 fig, 8 ref.

Descriptors: *Maps, *Hydrogeology, *Groundwater, *Water table, *Groundwater availability, Maryland, Water supply, Land use, Planning, Water pollution control, Septic tanks.
Identifiers: Harford County(Md), *Jarrettsville quadrangle.

The Jarrettsville quadrangle in Harford County, Md., is underlain by metamorphosed sedimentary and igneous rocks. Water is stored in and transmitted through an interconnecting system of fractures in the rock and in the saturated part of the overlying saprolite. Much of the rapidly expanding suburban development is in areas not served by public-water and sewage systems. Accordingly, many of the new housing subdivisions must rely on individual wells and septic systems, with some risk of contamination of the water supply. This atlas provides maps intended for use by planners to assist with land-use planning and to help minimize potential environmental problems. The maps include data concerning: (1) Depth to water table, (2) slope of land surface, (3) ground-water availability, and (4) constraints on installation of septic systems. (Woodard-USGS)
W78-00805

BEL AIR QUADRANGLE HYDROGEOLOGY,
Geological Survey, Towson, MD. Water Resources Div.
L. J. Nutter.
Maryland Geological Survey, (Baltimore), Quadrangle Atlas No 6, 1977. 4 maps, 1 fig, 8 ref.

Descriptors: *Maps, *Hydrogeology, *Groundwater, *Water table, *Groundwater availability, Maryland, Water supply, Land use, Planning, Water pollution control, Septic tanks.
Identifiers: Harford County(Md), *Bel Air quadrangle.

The Bel Air quadrangle in Harford County, Md., is underlain by metamorphosed sedimentary and igneous rocks. Water is stored in and transmitted through an interconnecting system of fractures in the rock and in the saturated part of the overlying saprolite. Much of the rapidly expanding suburban development is in areas not served by public-water and sewerage systems. Accordingly, many of the new housing subdivisions must rely on individual wells and septic systems, with some risk of contamination of the water supply. This atlas provides maps intended for use by planners to assist with land-use planning and to help minimize potential environmental problems. The maps include data concerning: (1) Depth to water table, (2) slope of land surface, (3) ground-water availability, and (4) constraints on installation of septic systems. (Woodard-USGS)
W78-00806

CLASSIFICATION OF THE HYDROLOGIC SETTINGS OF LAKES IN THE NORTH CENTRAL UNITED STATES,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2H.
W78-00808

A BICENTENNIAL REFLECTION: STREAMGAUGING IN THE UNITED STATES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7A.
W78-00809

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1975.
Geological Survey, Portland, OR. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 153, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report OR-75-1, May 1976. 386 p, 5 fig, 3 tab, 20 ref.

Descriptors: *Oregon, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Oregon consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 300 gaging stations; stage only records for 8 gaging stations; stage and contents for 40 lakes and reservoirs; water quality for 83 gaging stations, and water levels for 103 observation wells. Also included are 178 crest-stage partial-record stations and 12 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. these data represent that part of the National Water Data System operated by the U.S. Geological Survey and Cooperating State and Federal agencies in Oregon. (Woodard-USGS)
W78-00817

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1976.
Geological Survey, Towson, MD. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 724, Price codes: A16 in paper copy, A01 in microfiche. Water-Data Report MD-DE-76-1, June 1977. 351 p, 4 fig.

Descriptors: *Maryland, *Delaware, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 year for Maryland and Delaware consist of records of stage, discharge, and water quality of streams; stage, content, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 107 gaging stations; stage and contents for 1 reservoir; water quality for 54 gaging stations and 91 wells; and water levels for 29 observation wells. Also included are data for 54 low-flow partial-record stations, 45 crest-stage partial-record stations, and 4 tidal crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Maryland and Delaware. (Woodard-USGS)
W78-00818

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
Geological Survey Water-Data Report ND-76-1, July 1977. 602 p, 6 fig.

Descriptors: *North Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 134 gaging stations, stage and contents for 13 lakes and reservoirs; water quality for 51 gaging stations, 3 partial-record flow stations, 12 lakes, 21 wells; and water levels for 32 observation wells. Also included are 5 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in North Dakota. (Woodard-USGS)
W78-00819

SIMULATION OF VELOCITY DISTRIBUTION AND MASS TRANSFER,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-00825

ALLUVIAL CHANNEL BEDFORMS,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-00826

8. ENGINEERING WORKS

8A. Structures

SPILLWAY AND STILLING BASIN FOR LOOKOUT POINT DAM, MIDDLE FORK WILLIAMETTE RIVER, OREGON: HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer District, Bonneville, OR. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W78-00549

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS,
Water Resources Engineers, Springfield, VA.

For primary bibliographic entry see Field 8B.
W78-00699

OUTLET WORKS AND STILLING BASIN, HOWARD HANSON DAM, GREEN RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer Div. North Pacific, Bonneville, OR. Hydraulics Lab.
For primary bibliographic entry see Field 8D.
W78-00705

POSSIBLE FAILURE OF THE LOW-SILL CONTROL STRUCTURE AT OLD RIVER, LOUISIANA, ECONOMIC AND PHYSICAL CONSEQUENCES,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-00719

8B. Hydraulics

CRITICAL REYNOLDS NUMBER FOR ORIFICE AND NOZZLE FLOWS IN PIPES,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
N. S. L. Rao, K. Sridharan, and S. H. Alvi.
Journal of Hydraulic Research, Vol. 15, No. 2, p 167-178, 1977. 11 fig, 1 tab, 11 ref.

Descriptors: *Reynolds number, *Turbulent flow, *Orifices, *Pressure head, Hydraulics, Nozzles, Head loss, Pipe flow, Discharge coefficient, Laminar flow.
Identifiers: *Pressure recovery length, Piezometric head, Critical Reynolds number.

The critical Reynolds number at which the flow downstream of an orifice or nozzle in a pipe becomes turbulent is an important parameter as it is the demarcating point between purely laminar flow and relaminarising flow. The value of the critical Reynolds number was estimated for sharp-edged orifices, quadrant-edged orifices and long radius nozzles from indirect evidences using mean flow measurements. Different criteria were considered, such as the variations of coefficient of discharge, loss coefficient, loss as percentage of piezometric head differential across the meter, and presure recovery length downstream of the orifice. The criteria identify a range of transition Reynolds number for different orifices and nozzles. The critical orifices Reynolds number was seen to approach a constant value for low values of orifice or nozzle diameter to pipe diameter ratio. The critical Reynolds number increases gradually with increase in edge radius, with the nozzle having the highest value. (Singh-ISWS)
W78-00525

ARMORING PROCESS IN DEGRADING STREAMS,
Mosul Univ. (Iraq). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-00527

SUBROUTINE FOR SETTLING VELOCITIES OF SPHERES,
Water Resources Engineers, Inc., Walnut Creek, CA.
For primary bibliographic entry see Field 2J.
W78-00528

SPILLWAY AND STILLING BASIN FOR LOOKOUT POINT DAM, MIDDLE FORK WILLIAMETTE RIVER, OREGON: HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer District, Bonneville, OR. Hydraulic Lab.
L. Z. Perkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 314, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 42-1, December 1962. 109 p, 61 fig, 15 tab, 2 ref, 1 append.

Descriptors: *Dams, *Oregon, *Spillways, *Settling basins, *Model studies, Hydraulic models, Structures, Hydraulic structures, Spillway crests, Gates, Spillway gates, Diversion tunnels, Concrete structures, Flow, Flow control, Discharge(Water), Outlet works, Fluid mechanics, Hydraulics, Civil engineering.
Identifiers: *Lookout Point Dam(Ore), *Willamette River.

Model investigations for Lookout Point Dam were concerned with the hydraulic performance of the spillway and stilling basin, regulating outlets, and outlet channel. Two undistorted models were used in the principal investigations: (1) a 1:72-scale general model, and (2) a model of a single regulating outlet constructed to scale ratios of 1:16 and then 1:19.2 (the model scale was changed to compensate for enlargement of outlets). Supplemental tests to determine the hydraulic effects of H-beams half-embedded in the spillway pier noses were made on a 1:33-scale sectional model of the spillway for Chief Joseph Dam. The H-beams were proposed for use as emergency gate guides at Lookout Point Dam. Tests in the general model indicated that although performance of the original spillway and stilling basin was satisfactory, certain alterations could be made to improve hydraulic efficiency or reduce construction costs. Hydraulic and economic considerations made it necessary to redesign the spillway crest, to reduce the number and to increase the size of the regulating outlets, and to install an eyebrow-shaped deflector over the exit of each outlet. It was determined that flow conditions and pressures over the revised spillway were satisfactory for all discharges that were reproduced for study. The final design stilling basin and outlet channel provided good energy dissipation for spillway flows to 180,000 cfs (2.07 times the flood of record, 87,000 cfs). (Sims-ISWS)
W78-00549

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS,
Water Resources Engineers, Springfield, VA.
M. T. Tseng, J. L. Matticks, and B. Black.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 084, Price codes: A02 in paper copy, A01 in microfiche. Contract Report No. FHWA-RD-75-55, August 1974. 18 p, 4 fig, 2 tab. DOT-FH-11-7669.

Descriptors: *Flood flow, *Risks, *Bridge design, *Engineering, Hydrologic aspects, Model studies, Decision making, Dikes, Economics, Evaluation.
Identifiers: *Bridge opening, Stream crossing, Spur dike models.

This is the fifth in a series of five volumes comprising the final report of the Federal Highway Administration sponsored study of the above title. The objective was to develop an engineering systems analysis method to enhance the decision-making process for highway stream crossing design. The method applies economic risk techniques as well as standard hydraulic and hydrologic factors in the design of bridge waterways. Test data from experiments with spur dike models were included in this report. Elliptic and logarithmic spur types were tested. Velocities and depths were measured along the model face and across the bridge opening for 2 flow rates. The tests were conducted under fixed-bed conditions. (Singh-ISWS)
W78-00699

FINITE ELEMENT ANALYSES OF STRESSES AND MOVEMENTS IN BIRCH DAM,
California Univ., Berkeley. Office of Research Services.
For primary bibliographic entry see Field 8D.
W78-00701

GEOMORPHOLOGY, SHALLOW SUBBOTTOM STRUCTURE, AND SEDIMENTS OF THE ATLANTIC INNER CONTINENTAL SHELF OFF LONG ISLAND, NEW YORK,
Coastal Engineering Research Center, Fort Belvoir, VA.
S. J. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 467, Price codes: A06 in paper copy, A01 in microfiche. Technical Report 76-2, March 1976. 123 p, 30 fig, 4 tab, 88 ref, 2 append.

Descriptors: *Geomorphology, *Atlantic Coastal Plain, *Continental shelf, *New York, Beaches, Sedimentation, Sediments, Geology, Seismic studies, Hydrology.
Identifiers: *Long Island(NY), *Atlantic Inner Shelf, Seismic reflection, Beach nourishment.

About 800 sq mi of the Atlantic Inner Continental Shelf off Long Island, New York, were studied by CERC to obtain information on the sea floor morphology, sediment distribution, and shallow subbottom stratigraphy and structure. Three primary acoustic horizons are evident on the seismic profiles and have been identified by correlation with cores, land borings, and surface exposures of the reflectors. Granitic bedrock is the oldest and deepest horizon underlying Long Island, but its recognition on the seismic records, due to limited subbottom penetration, is confined to northern Gardiners Bay. The bedrock surface slopes southeast and exhibits considerable relief where glacial ice has enlarged pre-Pleistocene drainage channels. Upper Cretaceous and Tertiary semiconsolidated clastic sediments overlie the bedrock and dip and thicken to the southeast. Surficial sediments on the inner shelf are primarily fine-to-medium quartz sand with secondary occurrences of coarse sand and pea gravel on the Atlantic shelf and silt-clay mixtures in the Gardiners Bay region. Much of the surficial sand on the inner shelf is suitable as fill for beach restoration, except for that of the shoreface region (0 to -30 ft MSL) which contains fine sand and that of major parts of Gardiners Bay which contain organic-rich silt and clay. Topographic highs on the sea floor in the form of linear shoals, and broad deltalike platforms in eastern Long Island appear most suitable for sand recovery. The sea floor in most potential borrow areas is flat, and sand occurs as blanket deposits. Potential sand reserves within about 12 ft of the sea floor in the region are estimated to be more than 8 billion cubic yards. (Lee-ISWS)
W78-00704

TWO-DIMENSIONAL MODEL FOR TWO-LAYER FLOW,
Thessaloniki Univ., Salonika (Greece) Dept. of Civil Engineering.
G. J. Balafoutas, and M. B. Abbott.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers. Vol. 103, No. EM5, Proceedings Paper 13263, p 789-806, October 1977. 8 fig, 1 tab, 13 ref.

Descriptors: *Density currents, *Model studies, *Flow, Hydrodynamics, Mathematical models, Stratified flow, Waves(Water), Hydraulics, Equations.
Identifiers: Cross-convective mass.

A two-dimensional, two-layer, nearly-horizontal flow was solved by the method of characteristics. In the computational model, the two-dimensional field was divided in parallel channels, and the two-dimensional flow was replaced by two series of one-dimensional canalized flows. For a more

realistic application of the model, a dissipative interface and an 'accentuating interface' were proposed. The cross-convective terms were introduced into the model numerically. Finally, some computational results were mentioned. (Lee-ISWS)
W78-00713

HYDRODYNAMIC PRESSURE IN SEMICYLINDRICAL RESERVOIR,
Universidad Nacional Autonoma de Mexico, (Mexico). Inst. de Ingenieria.
F. J. Sanchez-Sesma, and E. Rosenblueth.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol. 103, No. EM5, Proceedings Paper 13298, p 913-919, October 1977. 4 fig, 3 tab, 10 ref.

Descriptors: *Dam design, *Dams, *Hydrodynamics, *Reservoirs, Pressure, Earthquakes, Hydraulics, Cross-sections, Analysis, Seismic studies, Equations, Shape.
Identifiers: Moments, Overturning tests, Thrust, Semicylindrical reservoirs.

Solutions were presented for modal analysis of hydrodynamic pressures generated by the 3 translational seismic components, longitudinal, vertical, and transverse, on a dam limiting a semicircular cylindrical reservoir. The main purpose was to show the influence of the cross-sectional shape of the reservoir in the hydrodynamic responses. Results were compared with those for rectangular cross section. Responses were found to be systematically smaller with semicircular cross section for a given cross-sectional area and depth. It was concluded that for design purposes the fundamental mode adequately approximates the response for various excitations of practical interest. (Lee-ISWS)
W78-00714

MODEL STUDY OF THE INLET AND SUMP ON THE CLINTON FIRST AVENUE PUMP STATION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8C.
W78-00717

REVIEW OF C.E. JACOB'S DOUBLET WELL,
G. Wickersham.
Ground Water, Vol 15, No 5, p 344-347, September-October 1977. 2 fig, 9 ref.

Descriptors: *Patents, *Saline water barriers, *Wells, *Saline water intrusion, Water levels, Groundwater, Freshwater, Skimming, Brine disposal, Oil wells, Oil-water interfaces, Injection wells, Equipment, Pumps, Pumping, Reviews, History.
Identifiers: *Doublet wells, Coning, Packers.

C.E. Jacob, noted hydrologist, received patents on his doublet well invention in 1965. Due to his death soon thereafter, no paper was written or published describing his invention. The purpose of this paper is to stir interest in in his original doublet theory and to make known a technique that can be useful to hydrologists. Jacob's patents are for a single location doublet well that produces freshwater or petroleum from underground reservoir formations without contamination by underlying heavier liquid. By use of packers, water is pumped from one horizon and discharged into a different horizon. A closed cell is created whereby the heavier liquid is recirculated below the streamline boundary, while lighter fluid passes into the well and is raised to the surface. The doublet well as proposed by Jacob has the potential to increase the usefulness of groundwater. It permits a greater rate of production of the lighter liquid than previously possible. It is applicable to saline intrusion and oil vs brine situations. The single doublet is also a possible mechanism for the groundwater heat pump. (Visocky-ISWS)
W78-00720

EYEBROOK RESERVOIR SIPHON SPILLWAY - PAPER II,
G. C. S. Oliver.
Journal of the Institution of Water Engineers and Scientists, Vol 30, No 1, p 35-42, February 1976. 2 fig, 1 tab.

Descriptors: *Spillways, *Siphons, *Hydraulic structures, *Reservoirs, Discharge(Water), Flood control, Closed conduits, Prototypes, Prototype tests, Flow control, Water levels, Reservoir operation, Flow characteristics, Hydraulics, Foreign countries.
Identifiers: *England, *Eyebrook Reservoir Siphon Spillway.

A paper, 'Eyebrook Reservoir Siphon Spillway', was given to the Institution on 5 December 1958, and published in the Journal of the Institution of Water Engineers, Vol. 13, No. 3, May 1959. Described in the paper was the conversion in 1955 of a bellmouth spillway into a siphon spillway in order to raise safely the top water level of the reservoir by 2'6 without heightening the dam. The capacity of the reservoir was increased by 250 million gallons. The paper described in detail the results on a 1/5 in scale model of a single Eyebrook siphon. A few details of the actual siphons in operation were given in the discussion. The purpose of the 1976 paper was to give further details of the siphons in operation during the last 20 years and to discuss the implications learned. The total discharge capacity of the spillway is 4000 cfs. Each siphon was designed to pass a maximum of 250 cfs. Ten different floods have resulted in the spillway discharging, under siphonic conditions, flow of from 350 to 1,250 cusecs. The difference in reservoir water levels over the varying flows has been less than 1 in. There has been no unnecessary flooding below the Dam as the first siphon does not start to operate until the water level in the reservoir rises 0.65 ft above the overflow. The discharge is controlled then with very little further rise in reservoir water level. (Humphreys-ISWS)
W78-00743

1974 FLOATING BREAKWATERS CONFERENCE PAPERS.
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as COM74-11637, Price codes: A00 in paper copy, A01 in microfiche. Marine Technical Report Series No. 24, 1974. 302 p. Papers presented at Floating Breakwaters Conf. held at Newport, RI, April 23-25, 1974. Co-sponsored by Rhode Island and Washington Universities, Kowalski, T. (Ed.). NOAA-SG-04-3-158-3.

Descriptors: *Conferences, *Resources development, Bibliographies, *Water pollution control, Environmental effects, Shore protection, Breakwaters, Coastal structures, Construction materials, Harbors, Marinas, Beach erosion.
Identifiers: Coastal zone, Resources management, Floating breakwaters, Wave attenuation, Scrap tires.

The 18 papers given at the Floating Breakwater Conference held in Newport, Rhode Island, April 23-25, 1974 are presented. Titles included: Floating Breakwaters--State of the Art; Theoretical Analysis of Floating Breakwater Performance; The Effect of Surge, Heave and Pitch on the Performance of a Floating Breakwater; Tethered Float Breakwaters; The Performance of an Offset Breakwater Configuration in Wind-generated Waves; A Wave Barrier Concept; Development of Hermaphrodite Breakwater Units Utilizing Hydrofoils in Specific Arrangement; Attenuation of Wind-generated Deep Water Waves by Pneumatic and Hydraulic Breakwaters; Prototype Performance Characteristics of a Floating Breakwater; The 'Seabreaker' Floating Breakwater; Goodyear Scrap Tire Floating Breakwater Concepts; The Harris Floating Breakwater; Scrap Tire Floating Breakwaters; Materials and Construction Techniques for Floating Breakwaters; Practical Applications of Floating Breakwates for Small Craft Harbors; Workshop I: Future Uses of Floating Breakwaters; Workshop II: Floating Breakwaters for Small Boat Marinas; and A Chronological Survey of the Literature on Transportable and Floating Breakwaters. (Sinha-OEIS)
W78-00840

THEORETICAL ANALYSIS OF FLOATING BREAKWATER PERFORMANCE,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee, and W. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-02, Price codes: A02 in paper copy, A01 in micro

Descriptors: *Breakwaters, *Engineering structures, *Barriers, *Coastal structures, Shore protection, Estuaries, Water pollution control, Models, Resources development, Environmental effects.
Identifiers: *Floating breakwaters, *Boundary-value problems, Incident waves, Coastal zone, Resources management.

The problem of computing the response of a floating-breakwater systemaacted upon by incident waves is considered. A theoretical, linear model is developed based on the assumptions of deep water, an inviscid fluid, irrotational fluid flow, small incident waves and small breakwater motions. The breakwater is assumed to be long and uniform in the direction parallel to the incident wave crests. These assumptions permit the formulation of a set of coupled, linear, second-order differential equations for the breakwater sway, heave and roll motions. The solutions to four similar boundary-value problems for the velocity potential permit the computation of the exciting forces and hydrodynamic coefficients required in the equations of motion. The diffracted and breakwater-motion generated wave fields are obtained from the solution of the boundary-value problems. Computer-calculated breakwater system response is compared with experimentally obtained data for a breakwater of rectangular cross section. Although there are some discrepancies, the theoretical model provides reasonable predictions of the transmitted waves and breakwater motions. (See also W78-00840) (Sinha-OEIS)
W78-00842

PROTOTYPE PERFORMANCE CHARACTERISTICS OF A FLOATING BREAKWATER,
Washington Univ., Seattle. Ocean Engineering Research Lab.
D. R. Christensen, and E. P. Richey.
Available from the National Technical Information Service, Springfield, VA 22161 as COM74-1163709, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 159-179, 1974. 20 fig, 6 ref. Presented at Floating Breakwaters Conference held Newport, RI, April 23-25, 1974.

Descriptors: *Breakwaters, *Harbors, *Engineering structures, *Coastal structures, Hydraulic structures, Alaska, Storms, Environmental effects, Water pollution control, Resources development.
Identifiers: *Floating breakwaters, Wave effects, Coastal zone, Resources management.

The characteristics, i.e., transmission coefficients anchor forces, and accelerations in heave, roll, and sway are evaluated from measurements taken on a floating breakwater protecting a small boat harbor at Tenakee Springs, Alaska. The breakwater consists of series-connected modules of

lightweight, post-tensioned, styrofoam filled concrete. The modules, in planform, are 21 ft x 60 ft open rectangles with a three foot perimeter and draft about 3 ft of their 5-ft vertical dimension. The field measurements were planned with the combined purpose of evaluating a particular type of breakwater under different wave exposures and to supply basic data for the verification and development of a theoretical predictive model for breakwater performance. The instrumentation was designed with multiple-channel, digital recording capability and packaged for use in remote locations, requiring only periodical maintenance checks and tape changes. The system can be set to be actuated at a selected wind speed and to sample the various input sensors at prescribed intervals and durations of time. (See also W78-00840) (Sinha-OEIS)
W78-00849

THE 'SEABREAKER' FLOATING BREAKWATER,
National Research Development Corp., London (England).
H. G. Haslet.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-10, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 181-191, 1974. 4 fig. Presented at Floating Breakwaters Conference held Newport, RI, April 23-25, 1974.

Descriptors: *Breakwaters, *Engineering structures, *Coastal structures, *Resources development, Water pollution control, *Environmental effects, Harbors, Hydraulic structures, Swell.
Identifiers: *Floating breakwaters, *Seabreakers, *Wind-generated waves, Design wave, Wave attenuation, Coastal zone, Resources management.

The concept of using a long, stiff horizontal surface for wave attenuation evolved during flume tests in 1963. Each unit is a long, rigid pontoon of specialized design, with a universal joint at either end enabling a string of units to be joined together. It may be used in four different ways: permanently moored, temporarily moored, crawling, or full mobile. Possible uses are discussed, together with the practical problems that have been faced. Advantages of the design include shallow draft, light weight, modest mooringk loads even in strong currents, east of towing or self-propulsion, ability to take the ground or be winched up a beach, seaworthiness under overload conditions, and provision for catwalk, daymarks, lights, and refuge. Over 60% attenuation of wave height is claimed in wind-driven waves or steep swell, up to the size of the Design Wave for that particular unit. (See also W78-00840) (Sinha-OEIS)
W78-00850

THE HARRIS FLOATING BREAKWATER,
A. J. Harris, and J. M. Thomas.
Available from the National Technical Information Service Springfield, VA 22161 as COM-74-11637-12, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 213-232, 1974. 18 fig. Presented at Floating Breakwaters Conference held Newport, RI, April 23-25, 1974.

Descriptors: *Breakwaters, *Harbors, *Marinas, *Engineering structures, *Coastal structures, Water pollution control, Environmental effects, Resources development.
Identifiers: *Floating breakwaters, Wave energy, Moorings, Deep-sea freighters, Coastal zone, Resources management.

A basic feature of the Harris Breakwater (and the difference between it and the Bombardon) is that it presents a thin horizontal barrier to wave motion and causes dissipation of wave energy without creating major stresses in the structure and moorings. Extensive tests were carried out in the Solvent on a one-tenth scale model. The test confirmed earlier opinion, and because test readings co-related the structural characteristics and natural sea-state conditions, basic design formulas were established and the calculations checked against actual results. The application of the Harris Breakwater has been extended from marinas to the protection of moorings for deep sea freighters and, combined with the S.B.M., for super-tankers. Other uses are related to flexibility, mobility and lack of effect on existing currents and on the seabed. (See also W78-00840) (Sinha-OEIS)
W78-00852

SCRAP TIRE FLOATING BREAKWATERS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
T. Kowalski.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-13, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 233-246, 1974. 13 fig, 4 ref. Presented at Floating Breakwaters Conference held Newport, Rhode Island, April 23-25, 1974.

Descriptors: *Breakwaters, *Construction materials, *Engineering structures, Coastal structures, Ocean waves, Waves(Water), Water pollution control, Environmental effects, Resources development.
Identifiers: *Floating breakwaters, Wave attenuation, Scrap tires, Coastal zone, Resources management.

Tests indicate that even a simple three-tire-deep mat has a wave suppression efficiency of approximately 70% in waves of significant height of 2.5 ft. Problems were encountered with the strapping materials used which proved inadequate when subjected to continuous twisting action. Better protection is also needed for the foam used for buoyancy. Recommendations are given for the improved methods of construction, foaming of tires for buoyancy and the materials used for tying the tires together. Suggestions are presented for the improvement of the efficiency of wave attenuation by considering the details of the configuration of the leading edge, main body and the trailing edge of the breakwater. (See also W78-00840) (Sinha-OEIS)
W78-00853

MATERIALS AND CONSTRUCTION TECHNIQUES FOR FLOATING BREAKWATERS,
Alaska Div. of Water and Harbors, Juneau.
D. S. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-14, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 247-261, 1974. 2 ref. Presented at Floating Breakwaters Conference held Newport, RI, April 23-25, 1974.

Descriptors: *Breakwaters, *Construction materials, *Engineering structures, *Coastal structures, *Resources development, Water pollution sources, Environmental effects, Concretes, Prestressed concrete, Steel, Elastomers, Flotation.
Identifiers: *Floating breakwaters, Timber, Coastal zone, Resources management.

The type of materials used for floating breakwaters, their fabrication and final assembly in the chosen location can be more important than the theoretical configuration. Materials used must be durable and corrosion resistant, withstand impact and fatigue stresses, be unsusceptible to damage from freezing and temperature fluctuations. Various material choices such as steel, timber, reinforced and prestressed concrete with emphasis on the type of concrete which has been proven durable as well as reinforcing and prestress steel properties, are commented on. All consideration is from the practical standpoint of marine construction and its special problems. Types of moorage and materials which can be utilized are discussed as is the very real problem of location and installation in what must be assumed as adverse weather and poor foundations. (See also W78-00840) (Sinha-OEIS)
W78-00854

PRACTICAL APPLICATIONS OF FLOATING BREAKWATERS FOR SMALL CRAFT HARBORS,
Alaska Div. of Water and Harbors, Junean.
D. S. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-15, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 263-277, 1974. 15 fig. Presented at Floating Breakwaters Conference, held Newport, Rhode Island, April 23-25, 1974.

Descriptors: *Breakwaters, *Harbors, *Coastal structures, *Engineering structures, *Environmental effects, Water pollution sources, Resources development, Design criteria, Economics, Alaska.
Identifiers: *Floating breakwaters, Coastal zone, Resources management.

The application and limitations of floating breakwaters for small craft harbors are analyzed. Recommendations are proffered for the use of this type of harbor protection. The development of a structure to suite the economics and needs of the State of Alaska is described. Three projects utilizing the same basic configuration were completed. Various types of anchoring, connections, and design details were utilized. User acceptance and future users are explained. (See also W78-00840) (Sinha-OEIS)
W78-00855

WORKSHOP I: FUTURE USES OF FLOATING BREAKWATERS.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-16, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 279-290, 1974. From the Floating Breakwaters Conference held at Newport, Rhode Island, April 23-25, 1974.

Descriptors: *Breakwaters, *Harbors, Engineering structures, *Resources development, *Water pollution sources, Environmental effects, Beach erosion, Swimming, Ports, Nuclear powerplants.
Identifiers: *Floating breakwaters, Seaplane airports, Offshore platforms, Oil refineries, Coastal zone, Resources management.

Future uses of floating breakwaters were discussed at a workshop. Participants said that floating structures, which would dissipate wave energy, might someday be used to protect many harbor facilities, control coastal erosion and protect swimming areas. Among the other ideas were futuristic floating breakwaters which could protect areas for seaplane airports and breakwaters which could protect offshore nuclear power plants, oil refineries and deepwater ports. (See also W78-00840) (Sinha-OEIS)
W78-00856

WORKSHOP II: FLOATING BREAKWATERS FOR SMALL BOAT MARINAS.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-74-11637-17, Price codes: A02 in paper copy, A01 in microfiche. In: Rhode Island University Marine Technical Report Series No. 24, p 281-282, 1974. From the Floating Breakwaters Conference held Newport, Rhode Island, April 23-25, 1974.

Descriptors: *Breakwaters, *Marinas, *Construction materials, *Engineering structures, Coastal structures, Resources development, Water pollution sources, Environmental effects.
Identifiers: Floating breakwaters, Scrap tires, Coastal zone, Resources management.

An evening workshop brought together several marina owners and managers, local town officials and many of the regular conference participants for a discussion concerning the use of floating breakwaters for small boat marinas. Much of the workshop interest was focused on the potential use of scrap truck and auto tires as material for fabricating relatively inexpensive, effective floating breakwaters for small boat marinas. (See also W78-00840) (Sinha-OEIS)
W78-00857

8C. Hydraulic Machinery

MODEL STUDY OF THE INLET AND SUMP ON THE CLINTON FIRST AVENUE PUMP STATION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
C. Farell.
IIHR Report No. 196, November 1976. 107 p, 42 fig, 11 ref.

Descriptors: *Hydraulic models, *Flow separation, *Pumping plants, *Baffles, *Hydraulic design, *Flow profiles, *Iowa, Hydraulics, Velocity, Channels, Model studies, Sumps, Froude number, Vortices.
Identifiers: *Clinton(Iowa).

A 1:7 scale model of the inlet and sump was constructed, comprising the new approach channel, the pump bays and forebay, the pump sumps and bells, and the approach conduit to the existing station. It was found that the 45-degree angle at which the flow is diverted from the approach channel into the two new pump sumps produces a large dead-water zone in the forebay and results in pronounced dips in the magnitude of the velocity in the pump bays and sumps, occurring toward the centerwall dividing the bay area. Captive eddies in the pump sumps due to this velocity nonuniformity were not detected, however, and neither were vortices originating at the free surface. On the other hand, thin vortices originating off the converging side walls of the sumps were observed. The vortices were rather stable in position and somewhat intermittent in time. The pressure fluctuations on the side walls associated with the vortices were found to be considerable, but pressure fluctuations elsewhere on the sumps boundaries were negligible. Baffle arrangements using a few baffles and avoiding narrow passages where trash accumulations could result in obstruction of the flow were developed to improve the uniformity of the approach flows to the sumps. The baffle arrangements did not eliminate completely the side wall vortices, whose strength, frequency of occurrence, and duration of persistence were found to be related to the conditions of the approach flow. (Adams-ISWS)
W78-00717

8D. Soil Mechanics

FINITE ELEMENT ANALYSES OF STRESSES AND MOVEMENTS IN BIRCH DAM,
California Univ., Berkeley. Office of Research Services.
A. Soriano, J. M. Duncan, K. Wong, and J. M. Simon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 448, Price codes: A05 in paper copy, A01 in microfiche. Contract Report S-76-2, April 1976. 100 p, 50 fig, 8 tab, 10 ref, 1 append. DACW39-68-C-0078.

Descriptors: *Finite element analysis, *Earth dams, *Foundations, *Oklahoma, *Clays, Soil mechanics, Consolidation, Stress, Risks, On-site tests, Analytical techniques.
Identifiers: *Birch Dam(Okla), *Time-dependent consolidation, Heterogeneous deposits.

Finite element analyses were done to evaluate stresses and movements in the Birch Dam and its foundation for the pre- and post-construction conditions. The existence of compressible clays and silts in the foundation and the considerable time delay in the movements due to the consolidation of the foundation were considered. Because of the low strengths of clays in the foundation of the dam, it will be necessary to build the dam in 2 stages, allowing time for consolidation of the foundation before the second stage is built. The necessity for characterizing the stress-strain and strength characteristics of a heterogeneous deposit of natural soils and the necessity for determining time-dependent consolidation characteristics lead inevitably to undertainties in the accuracy of the results. When Birch Dam has been built and field measurements are available to compare with the analytical results presented, it will be possible to judge the effectiveness of th analyses. (Singh-ISWS)
W78-00701

OUTLET WORKS AND STILLING BASIN, HOWARD HANSON DAM, GREEN RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer Div. North Pacific, Bonneville, OR. Hydraulics Lab.
P. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 324, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 88-1, September 1966. 102 p, 4 fig, 20 tab, 13 photo, 28 plate, 1 append.

Descriptors: *Outlet works, *Hydraulic models, *Washington, Hydraulics, Hydraulic structures, Tunnels, Dams, Model studies, Basins, Design, Hydraulic design.
Identifiers: *Stilling basin, *Green River(Wash), *Howard Hanson Dam(Wash), Horseshoe tunnel, Emergency closure gate, Transition section splitter, J-rubber seals, Pressure chamber.

The outlet structure, horseshoe tunnel, and stilling basin proposed for Howard Hanson Dam were studied in a 1:25-scale hydraulic model. Flow conditions and pressures within the tunnel and stilling basin, discharge rating curves for the tainter-type regulating valves, and hydraulic downpull forces on the emergency closure gate were investigated. Design changes resulting from the tests were as follows: the transition section splitter was shortened 17.5 ft, the stilling basin was lowered from elev 987 to elev 981, and the two-step vertical end sill was replaced by an end sill sloped 1 on 1. Maximum downpull on the closure gate was 187 kips when flow was passed through one intake. It was 210 kips with flow through both intakes when air vents in the tainter valve housing were open, and 335 kips when the air vents were closed. Data for maximum allowable clearances for J-rubber seals on tainter valves operated under heads up to 200 ft of water were obtained in a 1:1-scale pressure chamber. Maximum head on the tainter valves at Howard Hanson Dam is about 171 ft. A 1/2-in. clearance between seal retainer bars on the valves and side seal plates in the conduit was allowable; there should be no clearance between the side seals and support plates at the intersection with the top seal. Values of friction drag for rectangular and music-note J-rubber seals against stainless, machine-finished, and chrome-plated steel surfaces were given in the appendix. (Lee-ISWS)
W78-00705

8F. Concrete

MATERIALS AND CONSTRUCTION TECHNIQUES FOR FLOATING BREAKWATERS,
Alaska Div. of Water and Harbors, Juneau.
For primary bibliographic entry see Field 8B.
W78-00854

8G. Materials

VIBRATING SCREENS IN INDUSTRIAL WASTE WATER TREATMENT,
Link Belt Co., Colmar, PA.
For primary bibliographic entry see Field 5D.
W78-00507

MATERIALS AND CONSTRUCTION TECHNIQUES FOR FLOATING BREAKWATERS,
Alaska Div. of Water and Harbors, Juneau.
For primary bibliographic entry see Field 8B.
W78-00854

8I. Fisheries Engineering

ABUNDANCE, GROWTH, DISTRIBUTION AND MOVEMENTS OF WHITE STURGEON IN THE MID-SNAKE RIVER,
Idaho Cooperative Fishery Research Unit, Moscow.
J. C. Coon, R. R. Ringe, and T. C. Bjornn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 604, Price codes: A04 in paper copy, A01 in microfiche. University of Idaho College of Forestry, Wildlife and Range Sciences, Completion Report, September 1977. 63 p, 9 fig, 19 tab, 24 ref. OWRT B-026-IDA(1), 14-31-0001-3877.

Descriptors: *Growth rates, Environmental effects, Population, Size, *Movement, *Fish reproduction, Habitats, Fish barriers, Food habits, Impoundments, Idaho, *Distribution, Dams, Post-impoundment, Fish management, Tagging.
Identifiers: *White Sturgeon, *Mid-Snake River(Idaho).

During the years 1972-75, 876 sturgeon were captured from the Snake River between Lower Granite and Hells Canyon dams. The sturgeon were marked or tagged so that their abundance, growth, distribution and movements could be assessed. 204 of the sturgeon were recaptured, some up to eight times. Some of the large pools in the Snake River contained more than 200 sturgeon, according to estimates. By expanding population estimates we made for several pools in the river, it is believed that 8,000-12,000 sturgeon resided in the study area during the period 1973-75. Small sturgeon (less than 3 ft.) were the most abundant (86%) of the fish caught. Sturgeon 3-6 ft. in length were least abundant (4%) and large fish (over 6 ft.) comprised 10% of the fish caught. There was some tendency for the 2-3 ft. sturgeon to move downstream, whereas the larger sturgeon did not move far from the original site of capture. Growth of sturgeon produced since dams were constructed in Hells Canyon was less than for sturgeon produced prior to damming of the river. Sturgeon are reproducing successfully in the middle section of the Snake River but the population may not thrive as in past years if the growth rate has indeed slowed and if critical habitat for the rearing of 3-6 ft. sturgeon has been eliminated by dams in the lower Snake River.
W78-00552

SUGGESTED CRITERIA FOR IRRIGATION WATER INTAKES IN MISSOURI RIVER RESERVOIRS, SOUTH DAKOTA,
South Dakota State Univ. Brookings, Dept. of Civil Engineering.
D. J. Voogt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 090, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1977. 23 p, 3 fig, 6 ref. OWRT A-060-SDAK(1), 14-34-0001-7087.

Descriptors: Irrigation, Water delivery, *Intakes, Reservoir fisheries, Fish passages, Fish behavior, *Fish conservation, *South Dakota, Reservoirs, *Missouri River, *Irrigation water, Pumping.
Identifiers: *Blue Blanket reservoir(So Dak).

Shallow embayments and backwater areas associated with the Missouri River reservoirs form the primary spawning and nursery grounds of fish. The biological impact on these areas of irrigation water intakes was investigated . The study was confined to one type of inlet conveying about 3 cfs placed in the productive spawning embayment near North-South Dakota border called Blue Blanket. Pumping took place during July and August. The pumping had no measurable impact on fish life. No egg, larva or fish life of any kind was detected in the irrigation water samples. Counts of zooplankton numbers in the irrigation water were considerably lower than in the reservoirs, indicating possible avoidance. The flow pattern into the inlets indicates that the zone of influence of the intake is relatively small. (Wiersma-South Dakota State)
W78-00706

AERATION OF HYDRO RELEASES AT FT. PATRICK HENRY DAM,
Tennessee Valley Authority, Chattanooga. Water Quality and Ecology Branch.
For primary bibliographic entry see Field 5G.
W78-00711

IMPINGEMENT OF FISHES AT PEACH BOTTOM ATOMIC POWER STATION, PENNSYLVANIA,
Ichthyological Associates, Inc., Drumore, PA.
D. Mathur, P. G. Heisey, and N. C. Magnusson.
Transactions of the American Fisheries Society, Vol 106, No 3, p 258-267, 1977. 2 fig, 6 tab, 15 ref.

Descriptors: *Nuclear powerplants, *Cooling water, *Fishkills, *Water cooling, *Fish behavior, *Mortality, *Fish populations, *Intakes, *Intake structures, *Water temperature, *Regression analysis, Channel catfish, Sunfishes, Pennsylvania.
Identifiers: *Impingement, Peach Bottom Atomic Power Station, Fish screens, Vertical traveling screens, White crappie, Bluegill, Sunfish.

The rate of impingement of fishes on the vertical traveling screens at Peach Bottom Atomic Power Station, Pennsylvania, was determined from November, 1973 through December 1975. Channel catfish, white crappie, and bluegill were impinged most frequently. Impingement was highest in November through April. Impingement was highest during the start-up phase of each unit. Multiple regression analysis revealed that the intake water temperatures, daily river flow, and pond elevation accounted for 32 to 73% of the variation in the impingement of fishes. Winter (January through March) mortality of white crappie and bluegill at the screens was equal to that caused by a few anglers over the same period. The design and placement of the screens, preceded by relevant behavioral studies were, in part, responsible for minimal fish losses due to impingement at Peach Bottom. (Katz)
W78-00875

USE OF THE LESLIE MATRIX FOR ASSESSING ENVIRONMENTAL IMPACT WITH AN EXAMPLE FOR A FISH POPULATION,
Stone and Webster Engineering Corp., Boston, MA. Environmental Div.
T. J. Horst.
Transactions of the American Fisheries Society, Vol 106, No 3, p 253-257, 1977. 4 fig, 1 tab, 9 ref.

Descriptors: Mathematical studies, *Mathematical models, Fish populations, *Growth rates, *Entrainment, *Fish eggs, *Larvae, Statistical methods, *Statistical models, *Estimating equations, Analytical techniques, Population, Environmental effects.
Identifiers: *Leslie matrix, Cunner.

The Leslie matrix model for discrete population theory was examined for the assessment of the effects of environmental alterations on a species population using an eigenvalue analysis. This analysis provided estimates of population growth rate and stable age distribution. A sensitivity analysis was conducted for changes in elements of the population matrix and the resultant effect on population growth and stable age distribution. An example of the technique was presented for the cunner (Tautogolabrus adspersus). This example considered the effect of entrainment of cunner eggs and larvae at intakes of power stations. (Katz)
W78-00876

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

COASTAL ZONE LEGAL REFERENCES, 1976.
State Univ. of New York at Buffalo, Amherst. Sea Grant Law Center.
For primary bibliographic entry see Field 06E.
W78-00657

10D. Specialized Information Center Services

PENNSYLVANIA WATER RESOURCES RESEARCH CENTER TECHNOLOGY TRANSFER PROGRAMS - A CASE STUDY,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 04B.
W78-00565

10F. Preparation Of Reviews

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME I-SUMMARY REPORT,
Oklahoma Univ., Norman. Science and Public Policy Program; and Radian Corp., Austin, TX.
For primary bibliographic entry see Field 06G.
W78-00753

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SELECTED WATER RESOURCES ABSTRACTS

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

QUANTITATIVE MAP INTERPRETATION IN REGIONAL PLANNING SURVEYS (IN AFRIKAANS),
Agricultural Research Station, Bethlehem (South Africa).
For primary bibliographic entry see Field 7C.
W78-00934

AREA-DEFICIT-INTENSITY CHARACTERISTICS OF DROUGHTS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2B.
W78-01025

LATE PLEISTOCENE AND RECENT CLIMATIC CHANGES IN THE EGYPTIAN SAHARA,
Southern Methodist Univ., Dallas, TX. Dept. of Anthropology.
F. Wendorf.
The Geographical Journal, Vol. 143, No. 2, p 211-234, July, 1977, 7 fig, 1 tab, 20 ref.

Descriptors: *Climatic data, *Quarternary period, *Paleoclimatology, *Deserts, Playas, Basins, Water resources, Arid lands, Precipitaton(Atmospheric), underground stream, Pleistocene epoch, Geologic history, Geology, Sediments, Climates.
Identifiers: *Egypt, *Sahara Desert, Nubian Desert.

Six seasons of investigation on the prehistory of the Egyptian Sahara have provided significant new data on climatic changes in that area during the Quaternary. Numerous playas, basins, and fossil springs occur in the Nubian Desert and point to more abundant water resources in the past. It is now evident that there were several moist intervals when the area supported the large herbivores hunted by man. These moist periods were separated by periods of hyperaridity when there appears to have been little or no life in the Egyptian Sahara. The present hyperarid climate did not develop until after c. 3000BC. It is believed that most of the moisture responsible for the high water tables during these intervals was the result of local precipitation sufficient to provide the ground cover needed to support the abundant fauna. Some movement of underground water from higher elevations outside Egypt is also likely, but the relative contributions of these two sources cannot be evaluated. (Jamail-Arizona)
W78-01043

HYDROLOGIC AND CHEMICAL BUDGETS ON WALKER BRANCH WATERSHED-OBSERVATIONS AND MODELING APPLICATIONS,
Oak Ridge National Lab., TN.
R. J. Raridon, D. E. Fields, and G. S. Henderson.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-NSF-EATC24, Price codes: A04 in paper copy, A01 in microfiche. ORNL/NSF/EATC-24. Work supported by National Science Foundation. July 1976. 52 p, 6 fig, 6 tab, 34 ref, 2 append.

Descriptors: *Hydrologic budget, *Watersheds(Basins), *Data collections, *Simulation analysis, *Computer models, Cadmium, Runoff, Evapotranspiration, Streams, Systems analysis, Water quality.
Identifiers: *Chemical budget, Sensitivity analysis, Dissolved potassium, Hydrologic transport.

Data collected on Walker Branch Watershed for a six-year period have been analyzed and used for validation studies of the ORNL version of the Wisconsin Hydrologic Transport Model. In addition to hydrologic budgets, chemical budgets for dissolved potassium and cadmium were studied. Measurements of wetfall and dryfall, together with hourly rainfall and daily evaporation data, provided the input for the computer program. Comparisons of simulated water and material transport on a monthly basis show good agreement with measured land runoff values. A discussion of parameter selection and sensitivity analysis for the model is included. (Bell-Cornell)
W78-01071

HYDROLOGIC DATA FOR THE VAMOOSA AQUIFER, EAST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, OK. Water Resources Div.
J. J. D'Lugosz, and R. G. McClaflin.
Open-file report 77-487, July 1977. 38 p, 4 fig, 3 tab, 29 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Streamflow, *Water quality, *Oklahoma, Water yield, Aquifers, Well data, Water users, Water levels, Available water, Chemical analysis.
Identifiers: *East-central Oklahoma.

The U.S. Geological Survey has collected data as part of an availability and water-quality study pertaining to the Vamoosa aquifer in east-central Oklahoma. This report makes available both published and unpublished records at approximately 413 wells and 225 surface water sites. In addition, 39 selected references to pertinent groundwater and geologic reports covering parts of the 8-county area are included. (Woodard-USGS)
W78-01076

A HYDROLOGIC DESCRIPTION OF KEYSTONE LAKE NEAR TAMPA, FLORIDA,
Geological Survey, Tampa, FL. Water Resources Div.
For primary bibliographic entry see Field 2H.
W78-01088

SIMULATION OF THE INLET HYDROGRAPH FOR URBAN CATCHMENTS,
Institute of Hydrology, Walliford(England).
For primary bibliographic entry see Field 2E.
W78-01147

2B. Precipitation

SOLAR ACTIVITY AND RAINFALL VARIATION OVER SOUTHERN AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
T. G. J. Dyer.
South African Journal of Science, Vol 71, p 369-372, December 1975. 10 fig, 1 tab, 14 ref.

Descriptors: *Solar radiation, Weather patterns, *Rainfall, Climatic data, Temporal distribution, Stochastic hydrology, Precipitation, Weather forecasting.
Identifiers: South Africa, Transvaal, Karoo.

An investigation is reported of the relations between changes in solar activity, as measured by sunspot numbers, and rainfall vaiation over South Africa as measured by total annual receipts of rainfall at 157 rainfall stations over the period 1910-1972. The data indicate that there is a statistically significant correlation between some rainfall series of South Africa and the two solar cycles. (So. African Water Info. Center)
W78-00939

ASSESSMENT OF DRYNESS AND WETNESS BASED ON PRECIPITATION, WATER SUPPLY IN THE SOIL AND POTENTIAL EVAPOTRANSPIRATION (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia).
I. Penzar, and B. Penzar.
Poljopr Znan Smotra 36(46): 113-138. 1976. (English summary).

Descriptors: *Soil water, *Evapotranspiration, Soil moisture, Palmer's method, Precipitation(Atmospheric), Yugoslavia.

A study of the hygric regime in North-West Croatia (Yugoslavia) is made on the basis of meteorological data of the Zagreb Observatory, Gric, from 1862 to September 1975 inclusive. Values of potential evapotranspiration are analyzed, calculated from the air temperature after Thornthwaite. The difference between the amount of water obtained through precipitation and the amount that may be used for evapotranspiration is considered. It is shown that there is often insufficient precipitation water in the hot part of the year. However, if the water supply in the soil is taken into account in addition to precipitation, the hygric regime seems more favorable. For the study of the dry and wet periods in relation to agriculture, only the soil water in the arable layer was taken into consideration, whereas for forestry, pomology and viniculture, the total water supply to the depth of 1 m was considered. The water content in discrete soil layers was calculated by Palmer's method. Finally, a chronological list is given of the normal and abnormal hygric conditions in the last 114 yr.--Copyright 1977, Biological Abstracts, Inc.
W78-01017

AREA-DEFICIT-INTENSITY CHARACTERISTICS OF DROUGHTS,
Colorado State Univ., Fort Collins.
N. Tase.
Hydrology Papers No 87, November 1976. 47 p, 36 fig, 16 tab, 49 ref.

Descriptors: *Droughts, *Model studies, *Stochastic processes, Time series analysis, Mathematical models, Hydrology, Reviews, Precipitation(Atmospheric), Monthly, Probability, Equations, Mathematical studies, Great Plains.
Identifiers: *Areal droughts, Drought deficity, Drought intensity, Theory of run, Theory of recurrent events, Periodic-stochastic process.

Under the concept that monthly precipitation series over an area are composed of deterministic components specified by periodic parameters and a stationary stochastic component, a mathematical model of area-time process of monthly precipitation, especially of the stationary stochastic component, using the Upper Great Plains in the U.S.A. as an example of the model, was developed. The independent, identically distributed variables were obtained from the transformed stochastic component. The regional dependence structure was given by an exponential decay function with the interstation distance. By using the model, new samples of time series over the area at a new grid of 80 points were generated in order to investigate area-deficit-intensity characteristics of droughts. Probabilities of areal coverage of droughts were investigated further by applying the theory of runs, by applying the theory of recurrent events, and by similar approaches. Probabilities of specific areas covered by droughts of given properties also were investigated by considering the effects of the size and the shape of an area. (Lee-ISWS)
W78-01025

COMPUTATIONS WITH THE RAND CLOUD MODEL FOR THE HIPLEX WORKSHOP, JUNE 1975,
Rand Corp., Santa Monica, CA.
F. W. Murray.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 268, Price codes: A03 in paper copy, A01 in microfiche. Report, July 1975. 40 p, 13 fig, 2 tab, 1 ref.

Descriptors: *Cloud physics, *Model studies, *Mathematical models, Weather, Precipitation(Atmospheric), Rainfall, Nucleation, Computers, Atmosphere, Clouds, Equations, Water vapor, Droplets, Temperature, Humidity, Meteorology.
Identifiers: *Cloud models, *High Plains region.

The High Plains Cooperative Experiment sponsored by the Division of Atmospheric Water Resource Management of the Bureau of Reclamation is a largescale project to study the feasibility of augmenting precipitation in the High Plains region by artificial means. In July 1974, a planning workship was held in Vail, Colorado, at which intensive studies of the requirements for cloud modeling, measurements, and design and evaluation were made. One recommendation that came from the modeling sessions was that all of the models developed by the various participants be tested with the same set of data, and that another workshop be convened to compare the results. Data for two days, 10 and 17 August 1973, for the St. Louis region from Project METROMEX were provided. The modeling workshop was held in Denver on 11-13 June 1975. Approximately 14 participants presented results of their models. Limitations of time made it impossible to complete the computer runs of the Rand Cloud Model before the date of the workshop, so only partial results were presented. Since that time, two complete runs have been made and the results are reported. (Sims-ISWS)
W78-01063

PACIFIC SEA-SURFACE TEMPERATURE RELATED TO RAIN IN CALIFORNIA,
California State Univ., Fresno. Dept. of Geography.
C. G. Markham, and D. R. McLain.
Nature, Vol. 269, No. 5628, p 501-504, October 6, 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Rainfall, *California, *Water temperature, *Pacific Ocean, Temperature, Oceans, Weather, Air circulation, Precipitation(Atmospheric), Correlation analysis, Analytical techniques, Meteorology, Oceanography.
Identifiers: *Sea surface temperature.

California is experiencing the worst drought in modern history, and there is much concern and speculation about future rainfall prospects. Recently South Atlantic sea surface temperatures (SST) were related to rain in northeastern Brazil. Here similar methods were used to relate sea surface temperatures over the North Pacific Ocean to rainfall in California. December SST in the northeast Pacific off Washington were found to have a limited but definite predictive value and to account for about 45% of the variation in California rainfall for the period February-April. (Sims-ISWS)
W78-01066

THE 1976 AND 1977 DROUGHT IN CALIFORNIA: EXTENT AND SEVERITY,
California Univ., Davis. Dept. of Geography.
M. L. Shelton.
Weatherwise, Vol. 30, No. 4, p 139-146, 153, August 1977. 2 fig, 3 tab, 2 ref.

Descriptors: *Droughts, *California, *Water shortage, Precipitation(Atmospheric), Rainfall, Snowfall, Seasonal, Spatial distribution, Effects, Distribution patterns, Water resources, Agriculture, Climatology, Meteorology.
Identifiers: Drought severity.

Many stations in California experienced their most severe drought of this century during the 1976 and 1977 precipitation years. The unseasonable dry weather adversely affected agriculture, recreation, and water supplies throughout the state. During 1976, agriculture and the ski industry experienced large financial losses because precipitation was insufficient to support normal activities, range and forest fires burned approximately 165,000 acres of dry vegetation, and an acute water shortage in Marin County prompted one city to discourage tourists. The impact of the drought probably would have been even greater, but the statewide system of water shortage and transfer was able to compensate for natural water shortages by providing water to many affected areas. Moisture deficits at the seven stations selected as representative of various climatic regions in California indicate that the 1976 drought was more severe at a majority of these sites than the record dry year drought of 1924. Only the south coastal area represented by Los Angeles experienced a more severe drought during 1924 than during 1976. The statewide drought pattern suggested by the data for the representative stations is that the 1976 drought appeared in the state earlier than the 1924 drought, but it spread throughout the state more slowly than the 1924 drought. (Sims-ISWS)
W78-01134

A HIGH-RESOLUTION ELECTRONIC RAINFALL INTENSITY RECORDER AND TOTALISER,
Meteorological Office, Poona (India).
G. Venugopal, and V. Radhakrishnan.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 4, p 441-444, October 1976. 4 fig.

Descriptors: *Rain gages, *Rainfall intensity, *Instrumentation, Precipitation gages, Rainfall, Measurement, Gages, Equipment, Electronic equipment, Meteorology, Electrical engineering.
Identifiers: Recorders, Recording systems, Rainfall recorders.

An electronic distant-reading rainfall intensity recorder capable of measuring minute-to-minute values of the intensity of rain and recording them of a strip-chart recorder was designed and constructed at the Instruments Division of the Meteorological Office, Poona. The system measures the intensity of rainfall by converting rainwater into drops of equal size and counts the number of drops by an optical-cum-electronic device. The number of counts during every minute interval which constitutes a measure of the intensity of rainfall are recorded on a conventional strip-chart recorder. To measure the total rainfall during any given interval of time, an additional mark is printed on the chart for every 1 mm of rainfall. The system, which has a resolution of 1/2 mm of rain/hour, was tested during several spells of rainfall at Poona and was found to record quite accurately. (Sims-ISWS)
W78-01142

A MARKOV CHAIN MODEL FOR THE OCCURRENCES OF DRY AND WET DAYS,
Gauhati Univ. (India). Dept. of Statistics.
J. Medhi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 4, p 431-435, October 1976. 3 tab, 7 ref.

Descriptors: *Rainfall, *Model studies, *Mathematical models, Markov processes, Data processing, Weather, Rain, Foreign research, Monsoons, Statistics, Statistical models, Meteorology.
Identifiers: *India, *Gauhati(India), Dry spells, Wet spells.

Study of rainfall data in India began as early as 1889 with the work of Blanford. His work was extended by Sir Gilbert Walker. Mahalanobis, in his classic work (Sankhya 5:p 1-20, 1940), broke entirely new grounds with sound statistical reasonings in his study of the rainfall, runoff, and other meteorological features of the river basins of Orissa. Models based on stochastic processes and time series now are being applied in meteorological studies. Gabriel and Neumann used a Markov chain model in a study of weather conditions in Tel Aviv. A similar Markov chain model for the occurrence of dry and wet days in Gauhati (Airport) and to test the statistical significance of the model. (Sims-ISWS)
W78-01143

INFLUENCE OF CERTAIN FACTORS ON RAINFALL FREQUENCY VALUES,
Meteorological Office, New Delhi (India).
N. Tripathi.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 4, p 423-430, October 1976. 4 tab, 11 ref.

Descriptors: *Rainfall, *Probable maximum precipitation, *Frequency analysis, Precipitation(Atmospheric), Data processing, Analytical techniques, Temporal distribution, Precipitation excess, Air pollution, Urbanization, Effects, Statistics, Weather, Meteorology.
Identifiers: *India, Gumbel's method, Return periods.

Based on 84-year data of Calcutta, Delhi, Bombay, and Madras, it was found that to estimate the maximum one-day point rainfall for long return periods, more reliance is to be placed on stations with the longest records. For the error to be within plus or minus 25% in about 80% of cases, in the estimation of return period values, extrapolation may be made to five times the period of record and to ten times the period of record if the outliers are excluded from the series. Criteria to find the outliers were suggested. Some evidence was found to show that the return period values of rainfall of a station increase with increase in air pollution at that station. (Sims-ISWS)
W78-01144

MONSOON IN SIERRA LEONE,
Regional Meteorological Centre, Bombay (India).
A. K. Mukherjee.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol. 27, No. 4, p 385-390, October 1976. 9 fig, 2 tab, 3 ref.

Descriptors: *Rainfall, *Monsoons, *Africa, Frequency analysis, Diurnal, Seasonal, Spatial distribution, Temporal distribution, Precipitation(Atmospheric), Tropical regions, Statistics, Statistical analysis, Meteorology.
Identifiers: *Sierra Leone, *India.

General characteristics of monsoons in Sierra Leone are discussed. The months July, August, and September may be considered as monsoon months in Sierra Leone. Most of the rain in this country occurs in the mentioned three months. Rainfall data for the period 1954 to 1973 were analyzed. Rainfall gradually decreases from west to east and from south to north. Though the rainfall increases in monsoon, there is considerable reduction in thunderstorm activity. The diurnal variation of rainfall indicates that the rainfall is maximum in early morning and minimum in the evening. A comparison of rainfall characteristics was made with those over the west coast of India. (Sims-ISWS)
W78-01145

SIMULATION OF THE INLET HYDROGRAPH FOR URBAN CATCHMENTS,
Institute of Hydrology, Wallingford(England).
For primary bibliographic entry see Field 2E.
W78-01147

RAINFALL INTENSITY-FREQUENCY RELATIONSHIPS FROM MONTHLY EXTREMES,
Guelph Univ. (Ontario). School of Engineering.
T. Dickinson.
Journal of Hydrology, Vol 35, No 1/2, p 137-145, October 1977. 5 fig, 1 tab, 6 ref.

Descriptors: *Rainfall, *Frequency analysis, *Excessive precipitation, *Canada, Frequency, Frequency curves, Precipitation(Atmospheric), Climatology, Probability, Monthly, Seasonal, Annual, Variability, Meteorology, Hydrology.
Identifiers: *Rainfall frequency.

An approach is outlined for the development of rainfall extreme value distributions utilizing many extreme values per year. In particular, an extremal distribution is developed on the basis of monthly extremal distributions which are double exponential in form. The approach, applied to rainfall extremes of various durations at three stations in southern Ontario, offers an alternative to the estimation of distributions using only annual extremes. The alternative was shown to be less sensitive to the effects of outlier points and increases the utilization of rainfall information. It also revealed seasonal patterns of rainfall extremes which may be important for the consideration of rainfall-runoff determination. (Sims-ISWS)
W78-01149

METEOROLOGICAL ADJUSTMENT OF YEARLY MEAN VALUES FOR AIR POLLUTANT CONCENTRATION COMPARISONS,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
S. M. Sidik, and H. E. Neustadter.
Available from the National Technical Information Service Springfield, VA 22161 as N76-29738, Price codes: A03 in paper copy, A01 in microfiche. Technical Note D-8253, July 1976. 42 p, 10 fig, 4 tab, 19 ref, 1 append.

Descriptors: *Air pollution, *Pollutants, *Model studies, Mathematical models, Regression analysis, Suspended solids, Sulfur compounds, Nitrogen compounds, Meteorological data, Winds, Air temperatures, Precipitation(Atmospheric), Weather, Meteorology.
Identifiers: *Meteorological effects, Sulfur dioxide, Nitrogen dioxide, Suspended particles, Air pollution control.

Using multiple linear regression analysis, models were derived which estimate mean concentrations of Total Suspended Particulate (TSP), sulfur dioxide (SO2), and nitrogen dioxide (NO2) as a function of several meteorologic variables, two rough economic indicators, and a simple trend in time. Considered were 24-hour averaged concentrations measured in Cleveland, Ohio, from 1967 to 1972 (approximately 450 observations for TSP and 400 observations at 13 sites for SO2 and NO2) by the municipal Division of Air Pollution Control. Meteorologic data were obtained from the National Weather Service. The data did not include inversion heights. This is representative of data typically available to a local pollution-control agency. The goodness of fit of the estimated models is partially reflected by the squared coefficient of multiple correlation which indicates that, at the various sampling stations, the models accounted for about 23 to 47% of the total variance of the observed TSP concentrations. If the resulting model equations are used in place of simple overall means of the observed concentrations, there is about a 20% improvement in either (1) predicting mean concentrations for specified meteorological conditions, or (2) adjusting successive yearly averages to allow for comparisons devoid of meteorological effects. This improvement can be obtained with no additional cost other than a moderate effort at statistical analysis. An application to source identification was presented, using regression coefficients of wind velocity predictor variables. (Sims-ISWS)
W78-01153

2C. Snow, Ice, and Frost

RADIOCARBON DATING OF THE LAST GLACIATION IN PERU,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
J. H. Mercer, and M. O. Palacios.
Geology, Vol. 5, No. 10, p 600-604, October 1977. 2 fig, 1 tab, 26 ref. NSF GV-41411, ATM75-15513.

Descriptors: *Glaciers, *Radioactive dating, *Glaciation, *South America, On-site investigations, Ice, Glacial drift, Mountains, Fluctuations, Dating, Geomorphology, Alpine, Glaciology.
Identifiers: *Peru, *Cordillera Vilcanota(Peru), *Quelccaya Ice Cap(Peru).

In the Cordillera Vilcanota and the vicinity of the Quelccaya ice cap, near lat 14 deg S in eastern Peru, the last glaciation culminated sometime between about 28,000 and 14,000 B.P. Alpine glaciers were then only about half as long as during an earlier glaciation of unknown date. A rather minor readvance of the Quelccaya ice cap was in progress about 11,500 B.P. and culminated about 11,000 B.P., some 500 to 800 yr before the Younger Dryas Stade in Europe. By 10,000 B.P., the Quelccaya ice cap was little, if any, larger than it is today, and it was smaller than it is today between about 2700 and 1600 B.P. Glacier fluctuations during the interval 10,000 to 3000 B.P. have not yet been determined. A 'Little Ice Age' maximum culminated between 600 and 300 B.P. The relative importance of changes in temperature and precipitation in causing these glacier variations is uncertain. (Sims-ISWS)
W78-01009

1974 ICE BREAKUP ON THE CHENA RIVER,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska. Alaskan Projects Office.
T. McFadden, and M. Stallion.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-018 352, Price codes: A04 in paper copy, A01 in microfiche. Special Report 241, October 1975. 49 p, 25 fig, 4 tab, 52 ref, 4 append.

Descriptors: *Ice, *Rivers, *Ice breakup, *Alaska, Ice jams, Bridges, Dams, Piers, Ice cover, Water temperature, Air temperature, On-site investigations, Aerial photography, Damages, Cold regions.
Identifiers: *Chena River(Alaska), Ice thickness, River ice.

The Corps of Engineers, Alaska District, requested CRREL to observe and document the ice breakup of the Chena River in the spring of 1974. The purpose was to determine the potential for ice and debris damage to the outlet structure of the proposed Chena River Flood Control Dam. Accordingly, the Alaskan Projects Office of CRREL made a detailed study of the ice breakup, ice jams, and ice thickness on the Chena River prior to and during the actual breakup. Ice thickness were measured at specific locations on the Chena River, from its confluence with the Tanana River upstream to the first bridge on the Chena Hot Springs Road. Average ice thicknesses were computed, as well as average ice volumes per mile of river length. Wate temperatures and velocities were measured at different locations on the river. Aerial and ground reconnaissance was maintained on the river during the breakup period, and ground parties were dispatched to almost all ice jams observed on the river. Comparisons to other years' breakups were made, and it was concluded that the 1974 breakup was extremely mild. (Sims-ISWS)
W78-01013

AVALANCHE RELEASE AND SNOW CHARACTERISTICS, SAN JUAN MOUNTAINS, COLORADO.
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
Occasional Paper No. 19, May 1976. 268 p, 80 fig, 32 tab, 25 ref, 8 append. Armstrong, R.L., and Ives, J.D., editors. USBR 14-06-D-7155.

Descriptors: *Avalanches, *Colorado, *Snow, *Mathematical models, *Forecasting, Stastical methods, On-site investigations, Computer programs, Data processing, Networks, Snow cover, Seismic studies, Seismic properties, Snow management, Analytical techniques, Instrumentation, Monitoring, Weather modification, Methodology, Data collections.
Identifiers: *San Juan Mountains(Colo), *Red Mountain Pass(Colo).

The project objective was to develop a methodology to forecast accurately avalanche occurrences through study of the complex relationship which exists among terrain, climate, snow stratigraphy, and avalanche formation. The primary snow study site located at Red Mountain Pass (3400 m) included instrumentation to measure air temperature, temperatures within the snowpack, wind speed and direction, precipitation rate and amount, snow settlement rate, and net all-wave radiation at the snow surface. Seismic and infrasonic instrumentation for avalanche event detection was investigated during the first two winters, but neither of these systems proved feasible. Avalanche events were monitored by direct observation of 214 avalanche paths. A statistical forecast model based on discriminant function analysis of four years of data was developed. This model which, for major avalanche cycles during the dry and wet snow seasons, has an accuracy of 88% and 82% respectively, is also the first to be applied to groups of starting zones and individual paths, and to predict magnitude of avalanche occurrence. Evidence suggested that avalanche release within sub-freezing snow layers is primarily dependent on precipitation to trigger unstable layers deep within the snowcover. Delayed-action events are extremely rare. (Humphreys-ISWS)
W78-01062

COMPARISON OF DIFFERENT METHODS FOR ESTIMATING SNOWCOVER IN FORESTED, MOUNTAINOUS BASINS USING LANDSAT (ERTS) IMAGES,
Geological Survey, Tacoma, WA. Water Resources Div.; and Stanford Research Institute, Menlo Park, CA.
For primary bibliographic entry see Field 7B.
W78-01095

CENOZOIC EVOLUTION OF ANTARCTIC GLACIATION, THE CIRCUM-ANTARCTIC OCEAN, AND THEIR IMPACT ON GLOBAL PALEOCEANOGRAPHY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W78-01138

ICE FORCE MEASUREMENTS ON THE PEMBINA RIVER, ALBERTA, CANADA,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
F. D. Haynes, D. E. Nevel, and D. R. Farrell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A018 223, Price codes: A02 in paper copy, A01 in microfiche. Technical Report 269, October 1975. 16 p, 7 fig, 5 tab, 12 ref.

Descriptors: *Ice, *Ice loads, *Rivers, *Canada, On-site investigations, Measurement, Bridges, Piers, Pressure, Loads(Forces), Ice breakup, Ice cover, Ice jams, Piles(Foundations), Cold regions.
Identifiers: *Pembina River(Alberta), River ice.

In 1972, just before spring breakup, 23 in situ tests were conducted on the Pembina River, in Alberta, Canada, to measure ice forces. The tests simulated an ice sheet pushing against a bridge pier. The ap-

paratus utilized a hydraulic ram to push a 5.5-in (14.0-cm) wide vertical pile section horizontally against the ice sheet, which varied from 11.5 to 19.5 in (29.2 to 49.5 cm) in thickness. The velocity of the pile was varied from 0.07 to 21 in/sec (0.18 to 53.3 cm/sec) by hydraulic flow control valves. Both flat and round piles were used to represent the pier. Some tests began with the piles a few inches away from the ice sheet, whose edge was cut flat. Other tests began with the pile in contact with the ice sheet. For some of the round pile tests, augered holes were used to provide better initial contact. The in situ test results were compared with the ice force measurements made by other workers on a nearby bridge pier during ice breakup. The in situ test ice forces were about 50% higher than the bridge pier test results. The disagreement was caused by a difference between the sizes of the piles and the size of the pier and a three-day warming of the ice before the ice impacted against the pier. (Sims-ISWS)
W78-01154

2D. Evaporation and Transpiration

STUDY OF MASS TRANSFER AT THE AIR-WATER INTERFACE BY AN ISOTOPIC METHOD,
CEA Centre d'Etudes Nucleaires de Saclay, Gif Sur Yvette (France).
L. Merlivat, and M. Coantic.
Journal of Geophysical Research, Vol. 80, No. 24, p 3455-3464, August 20, 1975. 8 fig, 1 tab, 22 ref, 4 append.

Descriptors: *Evaporation, *Air-water interfaces, *Mass transfer, *Isotope studies, Laboratory tests, Model studies, Winds, Water, Water vapor, Turbulent boundary layers, Turbulent flow, Momentum equation, Oxygen, Hydrogen, Deuterium, Oceans, Physical properties.
Identifiers: Wind tunnels.

The calculation of evaporation flux is based on certain assumptions concerning processes in the vicinity of the air-water interface. Most of the recently proposed evaporation theories differ mainly in the estimated contributions of molecular and turbulent mass transfer in the vapor phase just above the liquid surface. By analyzing the hydrogen and oxygen stable isotope distribution in liquid water and water vapor, it was shown that processes taking place on a very small scale near the liquid can be investigated. The effect of molecular mass transfer was directly obtained without having to perform difficult measurements in the air in the immediate vicinity of the water surface. Experiments were carried out in the Institut de Mecanique Statistique de la Turbulence air-water tunnel specially designed for the simulation of ocean-atmosphere energy exchanges. The wind velocities varied from 0.7 to 7 m/s. The experimental results obtained did not support the classical Reynolds analogy between momentum and mass transfer down to the interface and the theory proposed by Sheppard, but they were in agreement with Sverdrup's, Kitaigorodskiy and Volkov's, and Brutsaert's theories, all of which involve a layer just above the air-water interface through which mass transfer is dominated by molecular diffusion. (Sims-ISWS)
W78-00977

ASSESSMENT OF DRYNESS AND WETNESS BASED ON PRECIPITATION, WATER SUPPLY IN THE SOIL AND POTENTIAL EVAPOTRANSPIRATION (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia).
For primary bibliographic entry see Field 2B.
W78-01017

MULTIPLE ESTIMATES OF LAKE ERIE EVAPORATION,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
J. A. Derecki.
Journal of Great Lakes Research, Vol. 2, No. 1, p 124-149, July 1976. 12 fig, 11 tab, 19 ref.

Descriptors: *Lake Erie, *Evaporation, *Analytical techniques, *Great Lakes, Water balance, Mass transfer, Energy budget, Precipitation, Runoff, Inflow, Discharge(Water), Storage, Water temperature, Winds, Solar radiation, Ice cover, Heat transfer, Lakes, Limnology, Reliability, Estimating.
Identifiers: *Lake Hefner equations.

Evaporation from large lakes cannot be measured directly, but several methods have been developed to compute lake evaporation. Because of the Great Lakes data limitations, evaporation determined by a single method is not sufficiently reliable and requires verification of accuracy by different methods. Monthly evaporation from Lake Erie was derived by the water budget, selected mass transfer, and the energy budget approaches. The period of record varies with the availability of data, 1937-68 for the water budget and mass transfer methods, and 1952-1968 for the energy budget method. Evaporation determined by the water budget method was used to provide control for the other methods. The evaporation rates varied from -9 to 25 cm/month with periods of low, median, and high annual evaporation averaging approximately 80, 90, and 100 cm. The analysis of results indicated that reasonably accurate evaporation estimates during the year can be obtained by the water budget and the modified Lake Hefner mass transfer equations. (Sims-ISWS)
W78-01035

2E. Streamflow and Runoff

ASPECTS OF THE FRESHWATER MOLLUSCA OF THE PONGOLA RIVER FLOOD PLAIN PANS,
South African Medical Research Council, Potchefstroom; and Potchefstroom Univ. for C. H. E. (South Africa).
S. J. Pretorius, A. C. Jennings, D. J. Coertze, and J. A. Van Eeden.
South African Journal of Science, Vol. 71, p 208-212, July 1975. 1 fig, 9 tab.

Descriptors: Mollusca, Flood plain, Snails, Ecological distribution, Species identification, Biomass concentration, Intermediate hosts, Schistosomiasis, Bilharzia.
Identifiers: Pongola River, J G Strydom Dam, Makatini Flats, South Africa, Bulinus(Physopsis) africanus, Biomphalaria pfeifferi.

A survey of the freshwater molluscs of the Pongola River flood plain pans was made during 1971. The identity and distribution of the molluscs in the various pans are given. A snail density and snail biomass comparison is made between a deep pan with abundant and a shallow pan with sparse vegetation. The mollusc fauna differed very little in the two pan types although different species predominate numerically in each and, likewise, different species accounted for the greater percentage of biomass. The two intermediate hosts of human schistosomiasis, Bulinus (Physopsis) africanus and Biomphalaria pfeifferi, seem to be among the most successful species in the pans, leaving little doubt that the future irrigation scheme on the Makatini flats could be a very dangerous schistosomiasis area. (So. African Water Info. Center)
W78-01008

GRAVITY WAVES ON A CURRENT: THE INFLUENCE OF VORTICITY, A SLOPING BED, AND DISSIPATION,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
O. Brink-Kjaer.
Series Paper No. 12, 1976. 137 p, 17 fig, 65 ref, 1 append.

Descriptors: *Waves(Water), *Gravity waves, *Mathematical studies, *Open channels, Mathematics, Equations, Analytical techniques, Analysis, Theoretical analysis, Free surfaces, Currents(Water), Velocity, Distribution patterns, Shallow water, Deep water, Open channel flow, Potential flow, Rotational flow, Energy dissipation, Numerical analysis, Wave lengths, Flow, Vortices.
Identifiers: Two-dimensional flow.

Periodic surface gravity water waves propagating on a shear current were investigated for two-dimensional flow. The influences of vorticity, a gently sloping sea bed, and dissipation were studied, the former by assuming a linear current profile. In the case of a horizontal bed and no dissipation, analytical expressions correct to second order were found for phase and group velocity, wave profile, particle velocity, pressure, mean wave energy density, radiation stress, and total mean energy flux. In the case of a gently sloping sea bed and no dissipation, analytical expressions were found for the variations of wave amplitude and height of mean water level in a time-independent medium. When dissipation was taken into consideration, the vorticity of the current velocity was related to the roughness of the bed. Formulas were presented by which the mean bed stress and the mean energy loss were determined. Graphs were presented which illustrate the effects of vorticity, shoaling, and dissipation on the parameters which characterized the combined current and wave flow. (Humphreys-ISWS)
W78-01014

POSSIBLE EFFECT OF SEDIMENTS AND CHANNEL PROCESSES ON RUNOFF REDISTRIBUTION IN A RIVER DELTA,
For primary bibliographic entry see Field 2J.
W78-01029

FRICTION FACTORS FOR VEGETATED WATERWAYS OF SMALL SLOPE,
Agricultural Research Service, Stillwater, OK. Water Conservation Structures Lab.
W. O. Ree, and F. R. Crow.
Report ARS-S-151, January 1977. 61 p, 57 fig, 34 tab.

Descriptors: *Friction, *Mannings equation, *Channels, *Grassed waterways, *Vegetation effects, Channel flow, Roughness(Hydraulic), Wheat, Sorghum, Cotton, Hydraulic properties, Hydraulic radius.
Identifiers: *Small slope channels, *Terrace-channel design, Plant density and quality.

Experiments were conducted over a 4-year period to determine the friction factors (Manning n) for vegetated waterways of small slope. The plants used were wheat planted in 7-inch and 14-inch rows parallel to the flow, wheat in 7-inch rows perpendicular to the flow, sorghum and cotton in 40-inch rows parallel to the flow, sorghum in 20-inch rows parallel to the flow, and sudangrass, lespedeza, and lovegrass broadcast planted in the channels. For the poor-quality stands of wheat, there was little or no difference in the n value for the 7-inch and 14-inch rows, but for the good-quality stands, the n values for the 7-inch row spacing were considerably larger than those for the 14-inch row spacing. For the higher flows, which submerged the vegetation, row direction had no effect on the friction factor, but there was a large difference in the n values for the lower flows. A comparison of the n values at a hydraulic radius

of 0.8 foot showed a value of 0.2 for the parallel rows and 0.4 for the perpendicular rows. For the 'Hegari' sorghum in 20-inch and 40-inch rows, there was a difference in then values for the low flows, with the wider row spacing having the lower value; but when the flow reached a hydraulic radius of about 1.5 feet, there was no difference in the n values for the two row spacings. (Bhowmik-ISWS)
W78-01031

DETROIT RIVER FLOW CHARACTERISTIC AND THEIR APPLICATION TO CHEMICAL LOADING ESTIMATES,
National Oceanic and Atmospheric Administration Ann Arbor, MI. Great Lakes Environmental Research Lab.
F. H. Quinn.
Journal of Great Lakes Research, Vol. 2, No. 1, p 71-77, July 1976. 2 fig, 4 tab, 2 ref.

Descriptors: *Flow, *Rivers, *Model studies, *Chlorides, Streamflow, Mathematical models, Wind tides, Seiches, Lakes, Variability, Spatial distribution, Sampling, Water quality, Water analysis, Statistical methods.
Identifiers: *Detroit River, Flow variation.

Unsteady flow characteristics were analyzed at the Windmill Point, Fort Wayne, Wyandotte, and Fermi sections of the Detroit River using 2 hydraulic transient mathematical models. Both models consisted of the complete one-dimensional equations of continuity and motion and were calibrated using discharge measurements taken during the 1963-1973 period. The models were used to generate hourly, daily, and monthly flows for the year 1968. A statistical analysis was made of the flows at the Fort Wayne and Fermi sections. The flows at the Fort Wayne section were representative of the entire river on a monthly basis and on a daily basis under most conditions. Individual section flows are necessary for use on an hourly basis or under Lake Erie wind, tide, and seiche conditions. Application of flows to computation of Detroit River chloride loadings shows entirely different loading phenomena for both base and peak loadings between the upper and lower river. It also illustrates the danger of computing yearly loadings based on a limited number of samples for the lower river. (Sims-ISWS)
W78-01037

RAINWATER AND SEDIMENT RUNOFF FROM SLOPES IN THE AZOV-KUBAN PLAIN,
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
For primary bibliographic entry see Field 2J.
W78-01046

DIRECT MEASUREMENTS OF SECONDARY CURRENTS IN RIVER BENDS,
Colorado State Univ., Fort Collins. Engineering Research Center.
J. C. Bathurst, C. R. Thorne, and R. D. Hey.
Nature, Vol. 269, No. 5628, p 504-506, October 6, 1977. 3 fig, 18 ref.

Descriptors: *Rivers, *Flow, *Currents(Water), Measurement, Velocity, Streamflow, Current meters, On-site investigations, Data processing, Boundaries(Surfaces), Shear stress.
Identifiers: River bends, Secondary currents.

Fludis flowing through pipes or channels can develop secondary currents. The secondary currents were defined as currents which occur in the plane normal to the local axis of the primary flow. The development of the currents in straight channels has been ascribed to anisotropic turbulence and the non-uniform distribution of boundary shear stress, but in meander bends, they are caused by skewing of the flow. Secondary currents distort the distributions of primary isovels and boundary shear stress from those expected in simple flows and, therefore, have important implications for bed and bank erosion and for resistence to flow. Measurements are reported of longstream and cross stream velocities carried out across sections of a river perpendicular to the outer banks of several bends using electromagnetic flow meter. (Sims-ISWS)
W78-01067

EFFECTS OF URBAN LAKES ON SURFACE RUNOFF AND WATER QUALITY,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
D. S. Cherkauer.
Water Resources Bulletin, Vol. 13, No. 5, p 1057-1067, October 1977. 4 fig, 2 tab, 6 ref.

Descriptors: *Watersheds(Basins), *Lakes, *Runoff, *Water quality, Surface runoff, Cities, Highways, Salts, Hydrographs, Storage, Effects, Chemicals, Chlorides, Magnesium, Dissolved solids, Outflow, Water pollution, Urbanization, Hydrology.
Identifiers: Road salt.

The effects of an artificial lake system upon the runoff hydrology of a small watershed were determined by comparing the quantity and quality of runoff with those of an adjacent and similar watershed containing no lakes. Lake storage reduced peak discharge and slowed flood recession rate downstream. Water stored within the lakes is generally of different quality than downstream surface runoff. Salt stored in the lakes from winter deicing is released during periods of surface runoff throughout the rest of the year. During summer or fall runoff events, lake outflow dominates the salt load of the outlet stream, generating double-peaked load hydrographs in which the second, or lake-induced, crest is many times large than the peak which corresponds to maximum flow. On the other hand, the lakes cause a reduction of salt loads and concentration in winter runoff. The concentration and loads of ions which are not related to road salt generally are affected less by the lakes, although they are increased substantially in the fall. (Sims-ISWS)
W78-01135

FITTING THE PEARSON TYPE 3 DISTRIBUTION IN PRACTICE,
Exeter Univ. (England).
J. Buckett, and F. R. Oliver.
Water Resources Research, Vol. 13, No. 5, p 851-852, October 1977. 1 tab, 4 ref.

Descriptors: *Streamflow, *Temporal distribution, *Model studies, Mathematical models, Equations, Flow, Frequency analysis, Hydrology.
Identifiers: *Pearson Type 3 distribution, Fitting equations.

The three-parameter Pearson type 3 distribution is frequently fitted to streamflow data, partly in order to estimate percentiles. This practical study confirmed that maximum likelihood methods can give very different, and much more satisfactory, estimates than the more usual method of moments. (Sims-ISWS)
W78-01136

THE INTERRELATIONSHIPS OF THE LONGITUDINAL PROFILES AND CHANNEL PATTERN FOR THE RED RIVER,
Missouri Univ., St. Louis. Dept. of Geology.
L. J. Lee, and B. L. Henson.
Journal of Hydrology, Vol 35, No 1/2, p 191-201, October 1977. 4 fig, 20 ref.

Descriptors: *Rivers, *Profiles, Meanders, Analytical techniques, Data processing, Correlation analysis, Braiding, Geomorphology, Valleys, River flow, Discharge water, Hydraulics.
Identifiers: *Red River, Longitudinal profiles.

The longitudinal river, valley, and regional profiles were plotted for the Red River. Plotting was done in such a way that specific geographic points and hydraulic parameters on one of the profiles could be correlated with the corresponding geographic points on the others. Strong interrelationships were found for the Red River between river sinuosity and valley slope. A smooth longitudinal river profile was maintained, in spite of irregularities in the valley or regional slope, by changes in sinuosity. A channel pattern alternation between braided and non-braided was found to be associated with changes in water surface slope. A new function was developed, herein called the meander function, which was found to be correlated with channel pattern and slope. Although the paper was confined to the Red River, the techniques used can be applied to any river. (Sims-ISWS)
W78-01146

SIMULATION OF THE INLET HYDROGRAPH FOR URBAN CATCHMENTS,
Institute of Hydrology, Walliford(England).
C. H. R. Kidd, and P. R. Helliwell.
Journal of Hydrology, Vol 35, No 1/2, p 159-172, October 1977. 4 fig, 4 tab, 12 ref.

Descriptors: *Urban hydrology, *Urban runoff, *Model studies, Mathematical models, Urban drainage, Hydrographs, Simulation analysis, Drainage, Watersheds(Basins), Rainfall, Precipitation(Atmospheric), Surface drainage, Surface runoff, Discharge(Water), Urbanization, On-site investigations, Hydrology, Hydraulics.
Identifiers: *Southampton(England).

A single nonlinear reservoir model was proposed as a realistic routing method for the above-ground phase of urban runoff. The use of the model was demonstrated on data collected from 2 very small (less than 1 ha) suburban catchments instrumented for this purpose. The shape of observed hydrographs was modelled satisfactorily using a non-linear exponent of 2/3 and fitted routing constants. (Sims-ISWS)
W78-01147

A STUDY INTO THE LOW-FLOW CHARACTERISTICS OF BRITISH RIVERS,
Institute of Hydrology, Wallingford (England).
M. A. Beran, and A. Gustard.
Journal of Hydrology, Vol 35, No 1/2, p 147-157, October 1977. 6 fig, 10 ref.

Descriptors: *Low flow, *Runoff, *Watersheds(Basins), Rainfall, Precipitation(Atmospheric), Low-flow frequency, Streamflow, Reservoirs, Storage, Regression analysis, Rivers, Streams, Flow, Data processing, Hydrology.
Identifiers: Error analysis.

Investigations are described currently being undertaken at the Institute of Hydrology into methods for predicting low flows from catchment characteristics. Different sources of errors in flow data were described. The sources were all taken into account when selecting suitable flow records for analysis. A number of analytical techniques which incorporate both the magnitude and duration of low flows were described, and some of their areas of application were given. Preliminary results highlight the need for careful screening of the data, the significance of mean annual rainfall, and the need for a geology index. Catchment characteristics used in the study were outlined, together with their effect on low flows. The regression analyses to be used in developing formulas for predicting the low flow indices from catchment and climate characteristics is discussed. (Sims-ISWS)
W78-01148

OBSERVED MIXING LENGTHS IN MOUNTAIN STREAMS,
Geological Survey of Canada, Ottawa (Ontario).
T. J. Day.
Journal of Hydrology, Vol 35, No 1/2, p 125-136, October 1977. 4 fig, 2 tab, 11 ref.

Descriptors: *Mixing, *Streams, *Mountains, Turbulence, Tracers, On-site investigations, Streamflow, Equations, Rivers, Roughness(Hydraulic), Velocity, hydraulics.
Identifiers: *Mixing lengths, *New Zealand.

Lateral mixing characteristics were investigated from a series of 41 dilution gaugings (slug injections) in five mountain streams (New Zealand). Data were presented which showed that mixing lengths for either center or side injections can be determined from the simple proportion, x sub m approximately equal to 25 w (where x sub m) is the mixing length and w the mean flow width). Observed mixing lengths were shown to be generally shorter than those predicted by conventional formulas. It also was shown that side injections do not require longer mixing lengths. Both the shorter mixing lengths and the lack of sensitivity to injection position is probably the result of increased turbulent and mechanical mixing associated with large roughness elements distributed along the flow boundary. (Sims-ISWS)
W78-01150

2F. Groundwater

GASS ON GAS,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 31, No 11, p 34-35, November, 1977.

Descriptors: *Groundwater, *Water wells, *Carbon dioxide, *Gases, Groundwater movement, Pressure head, Drawdown.

Many explanations have been offered for the occurrence of entrained gas in well water. The most probable of these describes the phenomenon in terms of chemical equilibrium. As ground water moves slowly through the subsurface environment, it dissolves many solids and gases. Any change in pressure, temperature, or chemical surroundings can alter the chemical equilibrium of underground water, changing its capacity to hold dissolved materials. As water is pumped from a well, the pressure differential that is created upsets the equilibrium, causing dissolved carbon dioxide to be released as gas bubbles. As the velocity of ground water increases, hydraulic head decreases which further contributes to the release of gas. Because entrained gas can lead to cavitation and damage to pumps, it is desirable to minimize the release of gas in the water being pumped. This can be accomplished by designing well systems so that velocity of water entering the well screen is low (0.1 ft./sec. or less) and drawdown is minimal. (Eberle-NWWA)
W78-00956

EFFECTS OF AQUIFER THICKNESS AND SIDE PERFORATION ON DISCHARGE FROM OPEN WELL,
Indian Inst. of Tech., Kharagpur.
A. P. Mishra, and T. P. Ojha.
Irrigation and Power, Vol 33, No 2, p 225-235, April, 1976. 10 fig, 5 tab, 5 ref.

Descriptors: *Aquifers, *Irrigation wells, *Discharge(Water), Flow, Groundwater movement, Well construction.

Ground water is the most vital and dependable source of supply for irrigation in India. When the open wells commonly used there are constructed by brick masonry, the side walls are impervious; most of these wells get their supplies from the first water-bearing formation encountered and do not receive sufficient discharge to support irrigation pumping equipment. Moreover, in cases of limited thickness of aquifer, the flow pattern gets disturbed and the prediction of discharge by previously developed formulas may not be reliable. Effects of aquifer thickness and of perforations in well walls on discharge in open wells are described. Laboratory simulation of field conditions was used to determine the mathematical relationships presented. (Eberle-NWWA)
W78-00962

MATHEMATICAL MODELING OF NATURAL GROUNDWATER RECHARGE,
Utah International Inc., San Francisco, CA. Environmental Quality Dept.
N. Krishnamurthi, D. K. Sunada, and R. A. Longenbaugh.
Water Resources Research, Vol. 13, No. 4, p 720-724, August 1977. 4 fig, 15 ref. OWRT A-16-COLO(2).

Descriptors: *Groundwater recharge, *Model studies, *Mathematical models, Soil water, Soil moisture, Capillary action, Pore pressure, Infiltration, Computer models.

A mathematical model was presented which determines natural groundwater recharge by using transient soil moisture data measured as a function of vertical position. The model was based upon the finite difference form of the Richards equation. The assumption was made that moisture content varies in the linear range of pressure-moisture and conductivity-moisture relations to obtain a solution to a particular field problem. The parameters of the model, estimated by a linear model of the moisture data, characterize the hydraulic properties of soil and their spatial variability. The finite difference form of the mathematical model was solved by iteration using the Newtonlike method, ensuring computational speed and accuracy. The model and the computer program were verified by using the first-order, approximate, one-dimensional solution of the infiltration equation for homogeneous soil. Application of the model to the High Plains of Colorado provided monthly recharge rates which correlate adequately with the time series data of water table elevations and events of precipitation and ephemeral streamflow. (Sims-ISWS)
W78-00974

HYDROGEOLOGICAL ASPECTS OF THE RICHARDS BAY AREA, SOUTH AFRICA,
National Physical Research Lab., Pretoria (South Africa).
P. F. Worthington.
South African Journal of Science, Vol 71, p 375-377, December 1975. 5 fig, 7 ref.

Descriptors: Aquifers, Groundwater recharge, Subsurface flow, Hydrogeology, Geophysics, Potable water, Water resources, Water supply, Geological surveys, Freshwater lakes, Groundwater basins, Permeable strata, Geoelectrical methods, Limestones, Water table, Groundwater resources evaluation.
Identifiers: South Africa, Richards Bay, Lake Mzingazi, Natal, Miocene.

Lake Mzingazi will suffice as the primary local source of potable water for Richards Bay over the next few years. A detailed program of geophysical and hydrogeological investigations within a surrounding area of about 100 km 2 is being carried out, with the major object of determining quantitatively the mechanism of sub-surface replenishment of the lake, through the distribution of permeable strata. A preliminary appraisal of the results is given. (So. African Water Info. Center.)
W78-00998

ELECTRICAL RESISTIVITY FOR ESTIMATING PERMEABILITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
W. E. Kelly.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 103, No. GT10, p 1165-1169, October 1977. 2 fig, 1 tab, 11 ref, 1 append. NSF GK-42130.

Descriptors: *Permeability, *Resistivity, *Aquifers, Groundwater, Electrical properties, Resistance, Electrical resistance, Aquifer testing, Electrodes, Correlation analysis, Pumping, Wells, Water wells, Hydrogeology.

The purpose of this note was to demonstrate that relations between aquifer resistivities determined from electric resistivity soundings and aquifer permeability can be developed. The approach should be useful for applications to shallow aquifers. During surface resistivity measurements in the field, electrical current may be made to follow approximately the same paths that water flowing to a well at that point would follow. In this way, the flow of electricity may be assumed to be subject to the same averaging process to which water flowing to a well is subject. As a first approximation, an electrical sounding with its center located over a potential well site would be appropriate; beneath the center of the array, current flow would be approximately horizontal, as would water flowing to a well. Also, comparable volumes of material may be sampled by the electrical resistivity measurements and by the pumping well. (Sims-ISWS)
W78-01010

A PRELIMINARY APPRAISAL OF THE GARBER-WELLINGTON AQUIFER, SOUTHERN LOGAN AND NORTHERN OKLAHOMA COUNTIES, OKLAHOMA,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01075

THICKNESS OF THE POTABLE-WATER ZONE IN THE FLORIDAN AQUIFER,
Geological Survey, Jacksonville, FL. Water Resources Div.
L. V. Causey, and G. W. Leve.
Florida Bureau of Geology Map Series No 74, 1976. 1 sheet, 8 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Potable water, *Subsurface mapping, *Florida, Water yield, Water quality, Potentiometric level, Aquifers, Depth.
Identifiers: *Floridan aquifer, *Potable-water zone thickness.

The Floridan aquifer, which is present throughout Florida, yields potable water only in central, west-central, and northern parts of the State. There is little or no potable water available from the aquifer in southern Florida and along the east-central coastal area. Potable water as referred to in the report contains 250 milligrams per liter or less of chloride or sulfate. Generally, if potable water is available in the aquifer it will be in the upper part. The top of the Floridan aquifer, which is composed of limestone and dolomite beds, ranges from more than 100 feet above sea level in west-central and north-central parts of the State to more than 1,000 feet below sea level in the southeastern and southwestern parts. A map shows the approximate thickness of the zone of potable water in the Floridan aquifer in Florida. The maximum tickness exceeds 2,000 feet in the central part of the State. From there, it thins to less than 250 feet in east-central, south-central, and west-central parts of the State. The thickness generally exceeds 500 feet in most of northern Florida and is as much as 1,750 feet thick in the northeastern part. (Woodard-USGS)
W78-01081

GROUND-WATER RESOURCES OF THE LOWER SANTIAM RIVER BASIN, MIDDLE WILAMETTE VALLEY, OREGON,
Geological Survey, Sacramento, CA. Water Resources Div.; and Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01084

RECONNAISSANCE OF GROUND-WATER RESOURCES IN A PART OF THE YAMPA RIVER BASIN BETWEEN CRAIG AND STEAMBOAT SPRINGS, MOFFAT AND ROUTT COUNTIES, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. E. Brogden, and T. F. Giles.
Water-Resources Investigations 77-4 (open-file report), May 1977. 1 sheet, 2 tab, 7 ref.

Descriptors: *Groundwater resources, *Aquifers, *Water yield, *Water quality, *Maps, Hydrogeology, Colorado, Aquifer characteristics, Water demand, Water utilization, Available water, Water analysis, Chemical analysis.
Identifiers: *Yampa River basin(Colo), *Moffat and Routt Counties(Colo).

Parts of the Yampa River basin near the towns of Steamboat Springs and Craig, Colo., have undergone rapid population growth in recent years. Aquifers in the study area include: alluvium; the Browns Park, Wasatch, Fort Union, Lance, Williams Fork, and Iles Formations; and the Lewis and Mancos Shales. Well yields are generally less than 25 gpm (gallons per minute). In the alluvium of the Yampa River, well yields may be as much as 900 gpm. Where the sandstones of the Williams Fork and Iles Formations are fractured, well yields have been reported to be as much as 100 gpm. Well yields from the Lewis and Mancos Shales are less than 5 gpm. The quality of the ground water is variable and dependent on rock type. Most of the waters are calcium and sodium bicarbonate types. Calcium sulfate type waters are found where water in the aquifer has been in contact with gypsum, organic materials, or coals. Dissolved-solids concentrations of ground water range from as little as 82 to as much as 4,230 milligrams per liter. (Woodard-USGS)
W78-01086

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01087

GROUND-WATER LEVELS AND DESCRIPTIONS OF OBSERVATION WELLS IN IDAHO, 1975,
Geological Survey, Boise, ID. Water Resources Div.
H. G. Sisco.
Idaho Department of Water Resources Water Information Bulletin No 43, December 1976. 314 p, 17 fig, 40 ref.

Descriptors: *Idaho, *Observation wells, *Water levels, *Basic data collections, *Aquifers, Geology, Water level fluctuations, Water utilization.

Ground-water-level data for the 1975 calendar year consist of well descriptions, water-level measurements, and well-location maps for all observation wells in Idaho maintained by the U.S. Geological Survey. The development of Idaho's ground-water resources has expanded at a very rapid rate in recent years. A large part of the agricultural water supply, as well as most municipal, industrial, and domestic supplies, is derived from wells. Use of ground water has been accompanied by a decline of local and, in some cases, regional ground-water levels. The director of the Idaho Department of Water Resources has the responsibility of administering and investigating the ground-water resources of the State so that orderly and optimum development of the resource can be attained. For this report, the State has been divided into seven areas. Well data are arranged alphabetically by county within each area. (Woodard-USGS)
W78-01089

SUMMARY OF GROUND-WATER CONDITIONS IN THE JAFFNA PENINSULA, REPUBLIC OF SRI LANKA, WITH A PLAN FOR INVESTIGATING FEASIBILITY OF GROUND-WATER DEVELOPMENT,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01093

2G. Water In Soils

METHYLATION OF MERCURY IN A TERRESTRIAL ENVIRONMENT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W78-00926

THE INFLUENCE OF CERTAIN CULTIVATION PRACTICES ON THE GROWTH AND PRODUCTION OF ZEA MAYS IN MARGINAL AREAS (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa).
For primary bibliographic entry see Field 3F.
W78-00947

THE EFFECT OF SEASONAL GRAZING ON THE INFILTRATION CAPACITY OF SOILS IN A CYMBOPOGON-THEMEDA VELD (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa).
J. A. Van den Berg, B. R. Roberts, and L. F. Vorster.
Proceedings of the Grassland Society of Southern Africa, Vol. 11, p 91-95, 1976. 3 fig, 2 tab, 28 ref. (English summary).

Descriptors: Rainfall, Seasonal, *Infiltration, *Grazing, Soil properties, *Porosity, *Permeability, Runoff, Soil moisture, Soil-water-plant relationships, Soil compaction, Veld.
Identifiers: South Africa.

The long term effects of grazing during fixed seasons and combinations of the seasons, on the infiltration capacity of soils in a Cymbopogon-Themeda veld in the Central Orange Free State were investigated. Two field experiments were grazed by Merino sheep and Afrikaner cattle respectively. Each experiment was a 2(4) factorial layout with grazing and resting as treatments. All possible combinations of spring, summer, autumn and winter served as the 16 treatments. The infiltration measurements were determined by means of a flood type concentric ring infiltrometer. The results showed that grazing during any one of the seasons reduced the infiltration capacity of the soils. The detrimental effects of summer and autumn grazing were, however, larger than those of winter and spring grazing. Highly significant positive correlations between infiltration capacity and veld condition, as measured in terms of the basal cover of climax grasses, were obtained. (So. African Water Info. Center)
W78-00949

PROTECTION OF A UNIQUE ECOLOGICAL AREA THROUGH IMPROVED WATER AND FERTILITY MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
P. E. Fischbach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 399, Price codes: A09 in paper copy, A01 in microfiche. University of Nebraska Water Resources Center, Completion Report, October 2, 1977. 187 p, 68 fig, 43 tab, 7 ref, 4 append. OWRT B-024-NEB(1), 14-31-0001-4101.

Descriptors: *Water management(Applied), *Soil properties, Model studies, *Nitrogen, Irrigation, *Water utilization, *Nitrates, Sands, Corn(Field), *Leaching, Soil water, Moisture deficit, Evapotranspiration, Percolation, Rainfall, Fertilizers, *Fertilization, *Nebraska, Crop production, Soil-water-plant relationships.

Research was conducted to define practices for managing water and nitrogen fertilizer in the production of irrigated corn on sandy soils. The objective was to increase the efficiency of use of the water resource while minimizing the leaching of nitrate nitrogen from the crop root zone to the groundwater system. On the sandy soils which were studied, experiments showed that it is not necessary to completely replenish the soil water deficit at each irrigation. Near maximum yields were obtained when water application was limited to an amount equivalent to .76 cm per day, approximately 60% of the peak evapotranspiration rate. Stored soil water and rainfall supplemented irrigation application. Percolation loss was minimized by this technique. An irrigation frequency of 3.5 days during July and August produced greater yields than did frequencies of 1.5 or 7 days. Research indicated that the present farmer practice of applying 250 kg/ha of nitrogen and completely replenishing the soil water deficit at each irrigation may result in nitrate leaching losses of 30 to 45 kg/ha during the growing season, depending on rainfall amount.
W78-01001

ELECTRICAL RESISTIVITY FOR ESTIMATING PERMEABILITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W78-01010

WATER AND CHLORIDE MOVEMENT THROUGH SOIL COLUMNS SIMULATING PEDAL SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma, and J. L. Anderson.
Soil Science Society of America Journal, Vol. 41, No. 4, p 766-770, July-August 1977. 6 fig, 4 tab, 17 ref. EPA R802874.

Descriptors: *Soil water movement, *Soils, *Laboratory tests, Soil water, Tracers, Chlorides, Dispersion, Infiltration, Hydraulic conductivity, Pores, Porosity, Saturated flow, Unsaturated flow, Soil physics, Soil science.
Identifiers: Miscible displacement, Soil microstructure.

Interpretation of dispersion phenomena in soils is complicated by many complex interactions within the highly heterogeneous pore system. Model experiments were designed, therefore, to investigate the specific effects of hydrodynamic dispersion of (1) vertically continuous macropores in different types of microstructure, and (2) different flow regimes. Two homogeneous microstructures were formed by mixing, puddling, and drying of sand and silty clay loam materials to sandy loam and clay loam textures. Small vertically continuous cylindrical pores were made in 30-cm long columns that had a diameter of 10 cm to simulate macropores. Breakthrough curves, following a

daily 0.5-cm application of chloride solution, showed that identical macropores have different hydraulic functions in different soil materials. The intermittent flow resulted in much better displacement of untraced water in the more permeable sandy loam columns, but 'immobile' water remained in both soils. Dispersion phenomena in both microstructures (which represented two 'ideal' textural porosities) differed significantly when saturated flow was compared with flow through a crust. Implications for the physical interpretation of soil structure descriptions were discussed. (Sims-ISWS)
W78-01011

AIR REGIME OF NONIRRIGATED AND IRRIGATED CISCAUCASIAN CHERNOZEMS,
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W78-01049

MICROWAVE REMOTE SENSING OF SOIL WATER CONTENT,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
J. Cihlar, and F. T. Ulaby.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-12446, Price codes: A09 in paper copy, A01 in microfiche. Technical Report 264-6, August 1975. 196 p, 70 fig, 17 tab, 125 ref, 2 append. NAS 9-14052.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, Moisture content, Model studies, Water balance, Soil temperature, Simulation analysis, Depth, Estimating, Profiles, Air-earth interfaces, Algorithms, Diurnal, Wavelengths, Computer programs, Infrared, Monitoring.

Two types of techniques appear potentially capable of providing location-specific soil water content information, namely water balance and remote sensing methods. Using a layered water balance model and a soil temperature simulation model, moisture and temperature profiles of a hypothetical soil located at mid-latitudes were generated, analyzed, and subsequently used for computing microwave soil parameters at three frequencies (1.4, 4.0, and 10.0 GHz) for a clear-sky summer day. The results suggest that: (1) soil moisture in the top 30 cm can be predicted on a daily basis for 1-cm depth increments within approximately 0.02 cu cm/cu cm, (2) soil temperature presents no problem in microwave remote sensing of soil moisture provided that surface soil temperature can be measured with infrared radiometers from the same platform, and (3) surface layer domination exists, i.e., remotely measured microwave response of a bare soil is determined primarily by the moisture at and near the surface unless appreciable air-soil discontinuities (in terms of wavelength) exist within the soil. An algorithm was proposed which combines the water balance and microwave methods to monitor profile soil water content content changes over large areas. A summary of passive and active microwave measurements of soil moisture was presented. (Visocky-ISWS)
W78-01056

DETECTION OF SOIL MOISTURE AND SOIL CHARACTERISTICS FROM SKYLAB,
Kansas Univ./Center for Research, Inc., Lawrence. Space Technology Center.
For primary bibliographic entry see Field 7B.
W78-01058

SOLUTE TRANSFER, WITH EXCHANGE BETWEEN MOBILE AND STAGNANT WATER, THROUGH UNSATURATED SAND,
Centre National de la Recherche Scientifique, Paris (France).
J. P. Gaudet, H. Jegat, G. Vachaud, and P. J. Wierenga.
Soil Science Society of America Journal, Vol. 41, No. 4, p 665-671, July-August 1977. 6 fig, 2 tab, 22 ref.

Descriptors: *Solutes, *Transfer, *Ion exchange, Unsaturated flow, Diffusion, Soils, Salinity, Depth, Leaching, Laboratory tests, Numerical analysis, Mathematical models, Equations, Stagnant water, Calcium chloride.
Identifiers: Miscible displacement, Unsaturated soil.

Changes in salt concentration with time were measured at several depths inside and at the exit of a 94-cm uniform unsaturated sand column which was leached at steady rates with solutions of calcium chloride. Observed salt distributions were compared with salt distributions calculated with a numerical procedure which was based on the dead-end pore model of Coats and Smith (1964). Values for the dispersion coefficient, the diffusional mass transfer coefficient, and the fraction mobile water used in the model were obtained at different water contents by curve fitting observed and calculated concentrations at one depth. The same values then were used to calculate salt distributions at other depths and at the exit of the column and were compared with measured salt distributions. Excellent agreement was obtained. The model presented a good description of the extensive tailing of the salt concentration distributions observed inside and at the exit of the column. The amount of stagnant water was found to increase with decreasing water content from 4% of the total water content of 0.256 cu cm/cu cm to 40% of the total water content at a water content of 0.200 cu cm/cu cm. The apparent dispersion coefficient decreased from 6 sq cm/hour to 1 sq cm/hour at water contents of 0.256 and 0.200 cu cm/cu cm, respectively. (Visocky-ISWS)
W78-01065

DEPRESSED WEIR WITH TWO UNEQUAL SHEETPILES IN ANISOTROPIC SOIL,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
A. S. Reddy, and U. Basu.
Journal of Hydrology, Vol 35, No 1/2, p 61-72, October 1977. 6 fig, 11 ref.

Descriptors: *Weirs, *Seepage, *Sheet piling, *Model studies, Mathematical models, Flow, Porous media, Permeability, Anisotropy, Soil, Soil water movement, Flow, Engineering structures, Hydraulic structures, Soil properties, Soil physics.
Identifiers: *Flow under a weir.

An analytical solution was presented, making use of the Schwartz-Christoffel transformation, for determining the seepage characteristics for the problem of flow under a weir having two unequal sheetpiles at the ends and embedded in an anisotropic porous medium of finite thickness. Results for several particular cases of simple hydraulic structures can be obtained from the general solution presented. Numerical results in nondimensional form were given for quantity of seepage and exit gradient distribution for various conditions in the equivalent transformed isotropic section; and, by making use of the physical parameters in the actual anisotropic plane and the set of transformation relations given, the quantities (seepage loss, exit gradient) can be interpreted in the actual anisotropic physical plane. (Sims-ISWS)
W78-01151

2H. Lakes

PHYTOPLANKTON, PHYTOPLANKTON GROWTH AND BIOMASS CYCLES IN AN UNPOLLUTED AND IN A POLLUTED POLAR LAKE,
For primary bibliographic entry see Field 5C.
W78-00920

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENT AND OVERLYING WATER,
For primary bibliographic entry see Field 5C.
W78-00921

A QUANTITATIVE SAMPLER FOR AQUATIC MACROPHYTES,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Botany.
For primary bibliographic entry see Field 7B.
W78-00929

DISTRIBUTION OF ORGANIC MATTER IN LAKE BAIKAL SEDIMENTS (OB OSOBENNOSTYAKH RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V OSADKAKH BAIKAL),
Limnologicheskii Inst., Irkutsk (USSR).
L. A. Vykhristyuk.
Doklady Akademii Nauk Belorusskoi SSSR, Vol. 205, No. 6, p 1455-1457, 1972. 1 fig, 14 ref.

Descriptors: *Organic matter, *Bottom sediments, *Lakes, Nitrogen, Carbon, Marine plants, Estuaries, Lakes, Bottom sediments, Lake sediments, Aquatic life, Benthos.
Identifiers: *Lake Baikal(USSR).

Analyses of the organic carbon and nitrogen contents and determinations of the carbon/nitrogen ratios in various part of Lake Baikal, including river estuaries, were made during the period 1966-1968. Analyzed was the upper layer of the bottom sediments, and a diagram is presented showing the points of sample collection. The contents of carbon and nitrogen and their ratio are discussed in relation to the flora and fauna of the lake, and the contribution of the rivers to the formation of the sediments. (Stapinski-IPC)
W78-00981

HYDROGEOLOGICAL ASPECTS OF THE RICHARDS BAY AREA, SOUTH AFRICA,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2F.
W78-00998

LAKE ST. LUCIA: MATHEMATICAL MODELLING AND EVALUATIONS OF AMELIORATIVE MEASURES,
University of the Witwatersrand, Johannesburg (South Africa) Hydrological Research Unit.
I. P. Hutchison, and W. Pitman.
The Civil Engineer in South Africa, Vol. 19, No. 4, p 75-82, 1977. 13 fig, 4 ref.

Descriptors: *Mathematical modelling, Ameliorative measures, Estuaries, Salinity, Ecology, Water level fluctuations, *Saline lakes, Salt marshes, Primary production, Rainfall, Salt balance, *Saline water-freshwater interfaces, *Environmental effects, *Remedies.
Identifiers: Lake St. Lucia, Mkuzi River, Msinene River, Hluhluwe River, Nyalazi River, Mpate River, Natal, South Africa.

Connected to the sea by a narrow estuary, St. Lucia lake is a shallow, generally saline water body situated on the sub-tropical east coast of northern Natal. The lake constitutes an internationally renowned nature reserve rich in freshwater and marine flora and fauna. With the advent of man, development of the catchments of the rivers feeding the lake has disturbed the delicate balance between the freshwater supply and evaporation losses. To an ever-increasing degree the system has now to rely on salt water from the sea to replace the water lost by evaporation. Consequently, during drought, salinities may rise to several times that of sea water, with dire consequences to the flora and fauna. Work was aimed

primarily at establishing the effect of man's activities on the water level and the salinity regimes in the lake and, secondly at selecting and testing feasible engineering measures aimed at preserving or enhancing the nature reserve environment. No attempt is made, however, to perform a benefit cost analysis of the lake system as a whole. The development of a set of interlinked mathematical models for simulating the water level and salinity regimes of the system is described. These models are employed to evaluate the effectiveness of a variety of possible remedial measures. (So. Africa Water Info Center)
W78-01006

JUVENILE FISH POPULATIONS IN THE MARGINAL AREAS OF LAKE MCILWAINE, RHODESIA,
Department of National Parks and Wildlife Management, Norton (Rhodesia).
B. E. Marshall, and C. A. Lockett.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 37-42, 1976, 6 fig, 2 tab, 15 ref.

Descriptors: Fish populations, Poisoning, Species abundance, Growth rate, Lakes, Fish production, Eutrophication.
Identifiers: Lake McIlwaine, Rhodesia, Southern Africa.

Lake McIlwaine is an artificial lake situated about 37 km to the southwest of Salisbury, Rhodesia. It has become eutrophic through the addition of sewage effluent and now supports a large population of blue-green algae and primary production is high. As a result there has been an increase in fish production and the lake supports a commercial fishery as well as being an important angling center. A program of fish poisoning using a rotenone derivative was carried out at five stations in Lake McIlwaine during 1974/75. It was hoped to estimate standing crop and population size by this means but this was not entirely successful. However data on the population of juvenile fish in the shallow, marginal waters were obtained and 17 of the 25 species known to occur in the lake were recorded. Species composition varied considerably and some species such as Hydrocynus vittatus and Alestes imberi which were known to be common were not recorded in large numbers. Standing crop estimates varied considerably; fish movement in response to temperature variations was a factor that accounted for much of this. Length-frequency distributions were plotted for the five most abundant species and an indication of their growth rates was obtained. (So. African Water Info. Center)
W78-01007

EUTROPHICATION OF LAKES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W78-01020

AN ANALYSIS OF DRAG COEFFICIENT AT HURRICANE WINDSPEEDS FROM A NUMERICAL SIMULATION OF DYNAMICAL WATER LEVEL CHANGES IN LAKE OKEECHOBEE, FLORIDA,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. E. Whitaker, R. O. Reid, and A. C. Vastano.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA023 683, Price codes: A06 in paper copy, A01 in microfiche. Technical Memorandum No. 56, Coastal Engineering Research Center, Fort Belvoir, Virginia, October 1975. 104 p, 63 fig, 2 tab, 44 ref. Army DACW 72-71-C-0011.

Descriptors: *Drag, *Storm surge, *Lakes, *Florida, *Model studies, Mathematical models, Hurricanes, Winds, Storms, Waves(Water), Water levels, Seiches, Surges, Wind tides, Surface waters, Marshes, Freshwater marshes.
Identifiers: *Lake Okeechobee(Fla), Drag coefficient.

A time-dependent, two-dimensional storm surge algorithm was used to estimate the drag coefficient, C sub D, over the windspeed range: W sub 10 = 20 to 40 meters per second, where W sub 10 is the windspeed 10 meters above MWL. The algorithm represents a vertically integrated physical model which includes nonlinear boundary conditions representing flooding and recession. Wind and water level data for the investigation were gathered by the U.S. Army Engineer District, Jacksonville, in the Lake Okeechobee, Florida, region. The lake is a roughly circular feature 60 kilometers in diameter with a maximum normal depth of 4 meters. The effect of extensively grassed, shallow areas of the lake on wind-driven circulation was simulated by a multilayer canopy flow model and included as a subroutine in the numerical analog. The surge model was calibrated for empirical constants with two seiches and quasi-static wind-induced condition within the lake. Two wind-stress relationships, a quadratic one and the Keulegan-Van Dorn expression, were used to model the air-sea interaction. Multiple surge calculations were performed with a range of C sub D, and statistical analyses were made of the difference between the observed and computed water levels for the hurricane of August 1949. The results indicated that the Keulegan-Van Dorn wind-stress model yields superior results over the windspeed range. This conclusion was verified by a simulation of the surge associated with the hurricane of October 1950. (Sims-ISWS)
W78-01023

SHORT-TERM TRANSIENT VARIATIONS OF LIMNOLOGICAL PARAMETERS IN GRAND TRAVERSE BAY, LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Sea Grant Program.
A. H. Vogel, J. J. Sygo, T. M. Kelly, R. P. Canale, and H. E. Allen.
Journal of Great Lakes Research, Vol. 2, No. 1, p 193-205, July 1976. 5 fig, 3 tab, 15 ref. NOAA 04-6-158-4408.

Descriptors: *Water quality, *Bays, *Lake Michigan, *Variability, Primary productivity, Chlorophyll, Nutrients, Dissolved oxygen, Conductivity, Hydrogen ion concentration, Temperature, Water temperature, Alkalinity, Light penetration, Biomass, Zooplankton, Surveys, Diurnal distribution, Storms, Weather, Limnology.

Throughout the period 30 July - 3 August 1973, measurements of primary production, chlorophyll a, dissolved and particulate nutrients, dissolved oxygen, conductivity, pH, temperature, alkalinity, light penetration, and zooplankton biomass were taken at 2 to 4 hour intervals at an anchor station in Grand Traverse Bay, Lake Michigan. Determinations were made at the water surface, and at 1, 2, 3, 5, 10, 15, 20, 35, and 50 meters. Diurnal changes were observed in temperature, dissolved oxygen, chlorophyll a, primary production, and zooplankton in the top 2 meters. Storm-induced changes were found for temperature, dissolved oxygen, silica, dissolved phosphorus, chlorophyll a, and primary production. The storm-induced changes were considerably greater than the diurnal changes for those parameters that responded to both causal agents. No significant changes were found for conductivity, pH, total phosphorus, or nitrate. Ammonia concentrations were too low to permit statistical analysis. (Sims-ISWS)
W78-01033

SEDIMENT DISTRIBUTION AND BOTTOM TOPOGRAPHY OF SOUTHEASTERN LAKE SUPERIOR,
Department of the Environment, Burlington (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2J.
W78-01034

MULTIPLE ESTIMATES OF LAKE ERIE EVAPORATION,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2D.
W78-01035

WATER QUALITY STUDIES OF SIXTEEN MINNESOTA RIVERS TRIBUTARY TO LAKE SUPERIOR,
Reserve Mining Co., Silver Bay, MN.
For primary bibliographic entry see Field 5A.
W78-01036

DISTRIBUTION OF WATER MASSES IN AND NEAR THE STRAITS OF MACKINAC,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
R. A. Moll, C. L. Schelske, and M. S. Simmons.
Journal of Great Lakes Research, Vol. 2, No. 1, p 43-59, July 1976. 11 fig, 4 tab, 18 ref. EPA R-802721.

Descriptors: *Water quality, *Surveys, *Lake Michigan, *Lake Huron, *Great Lakes, Sampling, Data processing, Silica, Nitrates, Phosphorus, Chlorophyll, Hydrogen ion concentration, Water temperature, Conductance, Secchi disks, Analytical techniques, Statistics, Correlation analysis, Limnology, Water analysis.
Identifiers: *Straits of Mackinac.

Three cruises in the Straits of Mackinac area were conducted from 30 August to 8 October 1973. Samples were taken from up to 11 depths during each cruise and were analyzed for silica, nitrate, total and soluble phosphorus, chlorophyll a, pH, water temperature, and specific conductance. Cluster analyses were used to visualize the relationship between stations for each depth on all cruises. The clearest relationships observed were from 0, 5, and 10 m depths, while clusters of data from other depths were not as useful in describing water masses. Analyses of 0 - 10 m depths showed a consistent homogeneous water mass extending through the northern edge of the Straits proper, past the western edge of Mackinac Island, to south of Bois Blanc Island. The cluster of stations was found during most wind conditions at the 3 depths considered. The last cruise, 6-8 October, occurred during a period of light winds from the southeast which partially disrupted this cluster. Relationships between the variables were defined by factor analysis which showed silica and nitrate increased with decreasing water temperature and pH, and partly as a function of depth. Secchi disc values tended to vary independently of most other variables, implying that these readings had little value in explaining water quality in the Straits region. (Sims-ISWS)
W78-01038

IFYGL SHIPBOARD VISUAL WAVE OBSERVATIONS VS WAVE MEASUREMENTS,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
P. C. Liu, and T. A. Kessenich.
Journal of Great Lakes Research, Vol. 2, No. 1, p 33-42, July 1976. 9 fig, 7 ref.

Descriptors: *Waves(Water), *Lake Ontario, *Great Lakes, On-site investigations, Limnology.
Identifiers: *International Field Year for the Great Lakes, Data comparisons, Wave height, Wave periods, Shipboard observations, Wave measurements.

Data used for this study were collected in Lake Ontario during 1972, the International Field Year for the Great Lakes (IFYGL). Shipboard me-

terological observations, which included visual estimates of wave height and wave period, were made in the Great Lakes by over 100 ships from the United States and Canada. Data collected from the ship reports covered a wide range of lake conditions and, hence, provide a useful basis for climatological studies of surface waves in the Great Lakes. The objective of this paper was to present an assessment of the reliability of the ship reports. Records from deep water wave gauges were compared with shipboard observations made within 50 km of the gauges. The results showed that visually estimated wave heights, H sub vo, and wave periods, T sub vo, were correlated with the recorded significant wave heights, H sub s, and average zero-crossing wave periods, T sub z, respectively by H sub s = (0.25 + 0.6 H sub vo) meters and T sub z = (2.0 + 0.2 T sub vo) seconds. Visual observations appeared to substantially underestimate the steepness of the waves. Long-term distributions for wave heights and wave periods followed the log-normal distribution quite closely. The results generally were similar to those of oceanic studies. (Sims-ISWS)
W78-01039

RESULTS FROM A NUMERICAL MODEL FOR SIMULATING CIRCULATION PATTERNS AND CHLORINITY DISTRIBUTIONS IN SAGINAW BAY,
Argonne National Lab., IL.
J. H. Allender, and A. W. Green.
Journal of Great Lakes Research, Vol. 2, No. 1, p 7-12, July 1976. 4 fig, 8 ref. NOAA 04-3-158-23.

Descriptors: *Water circulation, *Bays, *Salinity, *Lake Huron, *Great Lakes, Circulation, Winds, Seiches, Lakes, Chlorine, Distribution patterns, Diffusion, Advection, Model studies, Mathematical models, Pollutants, Path of pollutants, Water pollution, Limnology.
Identifiers: *Saginaw Bay.

Circulation and advection-diffusion of chlorine in Saginaw Bay were simulated in a detailed manner over real time periods as great as one month by using an alternating-direction-implicit (ADI) integration procedure. External forcing was based on interpolated time histories of wind records and on open boundary data inferred from spectral analyses of water level records. Average simulated circulation under prevailing southwesterly winds was compared with yearly-averaged observational data at 5 sites in the bay. Excellent agreement between the directions of observed and computed currents was found, except near the open boundary adjoining Lake Huron. Reasons for the disparity were discussed. The response of the chlorinity distribution to the time-dependent wind also was compared to the response to the mean wind over the same period. (Sims-ISWS)
W78-01040

FREE MODE COUPLING OF SAGINAW BAY AND LAKE HURON,
Argonne National Lab., IL.
J. H. Allender, and A. W. Green.
Journal of Great Lakes Research, Vol. 2, No. 1, p 1-6, July 1976. 6 fig, 1 tab, 6 ref. NOAA 04-3-158-23.

Descriptors: *Lake Huron, *Great Lakes, *Water levels, *Seiches, Time series analysis, Bays, Lakes, Circulation, Water circulation, Limnology, Waves(Water).
Identifiers: *Saginaw Bay, Water level spectra, Cross spectral calculations, Longitudinal modes.

Time series analyses were made of water level records from 4 stations within and outside of Saginaw Bay. Coherence squares computed from the series showed that the 2nd, 3rd, and 6th longitudinal modes of the bay are coupled strongly with the 3rd, 5th, and 6th longitudinal modes of Lake Huron. Cross spectra provided estimates of phase differences for the coupled modes at the various stations. The complexity of the spectra increases significantly due to the presence of many non-longitudinal seiches during periods when the mean wind exceeds approximately 3.5 m/sec. (Sims-ISWS)
W78-01041

LIMNOLOGICAL DATA REPORT FOR THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION -- U.S. GEOLOGICAL SURVEY COOPERATIVE LAKE STUDIES PROJECT,
Geological Survey, Augusta, ME. Water Resources Div.; and Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
D. J. Cowing, and M. Scott.
Geological Survey open-file report, March 1977. 145 p, 1 fig, 3 tab, 20 ref.

Descriptors: *Lakes, *Limnology, *Maine, *Biological properties, *Chemical properties, Lake morphology, Epilimnion, Tributaries, Lake basins, Hydrologic data, Data collections, Water analysis, Aquatic bacteria, Microorganisms, Benthic fauna.

The report contains physical, chemical, and biological information collected on 43 lakes in Maine. Methods of collection and analysis of the hydrologic data are outlined. Physical characteristics listed include drainage area, surface area, surface elevation, volume, maximum depth, mean depth, epilimnion depth, epilimnion volume, and length of shoreline. As many as 27 parameters are listed for lake sample sites and 5 for tributaries. Biological analyses include phytoplankton data for 2 of the study lakes, zooplankton data for 3, benthic macroinvertebrate data for 22, and bacterial data for lake tributaries. (Woodard-USGS)
W78-01078

LAKES OF OREGON: VOLUME 5. MARION COUNTY,
Geological Survey, Portland, OR. Water Resources Div.
J. F. Rinella.
Open-file report, 1977. 99 p, 4 fig, 2 tab, 27 ref.

Descriptors: *Lakes, *Oregon, *Investigations, *Hydrologic data, *Water quality, Drainage area, Elevation, Volume, Lake morphology, Lake morphometry, Inflow, Discharge(Water), Water utilization, Aerial photography, Bathymetry, Mapping.
Identifiers: *Marion County lakes(Oreg).

An inventory of lakes and reservoirs of Oregon is essential for a complete evaluation of the total surface-water supply of the State and a basis for answering questions about Oregon's lakes. The lake information is being issued in several volumes on a county or multicounty basis. This report, volume 5, includes hydrologic, physical, and water quality data for 115 lakes in Marion County. In general, any lake with a surface area greater than 5 acres is included in this inventory, but a few smaller bodies are also included. Natural ephemeral lakes are not included nor are manmade ponds several acres in size that are used solely for stock water. (Woodard-USGS)
W78-01080

A HYDROLOGIC DESCRIPTION OF KEYSTONE LAKE NEAR TAMPA, FLORIDA,
Geological Survey, Tampa, FL. Water Resources Div.
R. C. Reichenbaugh.
Water-Resources Investigations 76-124 (open-file report), 1977. 1 sheet, 14 fig, 1 tab, 10 ref.

Descriptors: *Lake basins, *Lake stages, *Lake morphology, *Hydrologic data, *Florida, Water quality, Rainfall, Streamflow, Runoff, Inflow, Surface-groundwater relationships, Lakes, Water levels, Water table, Hydrogeology, Maps, Aerial photography.
Identifiers: *Tampa area(Florida), *Keystone Lake, Brooker Creek, Cosme well field, Floridan aquifer.

The terrain around Keystone Lake, a 388-acre lake in northwest Hillsborough County, Florida, near the Cosme well field, is dotted with sinks that promote leakage from the surficial aquifer to the underlying Floridan aquifer. The lake, an integral part of the Brooker Creek channel, receives overland runoff from cypress swamps, pastures, citrus groves, and lakefront residential areas. The lake, a composite of many coalescing sinkholes, is generally 14 to 16 ft deep and has been dredged in places to 23 ft deep. Since 1960, rainfall in the area shows a cumulative negative departure of 86 in. from the long-term average. The mean annual lake stage in 1973 was the lowest on record. Concurrently, municipal pumpage in the Cosme well field from the Floridan aquifer peaked in 1961 and again in 1973, and in 1972 the potentiometric surface was the lowest since 1960. Comparisons of the hydrographs of lake stage and the potentiometric surface in the Floridan aquifer with rainfall graphs shows that both correspond closely to seasonal rainfall, resulting in the trend of decreasing seasonal maximum levels in the lake and the aquifer. Keystone Lake water quality is adequate for recreation and propagation of wildlife. (Woodard-USGS)
W78-01088

EFFECTS OF URBAN LAKES ON SURFACE RUNOFF AND WATER QUALITY,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W78-01135

COMPARISON OF MODEL AND OBSERVED CURRENTS IN LAKE MICHIGAN,
Argonne National Lab., IL.
J. H. Allender.
Journal of Physical Oceanography, Vol. 7, No. 5, p 711-718, September 1977. 4 fig, 3 tab, 16 ref.

Descriptors: *Currents(Water), *Lake Michigan, *Model studies, *Mathematical models, Lakes, Circulation, Water circulation, On-site investigations, Measurement, Winds, Temperature, Current meters, Limnology.

Results from four deterministic numerical-hydrodynamcial models for Lake Michigan were compared to data from the field program of the Federal Water Pollution Control Agency (FWPA) for September 1963, and to other limited data from which lake currents can be inferred. Fourier norms and average angle statistics show that model and observed currents as fixed locations do not compare well. Comparability does not improve when near-inertial motions are removed or when motions having periods up to 72 h are removed. This lack of agreement is practically unaviodable and results primarily from inadequate knowledge of the wind field and probably from the grid scale used in the models. Qualitative agreement between the model and FWPCA currents was seen in lake-wide plots of several day average motion. Surface currents inferred from satellite imagery were grossly similar to model currents under the appropriate, average wind conditions. (Sims-ISWS)
W78-01140

THE TIME-DEPENDENT RESPONSE OF A CIRCULAR BASIN OF VARIABLE DEPTH TO A WIND STRESS,
Northwestern Univ., Evanston, IL. Dept. of Engineering Sciences; and Northwestern Univ., Evanston, IL. Dept. of Geological Sciences.
G. E. Birchfield, and B. P. Hickie.
Journal of Physical Oceanography, Vol. 7, No. 5, p 691-701, September 1977. 5 fig, 2 tab, 14 ref, 1 append. NSF GA-25442, NOAA 04-4-022-37.

Descriptors: *Lakes, *Water circulation, *Great Lakes, *Lake Ontario, Winds, Wind tides, Circulation, Currents(Water), Waves(Water), Model studies, Mathematical models, Seiches, Topography, Limnology.
Identifiers: Barotropic response.

By solving an initial value problem, the time-dependent response of a large circular model lake to a steady wind stress was investigated. Bottom stress was neglected. The forced response was divided naturally into a 'seiche' response and a quasi-geostrophic 'current' response; the former was composed of gravity and topographic waves, the latter topographic waves only. The forced quasi-geostrophic response, consisting of coastal jets and return flow, slowly rotates cyclonically around the basin. The model was compared with forced barotropic response observed in Lake Ontario. (Sims-ISWS)
W78-01141

MICROBIOLOGICAL PROCESSES IN THE MEROMICTIC LAKE VALLE DE SAN JUAN IN CUBA (IN RUSSIAN),
V. I. Romanenko, M. Peres Eiris, V. M. Kudryavtsev, and M. Aurora Pubienes.
Mikrobiologiya 45(3): 539-546. 1976. (English summary).

Descriptors: *Meromictic lakes, *Cuba, *Mixolimnion, Microbiology, Pelodictyon phaeum, Sulfur bacteria.

The lake was studied in April and July of 1973. Gleothece prevailed in the mixolimnion and the green sulfur bacterium Pelodictyon phaeum in the layer of pink water down to 10 m. The production of photosynthetic sulfur bacteria comprises 3% of the production of algae. Sulfate reduction takes place mainly in water beyond the layer of sulfur bacteria. The content of H2S in the monimolimnion is 104 mg/l. Bacteria utilize 40% of the H2S produced. Three maxima in bacterial content were: at a depth of 7 m; in the layer of pink water, at a depth of 10 m; and at the bottom. Total mineralization and electroconductance of water at the bottom are higher by a factor of 6 than those at the surface. Destruction of organic substance is a little higher than production.--Copyright 1977, Biological Abstracts, Inc.
W78-01180

2I. Water In Plants

USES OF PHRAGMITES AUSTRALIS (IN AFRIKAANS),
Agricultural Research Inst., Middleburg (South Africa).
For primary bibliographic entry see Field 4A.
W78-00933

SOME OBSERVED INTERRELATIONSHIPS BETWEEN THE COVER OF AQUATIC VEGETATION AND VARIOUS PHYSICAL PROPERTIES OF THE WATER MEDIUM,
Botanical Research Unit, Durban (South Africa).
C. F. Musil, C. H. Bornman, and J. O. Grunow.
Journal of South African Botany, Vol 42, No 2, p 157-169, 1976. 7 fig, 4 tab, 3 ref.

Descriptors: *Aquatic plants, *Hydrogen ion concentration, *Water temperature, Turbidity, Aquatic weeds.
Identifiers: Pongolo River, Potamogeton crispus, Nymphaea lotus, Najas pectinata, Pistia stratiotes, Ludwigia stolonifere, Echinochloa, Scirpus.

High pH and oxygen but low total carbon dioxide values were recorded from water at sites containing high percentage covers of predominantly submerged aquatic vegetation. The converse was true in water at sites containing very dense covers of predominantly rooted-floating and free floating aquatic vegetation. The cover of submerged aquatic vegetation was influenced by the turbidity of the water and also by shading, particularly by that of floating aquatic vegetation. (So. African Water Info. Center)
W78-00941

THE INFLUENCE OF FERTILIZER-APPLIED CHLORINE, CHLORINE CONTENT OF IRRIGATION WATER AND LEACHING OF CHLORINE ON THE UPTAKE OF CHLORINE BY TOBACCO (IN AFRIKAANS),
Tobacco Research Inst., Rustenburg (South Africa).
For primary bibliographic entry see Field 3F.
W78-00943

THE ROLE OF WATER NUTRITION AND YIELD LEVEL IN THE GRAIN-STALK RATIO OF MAIZE (IN AFRIKAANS),
Pretoria Univ. (South Africa). Dept. of Plant Production.
For primary bibliographic entry see Field 3F.
W78-00946

THE PERIODS SENSITIVE TO INTERNAL PLANT MOISTURE STRESS DURING GROWTH AND DEVELOPMENT OF ZEA MAYS (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa).
For primary bibliographic entry see Field 3F.
W78-00948

STUDY OF THE INFLUENCE OF SOIL DROUGHT AND HIGH AIR TEMPERATURE ON SOME PHYSIOLOGICAL PROCESSES IN MAIZE PLANT (IN SERBO-CROATIAN),
Institut Kukuruz, Zemun (Yugoslavia).
B. Kerecki, L. Zaric, D. Jelenic, and M. Pencic.
Acta Bot Croat 35: 113-118. 1976. (English summary).

Descriptors: *Corn, *Drought, Humidity, Transpiration, Plant physiology, Stress.

Crop injuries, which occur often in Yugoslavian climatic conditions during the growing period, are due to high temperatures accompanied with relatively low air humidity. Heat stress effects the greatest damage on the plant during fertilization. An experiment was carried out with the maize hybrid, ZP 755, in the 8th phase of tassel development. The plants were grown in an open greenhouse in Mitcherlich pots, on soil whose moisture contents was 30%-70% of the maximum water capacity. Heat stress was provoked in the heat stress chamber with temperatures of 44-46 C, relative air humidity of 26% and wind velocity of 9/m/min. Water fractions, intensity of transpiration, and concentration of cell liquid were determined in the leaves of plants exposed to the heat stress, while N fractions were determined in leaf, stalk and root. Drought and heat stress cause considerable changes in all water and N fractions. The amount of bound water in treated plants increases while the amount of free water decreases. At the same time soluble and non-protein N is increased and total N decreased in relation to the control.--Copyright 1977, Biological Abstracts, Inc.
W78-01018

EFFECT OF WATER STRESS ON PROLINE SYNTHESIS FROM RADIOACTIVE PRECURSORS,
Iowa State Univ. Ames. Dept. of Botany and Plant Pathology.
S. F. Boggess, C. R. Stewart, D. Aspinall, and L. G. Paleg.
Plant Physiology, Vol. 58, No. 3, p 398-401, September, 1976, 4 fig, 20 ref.

Descriptors: *Radioactivity effects, *Moisture stress, *Wilting, *Leaves, *Amino acids, Isotopes, Carbon compounds, Radioactivity, Moisture content, Moisture deficit, Bermudagrass, Barley, Chromatography.
Identifiers: *Proline.

Although several plants have been reported to accumulate free proline during periods of water deficit or when subjected to other stress, the biochemical changes linking water stress and proline accumulation are not well understood. Experiments were conducted using radioactive isotopes to explore this relationship in greater detail. The results are presented. Barley leaves converted more 14 Carbon glutamic acid to free proline when water stressed than when turgid; neither decreased protein synthesis nor isotope trapping by the enlarged free proline pools found in wilted tissues seemed to account for the result. This apparent stimulation of proline biosynthesis in wilted leaves was not observed when radioactive ornithine or P5C were used as proline precursors unless proline levles were high as a result of previous water stress. This is interpreted to mean that any stimulation of proline synthesis by water stress must act on P5C formation rather than its reduction to proline. (Jamail-Arizona)
W78-01042

INDICES OF PLANT WATER STATUS: SOME COMPARISONS WITHIN AND BETWEEN CROP SPECIES,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
W. Shepherd.
The Journal of Applied Ecology, Vol 13, No 1, p 205-209, April, 1976, 2 fig, 9 ref.

Descriptors: *Leaves, *Drought resistance, *Drought tolerance, *Moisture, Stress, Crop production, Plant growth, Droughts, Barley, Wheat, Potatoes, Canopy, Moisture content, Irrigation effects, Osmotic pressure, Drying, Plant physiology, Stomata, Diffusion, Plant tissues.
Identifiers: Sap osmotic potential, Leaf water potential.

The effects of plant water status on physiological processes have been widely studied using four indices of plant moisture, ratio of plant water content to dry weight, sap osmotic potential, leaf water potential, and leaf water vapor resistance. Relationships between the various indices are complex, but are important because of their relevance to crop growth modelling, studies of water movement in plants, and the resistance of plants to drought. Some relationships between the indices and transpiration have already been reported. This paper considers further data from potato, barley, and wheat crops, giving particular consideration to differences between crops grown under conditions of plentiful and limited water supply. The four indices were determined for the upper third of the canopy, and for the lower part, the remainder of the leaves. The results are presented. The relationships were different for upper and lower levels of plants, and different crop species, grown under various water regimes. Crops raised with a limited water supply developed in ways that tend to restrict transpiration during subsequent periods of drought. (Jamail-Arizona)
W78-01050

STRUCTURE OF THE EPIDERMAL AND SUBEPIDERMAL CELLS OF SOME DESERT PLANTS OF ISRAEL, ANABASIS ARTICULATA AND CALLIGONUM COMOSUM,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Plant Physiology and Anatomy.
O. B. Lyshede.
Israel Journal of Botany, Vol 26, p 1-10, 1977. 8 fig, 1 tab, 26 ref.

Descriptors: *Plant morphology, *Plant tissues, *Desert plants, Drought tolerance, Drought resistance, Epidermis, Water vapor, Arid lands, Absorption, Xerophytes, Dehydration, Photosynthesis, Hysteresis, Cellulose, Deserts.
Identifiers: Israel, Wax, Stems, Anabasis, Calligonum.

The structure of the epidermal cell walls of the assimilating stem of Anabasis articulata and Calligonum comosum were investigated. Due to their peculiar structure and specialized assimilating tissue, the epidermal cell walls swell rapidly during water absorption but when dehydrated release water very slowly. The structure and function of the epidermis and hypodermis in relation to the inner tissues are discussed from an ecological point of view. (Ullery-Arizona)
W78-01053

RATE OF LEAF PRODUCTION AND SENESCENCE AND EFFECT OF LEAF AGE ON NET GAS EXCHANGE IN CREOSOTEBUSH,
New Mexico State Univ., University Park. Dept. of Biology.
J. P. Syvertsen, and G. L. Cunningham.
Photosynthetica (Prague), Vol 11, No 2, p 161-166, 1977, 1 tab, 18 ref.

Descriptors: *Growth rates, *Desert plants, *Plant physiology, *Photosynthesis, *Respiration, Carbon dioxide, Leaves, Transpiration, Arid lands, Growth chambers, Plant growth, Southwest US, Stomata, Shrubs.
Identifiers: Leaf senescence, Abscission, *Creosotebush, Larrea tridentata.

Creosotebush (Larrea tridentata DC. Cov.) is one of the most widespread and successful evergreen species of the warm desert regions of North America. One of the gaps in the knowledge of factors and processes associated with production of creosotebush is what determines senescence and in which manner net photosynthesis and dark respiration are affected by leaf senescence. Research was undertaken to ascertain if the rate of leaf senescence and subsequent abscission could be increased by increasing the rate of new leaf production and to determine the relationship between leaf age and gas exchange capacity. The results are presented. In growth chamber grown plants of creosotebush, the dark respiration, net photosynthesis, internal leaf resistance and stomatal and cuticular resistances to water and carbon dioxide were not affected by leaf age. Net photosynthesis did appear to be reduced in leaves older than 47 days. An increase in the apparent rate of leaf sensescence and subsequent abscission coincide chronologically with an increase in the rate of new leaf production. (Jamail-Arizona)
W78-01054

2J. Erosion and Sedimentation

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENT AND OVERLYING WATER,
For primary bibliographic entry see Field 5C.
W78-00921

MECHANICS OF SUSPENDED SEDIMENT IN RANDOM WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-00980

POSSIBLE EFFECT OF SEDIMENTS AND CHANNEL PROCESSES ON RUNOFF REDISTRIBUTION IN A RIVER DELTA,
S. S. Baydin.
Soviet Hydrology, Selected Papers, No 4, p 234-242, 1975. 3 fig, 1 tab, 26 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No 118, p 116-135, 1974.

Descriptors: *Deltas, *Channel morphology, *Rivers, Sediments, Sedimentation, Erosion, Bed load, Sediment transport, Meanders, Alluvial channels, Coasts, Beds, Braiding, Channels, Streams, Discharge(Water), Runoff, Flood plains, Geomorphology.
Identifiers: *USSR.

All channel forms in the mouths of rivers are associated with types of bedload transport produced by eht energy of the flow. Therefore, when investigating channel processes one should proceed from the energy characteristics of flow and the types of bedload movements and not from the forms of channel formations and geomorphological relations. In this case, the initial data must include: flow, the particle size of bottom deposits and sediment concentration, the slope of the land (valley) and its ratio to the slope of the water surface, and the ratio between the water slope during the flood and low-flow periods. A stream with a high flow energy does not meander and selects the shortest and straightest direction. Sediment transport is achieved in these reaches in the smooth stage during flood rise and in the structural bottom stage during flood recession and the low-flow period. With a decrease in slope and when flow energy is inconsistent with the particle size of the sediment, the flow can successively concentrate its energy in individual reaches, periodically moving the sediments from one reach to the other in the course of the year. The main types of structural sediment movement are: ribbon dune (riffle), midstream bar and side bar; and of structureless movement, continuous traction and sliding. (Sims-ISWS)
W78-01029

THRESHOLD OF SEDIMENT MOTION UNDER UNDIRECTIONAL CURRENTS,
Oregon State Univ., Corvallis. School of Oceanography.
M. C. Miller, I. N. McCave, and P. D. Komar.
Sedimentology, Vol. 24, No. 4, p 507-527, August 1977. 9 fig, 1 tab, 50 ref. NASA NSG-7178.

Descriptors: *Sedimentation, *Reviews, *Data collections, *Laboratory tests, Sediment transport, Movement, Sediments, Analysis, Analytical techniques, Flow characteristics, Equations, Wind erosion, Water flow, Erosion, Flow, Cohesionless soils, Open channels, Flumes, Particle size.
Identifiers: Incipient motion.

Carefully selected data for the threshold of sediment movement under unidirectional flow conditions were utilized to re-examine the various empirical curves that are commonly employed to predict the threshold. After a review of the existing data, the only data used were obtained from laboratory open channel flumes with parallel sidewalls where flows were uniform and steady over flattened beds of unigranular, rounded sediments. Without the restrictions, an unmanageable amount of scatter is introduced. The selected data were used to develop a modified Shields-type threshold diagram that extends the limits of the original diagram by 3 orders of magnitude in the grain-Reynolds number. The equally general but more easily employed Yalin diagram for sediment threshold also was examined. Although the Shields and Yalin diagrams are general in that they apply to a wide range of different liquids, in both cases somewhat different curves were obtained for threshold under air than for the liquids. The often used empirical curves of the friction velocity, the velocity 100 cm above the bed, the bottom stress, and Shields' relative stress, all versus the grain diameter, are limited in their ranges of application to certain combinations of grain density, fluid density, fluid viscosity, and gravity. The conditions must be selected before the curves are generated from either the more general Shields or Yalin curves. For example, on the basis of the data selected, empirical threshold relationships for quartz density material in water were tabulated. The limitations on any of the threshold relationships are severe. The limitations should be understood properly so that the empirical curves and relationships are not employed improperly. (Humphreys-ISWS)
W78-01030

SEDIMENT DISTRIBUTION AND BOTTOM TOPOGRAPHY OF SOUTHEASTERN LAKE SUPERIOR,
Department of the Environment, Burlington (Ontario). Inland Waters Branch.
C. I. Dell.
Journal of Great Lakes Research, Vol. 2, No. 1, p 164-176, July 1976. 11 fig, 18 ref.

Descriptors: *Sediments, *Topography, *Lake Superior, Surveys, Geomorphology, Spatial distribution, Sediment distribution, Lakes, Sediment sorting, Sedimentation, Limnology, Sampling, Sounding.
Identifiers: *Eastern Lake Superior.

Sediment distribution in the complex region of troughs and shoals in southeastern Lake Superior was studied by means of echo sounding, coring, and surface sediment sampling. The primary factor governing sediment type is water depth with sediment source, water movement, trough morphology, and lake history superimposed upon it. Thick accumulations of fine-grained sediment are confined to the trough bottoms, whereas coarser sediments occur on the sides and crests. In the southern part of the region, subaqueous erosion of red tills leads to the deposition of brown sandy sediments whereas farther offshore dark gray fine-grained sediments show the influence of eroding varved clays. Current action along the south shore and along the trough bottoms produces sediment sorting even in deep water. On slopes greater than 1 or 2 degrees, fine-grained postglacial sediment is very thin or absent, and lag deposits overlie glacial sediments. Evidence of ice scour indicates that modifications to sediment distribution may have occurred during the low level Houghton stage about 8000 B.P. Stratigraphic evidence suggests that the most probable origin of the complex bottom topography is erosion by moving ice. (Sims-ISWS)
W78-01034

RAINWATER AND SEDIMENT RUNOFF FROM SLOPES IN THE AZOV-KUBAN PLAIN,
Akademiya Nauk SSSR, Leningrad. Inst. Ozerovedeniya.
I. S. Boyko, and M. P. Zarrin.
Soviet Soil Science, Vol. 8, No. 1, p 71-73, January-February, 1976, 1 tab.

Descriptors: *Runoff, *Rainfall-runoff relationships, *Slope protection, Rainfall, Sediments, Slopes, Slope stability, Erosion, Erosion rates, Precipitation(Atmospheric), Floods, Hydraulic structures, Impact(Rainfall), Rain, Erosion control.
Identifiers: U.S.S.R.

Study of the formation of runoff from slopes in the slightly hilly relief of the Ciscaucasian steppe is not only the scientific interest, but also of great practical importance. The characteristics of rainwater and sediment runoff from this area were investigated. Surface runoff and sediments were measured and the results presented. Water runoff increases from flood to flood, regardless of the magnitude of the runoff-forming rain and runoff depth. This is attributable to the deterioration of the infiltration characteristics of the soil because of the increase in the water content of its upper horizon and the silting of interaggregate pores. The field data obtained indicate that under certain conditions heavy rains may cause considerable ero-

sion in plowed areas, even on very gentle slopes. This must be taken into account in planning hydraulic installations and in various kinds of erosion control practices in plowed areas. (Jamail-Arizona)
W78-01046

EROSION AND TRANSPORT OF BED-LOAD SEDIMENT,
Technische Hogeschool, Delft (Netherlands).
R. F. Luque.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-27298, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, 1974, 111 p. 21 fig, 6 tab, 32 ref.

Descriptors: *Bed load, *Erosion, *Sediment transport, Deposition(Sediments), Saltation, Sands, Gravels, Hydraulics, Equations, Mathematical studies, Laboratory tests, Scour.
Identifiers: *Mean critical shear stress, *Nonceasing scour, Average particle velocity, Shield grain-movement condition, Magnetite grain, Walnut grain, Bulk erosion.

Results were presented of a series of experiments in which were measured: the mean critical bed shear stress at SHIELDS' grain-movement condition and at the initiation of non-ceasing scour, the rate of bedload transport, the average particle velocity, the rate of deposition, and the average length of individual steps of saltating bed-load particles, in water, as a function of the time-mean bed shear stress. These experiments were performed in a closed rectangular flow channel at different slopes of the bed surface and using five different bed materials (two sands, gravel, magnetite and walnut grains). A comparison of the threshold drag acting at different downward slopes of the bed surface (0, 12, 18 and 22 degrees) resulted in a surprisingly large critical-drag angle of 47 degrees. The initiation of non-ceasing scour of a loose granular bed was studied experimentally behind a consolidated bed of the same material as the loose bed. The corresponding instantaneous threshold drag was about three times larger than the threshold drag was about three times larger than the threshold drag acting at SHIELDS' grain movement condition. The rate of bed-load transport measured as a function of the mean bed-shear stress satisfied a generalized MEYER-PETER and MULLER formula (1948), also at various downward slopes of the bed surface, as investigated up to 22 degrees. The rate of particle deposition was proportional to the rate of bed-load transport, and the average length of individual particle steps was a constant. This implied that the probability of a bed-load particle being deposited when striking the bed surface is independent of the flow rate within the experimental range. (See also W76-12827) (Lee-ISWS)
W78-01060

CALCIUM CARBONATES IN SUSPENDED DEPOSITS OF RIVERS AND IRRIGATION SYSTEMS IN CENTRAL ASIA (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
N. T. Kuznetsov.
Pochvovedenie 7. 104-109. 1976- (English summary).

Descriptors: *Calcium carbonate, *Dissolved solids, *Rivers, Salts, Suspended solids, Irrigation systems, River basins.
Identifiers: Asia, Central Asia, USSR.

The migration of CaCO3 in suspended deposits of rivers in the mountainous river basins in Middle Asia (USSR) is mostly due to geological conditions. Downstream the distributions of calcium carbonates in suspended deposits is primarily determined by weathering crusts. As is generally known, the crusts of the same bioclimatic zone differ less from one another than the original rocks. Thus the content of CaCO3 in suspended deposits of individual rivers and irrigation systems is leveled downstream.--Copyright 1977, Biological Abstracts, Inc.
W78-01072

UMPQUA RIVER ENTRANCE, OREGON.
Army Engineer District, Vicksburg, MS. Committee on Tidal Hydraulics.
For primary bibliographic entry see Field 8B.
W78-01152

2K. Chemical Processes

DISSOLVED OXYGEN AND SATURATION IN AN ENVIRONMENT OF HIGH ORGANIC PRODUCTION (ETANG DE BERRE): ROLE OF HALOCLINE ON DISTRIBUTION OF THESE AND ON THE OXYGEN-PHOSPHATE RATIO (IN FRENCH),
Centre Univ. de Luminy, Marseille (France).
For primary bibliographic entry see Field 2L.
W78-00935

GASS ON GAS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-00956

SULFUR CONTENT OF SEDIMENTS OF THE MARIN ESTUARY AND OTHER GALICIAN ESTUARIES, (IN SPANISH),
A. Fernandex Del Riego.
Bol Inst Esp Oceanogr 215. 1-22. 1976.

Descriptors: *Sediments, *Sulfur, *Estuaries, Spain, Sulfates, Cellulose, Pulp wastes, Thiobacteria.

Because of the presence of wastes from a cellulose factory which used S compounds in wood processing, S pollution in the Marin estuary was studied. Sediments were collected in several estuaries (in Spain) and analyzed. S values were 2.3 for the Marin estuary, 3.9 for the Arosa estuary and 2.9 for the Muros estuary. There was no correlation between S content of sediments and the distance from the source of S wastes. The main source of S was dissolved sulfates, which are broken down by thiobacteria. The number of thiobacteria depends on the nature of the organic matter in the sediments. Although the addition of cellulose to sediments can increase the number of thiobacteria, cellulose is not as effective as some other organic materials such as dead plankton residues. Other factors causing variations in S were water depth, topography of the bottom and shoreline profile.--Copyright 1977, Biological Abstracts, Inc.
W78-00986

THE RIVER SKAWA: WATER CHEMISTRY AND EUTROPHICATION, (IN POLISH),
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
M. Bombowna.
Acta Hydrobiol 18(4): 407-420. 1976. (English Summary).

Descriptors: *Rivers, *Water levels, *Chlorophyll, Eutrophication, Algae, Skawa River.

Changes in the chemistry of the River Skawa (Poland) at various water levels were described 4 seasons of the year, special attention being paid to the fertility of the river on the basis of chlorophyll content. The water in the river basin of the Skawa, a tributary of the River Vistula, is of a carbonate-calcareous type. A corresponding decrease in the chlorophyll content in attached algae, depending to a great degree on their species composition, shows a negative correlation with the water level in the river. The ratio of the chlorophyll content in the attached algae to that in the seston is a good index of productivity zones along the river course. The constant intensification of agriculture, with the present pollution of the river, brings about the eutrophication which has been advancing throughout the years and is manifested in the growing concentration of mineral nutrient compounds.--Copyright 1977 Biological Abstracts, Inc.
W78-00990

SOLUTE TRANSFER, WITH EXCHANGE BETWEEN MOBILE AND STAGNANT WATER, THROUGH UNSATURATED SAND,
Centre National de la Recherche Scientifique, Paris (France).
For primary bibliographic entry see Field 2G.
W78-01065

A PRELIMINARY APPRAISAL OF THE GARBER-WELLINGTON AQUIFER, SOUTHERN LOGAN AND NORTHERN OKLAHOMA COUNTIES, OKLAHOMA,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01075

HYDROLOGIC DATA FOR THE VAMOOSA AQUIFER, EAST-CENTRAL OKLAHOMA,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 2A.
W78-01076

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01087

2L. Estuaries

RELATIONSHIPS BETWEEN THE BIVALVE MACOMA BALTHICA AND BACTERIA IN INTERTIDAL SEDIMENTS: MINAS BASIN, BAY OF FUNDY,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5C.
W78-00905

DISSOLVED OXYGEN AND SATURATION IN AN ENVIRONMENT OF HIGH ORGANIC PRODUCTION (ETANG DE BERRE): ROLE OF HALOCLINE ON DISTRIBUTION OF THESE AND ON THE OXYGEN-PHOSPHATE RATIO (IN FRENCH),
Centre Univ. de Luminy, Marseille (France).
M. Minas.
Hydrobiologia 51(2): 149-162. 1976. (English Summary).

Descriptors: *Dissolved oxygen, *Lakes, Brackish water, Lake Etang de Berre, Nutrients, Phosphate.

The evolution of 02 distribution (concentration and saturation) was monitored in brackish waters of the lake Etang de Berre during several years. In relation to the occurrence of a well-defined pycnocline (halocline) an oxycline is shown to be present, leading to anoxic conditions in some cases. The relationships between 02 and nutrients under conditions of 02 depletion are examined and it is shown that anomalies are due to the dynamic aspects of the consumption-production-regeneration system. A concept of the theoretical 02 budget

in a brackish water basin is proposed. --Copyright 1977, Biological Abstracts, Inc.
W78-00935

DENSITY-INDUCED MOTIONS IN SHALLOW LAGOONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
D. R. Johnson, and T. N. Lee.
Miami University Sea Grant Technical Bulletin No 38, August, 1977. 32 p, 6 fig, 4 ref, 2 append. SG-No. 2-35147.

Descriptors: Density currents, *Gradients(Streams), *Estuaries, *Lagoons, *Flow characteristics, *Mathematical models, Movement, Biscayne Bay, Card Sound(FLA).

Horizontal density gradients are often present in estuaries. These gradients exert a torque which can induce a flow that may aid in reducing the residence time. Using simple models, the influence of a horizontal density gradient on the residence time of a shallow, well-stirred lagoon was investigated. Under steady-state conditions and with scaling taken from the southeast Florida lagoons (Biscayne Bay and Card Sound), it was found that density-induced motions do not contribute substantially to flushing the lagoon waters. However, as an estuary's depth increases or, if the horizontal density gradient is large, density-induced flow can be significant. A graphic approach is presented which can be used to determine density-induced residence time from knowledge of the horizontal density gradient and the water depth. (NOAA)
W78-00951

A MECHANISM FOR RIP CURRENT GENERATION ON AN OPEN COAST,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
R. A. Dalrymple.
Journal of Geophysical Research, Vol. 80, No. 24, p 3485-3487, August 20, 1975. 1 fig, 1 tab, 20 ref. ONR N00014-69-A-0407.

Descriptors: *Rip currents, *Waves(Water), *Coasts, Currents(Water), Beaches, Seashores, Model studies, Mathematical models, Laboratory tests, Oceans, Ocean waves, Wavelengths, Water levels.
Identifiers: *Wave interactions, Longshore currents.

A mathematical model was developed which provides an explanation for the occurrence of longshore and rip currents on the open coast. This concept was verified by a small experiment done in a model basin. It was shown that intersecting ocean wave trains of the same frequency will create periodic longshore variations in the mean water level both inside and outside the surf zone. In the surf zone this creates a longshore variation in wave height and wave-induced circulation previously attributed to edge waves and irregular bottom topography. (Sims-ISWS)
W78-00976

ANALYSIS OF INHOMOGENEOUS WAVE NUMBER SPECTRA,
Delaware Univ., Newark.
M. A. Tayfun, C. Y. Yang, V. Klemas, and H. Wang.
Journal of Geophysical Research, Vol. 80, No. 24, p 3469-3474, August 20, 1975. 4 fig, 12 ref. ONR N00014-69-A0407.

Descriptors: *Ocean waves, *Shores, *Aerial photography, *Analytical techniques, Wavelengths, Waves(Water), Shallow water, Heterogeneity, Beaches, Seashores, Oceanography.
Identifiers: *Wave spectra.

As waves propagate from deep to shallow water, various effects of the shallowing depth of water spatially modify spectral characteristics of the sea surface. In such spatially inhomogeneous regimes, spectral computations based on a finite field size are subject to errors due to an inherent spatial smoothing in addition to resolution errors of a more conventional nature. The conflicting requirements of resolution and smoothing errors for an accurate analysis prescribe an optimal field size for which the combined magnitude of such errors is minimal. The optimal field size, the associated errors in resolution and smoothing, and the conditions for limiting accuracy were derived for computations in a shallow water wave field in which refraction and shoaling constituted the predominant inhomogeneity effects. Bottom friction, percolation, and reflection were neglected, and calculations were based on a first-order approximate shallow water wave theory. (Sims-ISWS)
W78-00978

VORTEX GENERATION BY OSCILLATORY FLOW OVER RIPPLED SURFACES,
Naval Undersea Center, San Diego, CA.
E. B. Tunstall, and D. L. Inman.
Journal of Geophysical Research, Vol. 80, No. 24, p 3475-3484, August 20, 1975. 8 fig, 1 tab, 25 ref.

Descriptors: *Vortices, *Ripple marks, *Waves(Water), *Energy dissipation, Laboratory tests, On-site investigations, Model studies, Flow, Energy loss, Beaches, Shores, Seashores, Sands, Dye releases, Tracking techniques.
Identifiers: *Oscillatory flow.

Vortices generated by oscillatory flow over symmetrical sand ripples were investigated in order to ascertain the amount of wave energy loss that can be attributed to the formation and movement of vortices. The experimental phase of the investigation centered around the flow visualization of the vortices over the ripples. These laboratory data were used to obtain values for three parameters (vortex size, circulation, and radius of the vortex core) needed to evaluate the amount of energy bound up in the vortex, the energy relationship being derived from a trapped vortex model. Comparison of the vortex kinetic energy loss attributed to bottom effects indicated that the vortices possess about 7% of the measured wave energy loss, the majority of the remaining energy loss being attributed to bottom shear. (Sims-ISWS)
W78-00979

MECHANICS OF SUSPENDED SEDIMENT IN RANDOM WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
H. Wang, and S. S. Liang.
Journal of Geophysical Research, Vol. 80, No. 24, p 3488-3494, August 20, 1975. 7 fig, 26 ref. ONR N00014-69-A-0407.

Descriptors: *Sediments, *Suspended solids, *Waves(Water), *Coasts, Suspended load, Beaches, Sediment transport, Mass transfer, Model studies, Mathematical models, Mechanical properties.
Identifiers: *Surf zone.

The mechanics of suspended sediment under wave action were investigated. The results applied to regions well beyond the surf zone where the flow field, though irregular in appearance, was still amenable to mathematical expressions in gross terms. The motion of the suspended sediment particle and that of the fluid particle in a wave field were found to have an amplitude difference and a phase lag. The suspended sediment concentration was hyperbolic trigonometric function of water depth. The relation reduced to a power law for shallow water cases. The value of power was found to be a function of particle settling velocity, fluid particle velocity, and wave number. Wave mass transport velocity was derived on the basis of turbulent boundary layer as the lower boundary condition. Finally it was found that the rate of suspended sediment transport in a wind-generated random wave field can be approximated by a power function in terms of wind velocity. (Sims-ISWS)
W78-00980

SULFUR CONTENT OF SEDIMENTS OF THE MARIN ESTUARY AND OTHER GALICIAN ESTUARIES, (IN SPANISH),
For primary bibliographic entry see Field 2K.
W78-00986

DISTRIBUTION OF BENTHIC MACROFAUNA IN LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Zoology.
N. D. Christie, and A. Moldan.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 273-284, May 1977. 3 fig, 6 tab, 24 ref.

Descriptors: Benthos, Marine animals, Macrofauna, Species distribution, Water depth, Saline marshes, Baseline studies, Sediment analysis, Food chains, Water temperature, Primary productivity, Sampling stations, Biomass, Salinity range, Ecosystem ecology, Marine ecosystems.
Identifiers: Langebaan Lagoon, Saldanha Bay, South Africa.

Fifteen stations were sampled in Langebaan Lagoon using a diver-operated suction sampler. The macrofauna was analysed using numerical methods, by the rarefaction technique, to define relative species richness and by ash-free dry-weight biomass determinations. Three basic groups were defined: the channel, island and sand-bank groups. The channel and island groups had the greatest biomass and the hightest species richness values respectively. In contrast the sand-bank group had the lowest biomass values, intermediate species richness values and the highest density of individual animals per m2. The availability of food, water current velocity and hence sediment texture, water temperatures and salinity apparently were most important factors in determining the distribution of the macrofauna. (So. African Water Info. Center).
W78-00999

LAKE ST. LUCIA: MATHEMATICAL MODELLING AND EVALUATIONS OF AMELIORATIVE MEASURES,
University of the Witwatersrand, Johannesburg (South Africa) Hydrological Research Unit.
For primary bibliographic entry see Field 2H.
W78-01006

OCEAN SURFACE CURRENTS MAPPED BY RADAR,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
D. E. Barrick, M. W. Evans, and B. L. Weber.
Science, Vol. 198, No. 4313, p 138-144, October 14, 1977. 6 fig, 13 ref.

Descriptors: *Radar, *Ocean currents, *Instrumentation, Equipment, Remote sensing, Coasts, Ocean waves, Currents(Water), Electronic equipment, Measurement, Mapping, Oceans, Oceanography.
Identifiers: *Surface currents.

A high frequency radar remote sensing system for measuring and mapping near surface ocean currents in coastal waters was analyzed and described. A transportable prototype version of the system was designed, constructed, and tested. With two units operating tens of kilometers apart, the currents were mapped in near real time at a grid of points 3 by 3 km covering areas exceeding

2000 sq km, out to a distance of about 70 km from the shore. Preliminary estimates of the precision of current velocity measurements show it to be better than 30 cm/sec. (Sims-ISWS)
W78-01133

ADVECTION IN THE PERU CURRENT AS OBSERVED BY SATELLITE,
Hawaii Univ., Honolulu. Dept. of Oceanography.
For primary bibliographic entry see Field 7B.
W78-01137

CENOZOIC EVOLUTION OF ANTARCTIC GLACIATION, THE CIRCUM-ANTARCTIC OCEAN, AND THEIR IMPACT ON GLOBAL PALEOCEANOGRAPHY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
J. P. Kennett.
Journal of Geophysical Research, Vol. 82, No. 27, p 3843-3860, September 20, 1977. 13 fig, 1 tab, 111 ref. NSF OPP75-15511.

Descriptors: *Antarctic, *Glaciation, *Ocean circulation, Cenozoic era, Paleoclimatology, Ice, Glaciers, Circulation, Oceans, Sediments, Cores, Core logging, Core drilling, Geology, Climatology, Oceanography.
Identifiers: *Paleoceanography, Paleoglaciation, Paleocirculation.

Deep-sea drilling in the Antarctic region has provided much new data about the development of circum-Antarctic circulation and the closely related glacial evolution of Antarctica. The Antarctic continent has been in a high latitude position since the middle to late Mesozoic. Glaciation commenced much later, in the middle Tertiary, demonstrating that near polar position in not sufficient for glacial development. Instead, continental glaciation developed as the present day Southern Ocean circulation system became established when obstructing land masses moved aside. (Sims-ISWS)
W78-01138

RESIDUAL FLOW AND BOUNDARY SHEAR STRESS IN THE TURBULENT BOTTOM LAYER BENEATH WAVES,
Reading Univ. (England). Dept. of Meteorology.
B. Johns.
Journal of Physical Oceanography, Vol. 7, No. 5, p 733-738, September 1977. 4 fig, 11 ref.

Descriptors: *Turbulent boundary layers, *Waves(Water), *Model studies, Mathematical models, Numerical analysis, Flow, Roughness(Hydraulic), Shear stress, Friction, Fluid friction, Flow friction, Boundary layers, Shores, Ocean waves, Oceanography.

A model was considered of the turbulent bottom boundary layer beneath waves. Closure was effected at the level of the turbulent energy equation, and numerical solutions were obtained by a combination of finite-difference methods and a pseudo-spectral technique. The solutions were used to evaluate the induced streaming motion and the boundary shear stress. An expression was derived for the friction coefficient in terms of the bottom roughness and this was found to agree with values reported in experimental studies. (Sims-ISWS)
W78-01139

UMPQUA RIVER ENTRANCE, OREGON.
Army Engineer District, Vicksburg, MS. Committee on Tidal Hydraulics.
For primary bibliographic entry see Field 8B.
W78-01152

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

WELL REDEVELOPMENT: PART II,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 31, No 10, p 20-21, October, 1977.

Descriptors: *Water wells, *Maintenance, *Rehabilitation, Chlorination, Surfactants, Acids, Well screens, Aquifers, Iron bacteria, Explosives.
Identifiers: *Well redevelopment, Acidizing, Polyphosphates, Sequestering agents, Jetting, Sonic well cleaning.

Clogging of a well screen and the adjacent formation due to iron bacteria is caused by slimy organic material produced by the bacteria and the iron deposits associated with the organism. These materials may combine with scale minerals such as calcium carbonate. Treatment must, therefore, include a bactericide as well as a strong acid to dissolve scale. Hydroxyacetic acid can be used as such a dual-purpose agent, but many drillers prefer a three-step treatment method involving shock chlorination, acidization, and a final shock chlorination. Potassium permanganate is a strong oxidizing agent that can also be used to treat incrustation. For removing silt and clay from a well, sequestering agents such as sodium phosphate can be used to disperse small particles, making them easier to pump out. Surfactants, or wetting agents, can be used to enhance the dispersing efficiency of sequestering agents for the removal of silt and clay. Explosives and sonic well cleaning are two mechanical methods that can be employed in cases where chemical means are inapplicable. No matter what causes declines in well yield, it is always easier to redevelop the well if the problem is diagnosed early and treatment is applied before the well deteriorates to below 50 percent of original specific capacity. (See also W77-12673) (Eberle-NWWA)
W78-00952

REGIONALIZATION FOR FORESTS BASED ON THEIR SIGNIFICANCE FOR WATER MANAGEMENT (RAJONIZACE LESU Z HLEDISKA JEJICH VODOHOSPODARSKEHO VYZNAMU),
Vyzkumny Ustav Lesniho Hospodarstvi a Myslivosti, Zbraslav-Strnady (Czechoslovakia).
J. Bele.
Lesnictvi, Vol. 23, No. 3, p 151-166, March, 1977. 2 fig, 8 tab, 8 ref. (English summary).

Descriptors: *Hydrology, *Forest watersheds, Foreign countries, Forests, Watershed management, Watersheds(Basins), Water sources, Model studies.
Identifiers: Czechoslovakia, Spruce(Picea).

The hydrologic efficiency of a forest was defined as the amount of available water based on water balance. Such a balance was calculated, i.e., the difference between the horizontal and vertical precipitation and evaporation and transpiration was determined for a model spruce stand. The data obtained were used for large forest areas and, based on the results, Czechoslovazkian forests were divided into three groups characterized by amounts of available water of 0-200, 201-400, and 401 mm and more, respectively. The forests with the highest amount of available water were considered as hydrologically important, and they are going to be managed accordingly. The hydrologically important forests occupy 21.8% of the total forest area in Czechoslovakia. (Trubacek-IPC)
W78-01118

3D. Conservation In Domestic and Municipal Use

TETHERING SOLAR POWER IN RHODESIA.
Development Magazine, Vol 11, No 9, p 10-13, January 1977. 2 fig.

Descriptors: Solar heating, Domestic water, *Solar energy, Drying, Equipment, Rhodesia.

It is estimated that between 60 and 70% of all electricity consumed domestically is used for the heating of water and for cooking, and greater utilization of solar energy would do much to lighten the present power station load in Rhodesia. The general requirements of solar water heaters and solar crop dryers are discussed. (So. African Water Info. Center)
W78-00936

3E. Conservation In Industry

CONSIDERATIONS AND POSSIBILITIES OF OPTIMIZING THE WATER CIRCUITS OF THE BRAILA PULP AND PAPER MILL (CONSIDERATII SI POSSIBILITATI PRIVIND OPTIMIZAREA CIRCUITELOR APELOR DE FABRICATIE LA C.C.H.-BRAILA),
G. Neculau, C. Petrescu, V. Popa, and C. Stanciu.
Celuloza si Hirtie, Vol 23, No 2, p 63-65, February, 1974. 2 tab, 5 fig, 6 ref.

Descriptors: *Pulp and paper industry, *Water conservation, *Pollution abatement, Water reuse, Recirculated water, Pulp wastes.
Identifiers: Romania.

Water conservation and antipollution measures taken at a Romanian integrated pulp and paper mill are described. The white water recirculation scheme and the effluent treatment installation are also indicated. (Brown-IPC)
W78-00985

WASTE HEAT FOR EVAPORATION OF EFFLUENTS,
Ekono, Helsinki (Finland).
For primary bibliographic entry see Field 5D.
W78-01105

CLOSING UP KRAFT MILL SYSTEMS -- REDUCTION OF EFFLUENTS AND CONTROL OF MATERIAL BALANCES,
Swedish Forest Products Research Lab., Stockholm.
B. Warnqvist.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 75-80, 6 fig, 3 tab, 10 ref.

Descriptors: *Pollution abatement, *Pulp and paper industry, Water pollution control, Air pollution, Wastes, Industrial wastes, Effluents, Foreign countries, Sulfur compounds, Pulp wastes, Water reuse, Water pollution sources, Bleaching wastes, Lignins, Computer models, Water conservation, Industrial water.
Identifiers: Closed systems, Sulfur dioxide, Norway, Kraft mills.

The reduction and control of pulp screen room effluents and of sulfur (dioxide) emissions from the recovery furnace by system closure and by internal measures in bleached or unbleached kraft mills are discussed. In-plant solutions for reducing the large fraction of organic compounds in the screen room effluents include extensive brown stock washing, recycling the decker effluent to the screen room, screening at high pulp consistency, and in-line refining with minimum or no screening.

A Norwegian integrated mill is described which produces kraft pulp for bag paper and linerboard with in-line refining without screening. A proposal to close this system (continuous digester with high-heat washing zone, in-line refining, washing on drum filters, and high-density storage) suggests that the drum filter effluent be reused counter currently in the high-heat wash and that a radial washer be installed after the refiner to increase chemical recovery. Active control of sulfur and sodium balances is necessary because of environmental restrictions on spent liquor and flue gas discharges. The use of sulfur-free makeup chemicals instead of saltcake, and of oxidized white liquor instead of fresh alkali for flue gas scrubbing, decreases the input sulfur and sodium, respectively. To withdraw excess S, spent bisulfite liquor from the scubber can be added to the pulp slurry at the end of the chlorination bleaching stage where it facilitates the dissolution of lignin. The end product will be sodium and sulfate ions in the chlorination stage effluent. Computer calculations of the sodium and sulfur balances in a model draft mill using this bisulfite bleed process are discussed. (Swichtenberg-IPC)
W78-01108

DISPOSAL AND RECYCLING OF REJECTS FROM WASTE PAPER AND CLOSED WATER SYSTEMS,
Escher Wyss G.m.b.H. Ravensburg (West Germany).
W. H. Matzke.
British Paper and Board Industry Federation, Technical Section, Waste Utilization Symposium, Manchester, England, January 22-23, 1975 (Preprinted Proceedings), p 163-179. 6 fig.

Descriptors: *Water conservation, *Pulp and paper industry, Water pollution control, Pollution abatement, Flotation, Recycling, Effluents, Sludge, Equipment.
Identifiers: *Board mills, *Deinking mills, Closed systems, Savealls, Waste paper.

The closing of water circuits in a waste paper deinking plant and in a paper and board mill equipped with suction sheet formers are described. The low-volume Escher Wyss Clarflot flotation saveall is also described. The Clarflot cell is run with flocculating aids. Some pressurized air is introduced into the approach flow pipe, but the air consumption is low. The concentration of floated sludge can easily be adjusted in the Clarflot unit. (Sykes-IPC)
W78-01114

TOTAL WATER SYSTEM (AT) COSHOCTON MILL (OF) STONE CONTAINER CORPORATION,
Stone Container Corp., Coshocton, OH.
W. M. Babington, and L. R. Fisher, Jr.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 25-31. 4 fig, 5 ref.

Descriptors: *Pulp and paper industry, *Water conservation, Water reuse, Water pollution sources, Ohio, Sludge, Screens, Centrifugation, Aerated lagoons, Waste treatment, Water pollution treatment, Water purification, Industrial water, Sludge treatment, Solid wastes.
Identifiers: *Sulfite pulp mills, *Board mills, Fiber recovery.

Stone Container Corp. operates a 640 ton/day neutral sulfite semichemical corrugating medium mill at Coshocton, Ohio. Low-quality process water used in the chemical recovery system is supplied by a shallow well system. High-quality process water is obtained by processing sludge produced in the city's water treatment plant. Two-thirds of the mill's process waste water (3 million gal/day) is reused. Static screens are used to recover fiber in the raw waste water ahead of the primary clarifier. Clarifier sludge and thickened municipal lime sludge are centrifuged together. Clarifier overflow is pumped to an aerated lagoon equipped with floating mechanical aerators. Lagoon effluent is discharged directly into the Tuscarawas River. A second-stage aerated lagoon with a subsurface aeration system and a final clarifier are under construction. (Witt-IPC)
W78-01124

WATER QUALITY PROTECTION AT THE (SIMPSON PAPER COMPANY) SHASTA MILL,
Simpson Paper Co., Anderson, CA.
For primary bibliographic entry see Field 5D.
W78-01130

LEATHER TANNERY WASTE MANAGEMENT THROUGH PROCESS CHANGE, REUSE AND PREATMENT,
Pfister and Vogel Tanning Co., Milwaukee, WI.
For primary bibliographic entry see Field 5D.
W78-01156

NAVAL STORES WASTEWATER PURIFICATION AND REUSE BY ACTIVATED CARBON TREATMENT,
Hercules Inc., Hattiesburg, MS.
For primary bibliographic entry see Field 5D.
W78-01160

REVERSE OSMOSIS FIELD TEST: TREATMENT OF WATTS NICKEL RINSE WATERS,
Abcor, Inc., Wilmington, MA.
For primary bibliographic entry see Field 5D.
W78-01161

STATE OF THE ART: WASTEWATER MANAGEMENT IN THE BEVERAGE INDUSTRY,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Food and Wood Products Branch.
For primary bibliographic entry see Field 5D.
W78-01168

3F. Conservation In Agriculture

IRRIGATION OF SUGAR CANE,
South African Sugar Association Experiment Station, Mount Edgecombe.
G. D. Thompson.
South African Sugar Journal, Vol. 61, No. 3, p 126-131, March 1977. 3 fig, 5 tab.

Descriptors: *Irrigation practices, *Sugar cane, Rainfall, Soil moisture, Crop production.
Identifiers: South Africa.

The purpose of this review is to collate the pertinent available information, to assess the adequacy of the present state of knowledge, and to dicate the aspects or irrigation research that appear to most warrant further investigation. Within the South African sugar belt it is possible to discriminate between areas where irrigation is used to increase yields obtainable under rainfed conditions, and areas where irrigation is necessary to guarantee continuous sugarcane production. It has become traditional to refer to the former as areas requiring 'supplementary' irrigation, and to the latter as requiring 'total' irrigation. The decision to install a supplementary irrigation scheme in the rainfed areas is unfortunately seldom an easy one to make. Capital and running costs in relation to the value of the extra cane produced have always been such that profitability has been marginal, and most of the schemes which have remained in operation have on miller-cum-planter estates where milling profits can be used to make irrigation more worthwhile, and on fields as close as possible to the mill itself so that transport costs for the increased crop can be kept to a minimum. (So. African Water Info Center)
W78-00928

USES OF PHRAGMITES AUSTRALIS (IN AFRIKAANS),
Agricultural Research Inst., Middleburg (South Africa).
For primary bibliographic entry see Field 4A.
W78-00933

TETHERING SOLAR POWER IN RHODESIA.
For primary bibliographic entry see Field 3D.
W78-00936

IMPLEMENTATION OF FIELD LAYOUT FOR MECHANIZATION AND SURFACE WATER CONTROL,
South African Sugar Association Experiment Station, Mount Edgecombe.
For primary bibliographic entry see Field 4A.
W78-00942

THE INFLUENCE OF FERTILIZER-APPLIED CHLORINE, CHLORINE CONTENT OF IRRIGATION WATER AND LEACHING OF CHLORINE ON THE UPTAKE OF CHLORINE BY TOBACCO (IN AFRIKAANS),
Tobacco Research Inst., Rustenburg (South Africa).
H. G. Snyman, J. G. K. Coetzee, F. J. Shawe, and H. J. Boshoff.
Agrochemophysica, Vol 8, p 23-30, 1976. 6 fig, 3 tab, 10 ref. (English summary).

Descriptors: *Tobacco, *Chlorine, Leaching, Fertilizers, Irrigation, *Absorption, Drainage, Soil types.
Identifiers: Nicotiana.

In a field trial with tobacco the effect of leaching of applied Cl fertilizer from the soil under natural rainfall conditions on the uptake of chlorine by the plant was investigated. The leaching of chloride from the soil is very closely linked with natural rainfall. Soil and leaf analyses clearly showed that with a rainfall of 900 mm during the 1966/67 growing season (November to March), an application of 212 kg of Cl per ha was completely leached out from the 0-900mm earth layer, even when the removal of Cl by the plant was taken into account. This was reflected in the leaf analyses during the same season where a very low chloride content was registered. Even at the highest applications of chloride of 212 kg/ha, only 1,50, 0,66 and 0.56% chloride were registered for the lower, middle and top leaves respectively. Chlorine in the irrigation water is the most important contributory factor to high chlorine content in tobacco. (So. African Water Info. Center)
W78-00943

TESTS ON SPRINKLERS (IN AFRIKAANS),
Pretoria Univ. (South Africa). Dept. of Agricultural Engineering.
F. K. Geertsema.
Agricultural Engineering in South Africa, Vol 10, No 1, p 53-57, 1976. 1 fig, 1 tab, 2 ref. (English summary).

Descriptors: *Sprinklers, *Irrigation practice, *Sprinkler irrigation, Equipment, Sprays.

A brief description is given of the tests conducted on sprinklers at the Division of Agricultural Engineering, Silverton, Pretoria. The method of determining the Christiansen Coefficient of Uniformity (CU-value) is discussed in more detail. The relationship between the CU-valve and the following aspects is stated: Percentage wet and dry areas, Patterns of setting: rectangular and triangular, Single or double nozzle: In this connection it has been determined whether a single or

double nozzle-sprinkle gives the best results on a rectangular or square setting, Pressure, Stream straightener. The Christiansen Coefficient however has its limitations as norm for the judgement of any sprinkler's suitability for a specific task. (So African Water Info. Center)
W78-00944

THE ROLE OF WATER NUTRITION AND YIELD LEVEL IN THE GRAIN-STALK RATIO OF MAIZE (IN AFRIKAANS),
Pretoria Univ. (South Africa). Dept. of Plant Production.
P. C. Nel, and J. F. Verwey.
Agroplantae, Vol. 8, No. 4, p 65-68, 1976. 1 fig, 3 tab, 12 ref. (English summary).

Descriptors: *Corn(Field), Crop response, Crop production, *Nutrient requirements, Water demand, Soil-water-plant relationships.
Identifiers: Grain-stalk ratio.

The effect of fertilization with N, P, K and farmyard manure and of the level of irrigation on the grain:stalk ratio of the maize cultivar R200 was determined. An established long term field experiment, in which the various effects had stabilized over the years, was used for this investigation. At a low water level only K made a significant contribution to grain:stalk ratio. Where the availability of water was continually at a high level, the contribution of nitrogen, phosphorous, potassium and farm-yard manure to the grain:stalk ratio was significant. From the highly significant correlation coefficient (r=0,857) and regression coefficient it is deductible that the grain:stalk ratio increases linearly by 0,0575 with an increase of 1 000 kg/ha in grain yield. (So. African Water Info. Center)
W78-00946

THE INFLUENCE OF CERTAIN CULTIVATION PRACTICES ON THE GROWTH AND PRODUCTION OF ZEA MAYS IN MARGINAL AREAS (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa).
L. P. De Bruyn, and J. J. Human.
Agroplantae, Vol. 8, No. 4, p 69-75, 1976. 6 tab, 10 ref. (English summary).

Descriptors: *Corn(Field), *Crop response, Soil moisture, Cultivation.

Different cultivation practices by which soil moisture may be stored or utilized more efficiently by the maize plant, were compared in order to obtain higher yields in marginal areas. This was done in three different experiments on soil of the Kinross series of the Shortlands form at the Glen Agricultural Research Institute. The first of these experiments compared the growth and yields of maize continuously cropped with those obtained where maize was planted in alternate seasons on previously summer fallowed soil. Plant population at two levels (1,79 and 2,38 plants/m2) was used. These treatments were used in a 2 x 2 factorial arrangement in a randomized block design with six replications. Stored soil moisture significantly enhanced grain, stover and total dry material yields as well as the grain/stover ratio. Stored moisture was therefore used for vegetative growth, and to a greater extent for grain production. Yields obtained during four seasons averaged an increase of 477,8 kg/ha where maize was planted on previously fallowed soil. Continuous cropping, however, averaged 1 773,4 kg/ha and the increase in yield after fallow consequently did not compensate for the loss in yield due to fallow. The additional moisture due to summer fallow was not sufficient to justify a higher plant density. Thus 1,79 plants/m2 significantly outyielded 2,38 plants/m2 by 249,3 kg/ha. (So. African Water Info. Center)
W78-00947

THE PERIODS SENSITIVE TO INTERNAL PLANT MOISTURE STRESS DURING GROWTH AND DEVELOPMENT OF ZEA MAYS (IN AFRIKAANS),
Orange Free State Univ., Bloemfontein (South Africa).
L. P. De Bruyn, and J. J. Human.
Agroplantae, Vol. 8, No. 4, p 77-81, 1976. 1 tab, 1 fig, 15 ref. (English summary).

Descriptors: *Moisture stress, Soil-water-plant relationships, Water demand, Crop response, Soil moisture, Growth stages, *Corn(Field).

The first 70 days had little effect on grain yields. In marginal areas the period of sensitivity to moisture deficits during flowering commences 70 days after planting. During tasseling and silking 77-80 days after planting, sensitivity decreases somewhat although the plant remains significantly sensitive. Dry weather enhances pollination and flowering and the sensitivity therefore decreases 81-83 days after flowering. Peak flowering is the most sensitive period and its duration is 84-92 days with the peak sensitivity being reached 90 days after planting. Fertilization of the greater number of silks takes place 93-100 days after planting when sensitivity to moisture stress drops sharply. Subsequently, the plant remains insensitive to internal moisture deficits except during the seed fill stage which is represented by a slight rise in sensitivity 126-130 days after planting. The grain to stover ratio indicates that moisture was used for grain production at the cost of vegetative growth 75-84 days after planting. (So. African Water Info. Center)
W78-00948

LEAST COST IRRIGATION SYSTEM SPECIFICATIONS FOR VARIOUS CONDITIONS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
J. R. Busch.
Paper No. 76-2038, Presented at the Annual Meeting of the American Society of Agricultural Engineers, June 27-30, 1976, Lincoln, Nebraska. 13 p, 3 fig, 7 tab, 4 ref. OWRT B-028-IDA(5) and B-033-IDA(6).

Descriptors: Model studies, Simulation analysis, Optimization, *Irrigation efficiency, Costs, *Linear programming.

A methodology employing a dynamic-linear programming model was used to develop optimum rehabilitation plans for an irrigation district. The plans developed indicate the total irrigation system cost and configuration for various levels of efficiency and water cost. (Skogerboe-Colorado State)
W78-00973

PROTECTION OF A UNIQUE ECOLOGICAL AREA THROUGH IMPROVED WATER AND FERTILITY MANAGEMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-01001

COST COMPARISON OF DRIP AND FLOOD IRRIGATIONS SYSTEMS,
Texas A and I Univ., Weslaco. Citrus and Vegetable Training Center.
P. J. Rathwell, and R. F. Leyden.
Journal of the Rio Grande Valley Horticultural Society, Vol. 30, p 79-86, 1976, 1 fig, 3 tab, 4 ref.

Descriptors: *Irrigation systems, *Surface irrigation, *Flood irrigation, *Citrus fruits, *Cost comparisons, Irrigation, Irrigation efficiency, Orchards, Crop production, Irrigation design, Costs, Texas, Semiarid climates, Water requirements.
Identifiers: *Drip irrigation.

Drip irrigation and conventional surface flood irrigation for citrus orchards are compared with respect to installation and operating costs. Observations were made at an experimental citrus center in the Lower Rio Grande Valley of Texas. The results are presented. Drip irrigation provides a substantial savings of water in newly planted orchards, but as trees grow, water requirements are about the same under either drip or flood irrigation. The investment costs are comparable for both systems. The savings associated with a drip system are achieved during the first years of an orchard's existence. The labor involved in maintaining and cleaning the drip system is likely to be comparable to the irrigation labor required in a leveled orchard. Electrical costs may run high if the drip system is not engineered to deliver the required amount of water at a minimum electrical usage. (Jamail-Arizona)
W78-01048

AIR REGIME OF NONIRRIGATED AND IRRIGATED CISCAUCASIAN CHERNOZEMS,
Moscow State Univ. (USSR). Dept. of Soil Science.
N. G. Zborishchuk.
Soviet Soil Science, Vol. 8, No. 1, p 85-91, January-February, 1976, 3 fig, 3 tab, 8 ref.

Descriptors: *Irrigation effects, *Soil properties, *Soil compaction, *Aeration, Irrigation, Physical properties, Porosity, Carbon dioxide, Soil physical properties, Soil density, Soil physics, Oxygen.
Identifiers: U.S.S.R., Soil air.

Soil air is an important and very mobile part of the soil. The partial pressure of gases in soil air affects plant development conditions and the solubility of mineral compounds. Investigations were conducted to determine the air regimes of irrigated and nonirrigated Ciscaucasian Chernozems in the U.S.S.R. and the results are presented. It is demonstrated that irrigation changes some physical soil properties. It reduces the air reserves and aeration porosity. This promotes the accumulation of carbon dioxide in soil air, the content of which is twice as high in horizons of irrigated soils than in nonirrigated soils. Irrigation disturbs gas exchange in soils and promotes carbon dioxide accumulation. The longer the duration of the irrigation, the more pronounced this process becomes. (Jamail-Arizona)
W78-01049

MECHANISMS OF SURVIVAL OF ZOOSPORES OF PHYTOPHTHORA PARASITICA IN IRRIGATION WATER,
California Univ., Berkeley. Dept. of Plant Pathology.
S. V. Thomson, and R. M. Allen.
Phytopathology, Vol 66, No 10, p 1198-1202, October, 1976. 2 fig, 2 tab, 26 ref.

Descriptors: *Irrigation water, *Citrus fruits, *Arizona, *Rots, *Water reuse, Irrigation, Texas, Plant diseases, Fungi, Microorganisms, Plant pathology, Irrigation ditches, Orchards, Diseases, Fruit crops, Root systems.
Identifiers: *Zoospores, *Phytophthora parasitica.

Foot rot in citrus which is caused by several species of Phytophthora is discussed. The disease is a limiting factor for the production of citrus in Arizona because some 20% of the acres planted in citrus are affected. A practice that contributes to the spread and severity of the disease is the reuse of irrigation water. Zoospores of Phytophthora have been recovered from recycled irrigation water in Arizona. Information is presented on the survival of propagules of Phytophthora parasitica in irrigation water with special emphasis on zoospores. Samples were taken from irrigation drainage near Phoenix, Arizona, and were tested in a laboratory. P. parasites survived in irrigation water for several weeks. Thus, water recycled from citrus should not be used on citrus orchards,

and new orchards should not be planted where there is likelihood of exposure to contaminated irrigation water. (Jamail-Arizona)
W78-01055

STATE-OF-THE-ART: SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-01169

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

USES OF PHRAGMITES AUSTRALIS (IN AFRIKAANS),
Agricultural Research Inst., Middleburg (South Africa).
L. Viljoen.
Proceedings of the Grassland Society of Southern Africa, Vol. 11, p 19 - 22, 1976. 1 fig, 4 tab, 10 ref. (English summary).

Descriptors: *Aquatic plants, Erosion control, Marshes, River flow, Sediment control, *Bank stabilization, Rooted aquatic plants, Soil conservation, Reeds.
Identifiers: Phragmites australis.

Phragmites australis (communis) is one of the most widely distributed of the Angiosperme. This can be attributed to its adaptability and to the fact that it can propagate both vegetatively and by means of seed. It is because of these propogation properties that it is so useful for soil conservation and for the stabilization of sediment, gully banks and channels. Of particular value is its ability to withstand inundation, washing out and sediment deposition. It is normally grown in relatively moist soils where in addition to the role it plays in soil conservation, it produces large quantities of palatable grazing for cattle. (So. African Water Info. Center)
W78-00933

IMPLEMENTATION OF FIELD LAYOUT FOR MECHANIZATION AND SURFACE WATER CONTROL,
South African Sugar Association Experiment Station, Mount Edgecombe.
O. P. Landrey, J. P. Fourie, and N. A. Johnston.
South African Sugar Journal, Vol 60, No 4, p 165 - 175, April, 1976. 11 fig, 2 tab.

Descriptors: Crop production, *Cultivated lands, *Sugarcane, Slopes, Soil conservation, Soil erosion, Surface runoff, Drainage.

Escalating costs and the uncertain availability of labor have provided motivation for greater mechanization of field operations. It is difficult for machines to cope with irregular terrain, varying row widths and the presence of short lines, and hence it has become necessary to revise methods for laying out sugarcane fields. The principals involved, the necessary design criteria and the techniques for their implementation have been established in an attempt to solve the problem of mechanizing can production on the steep and often rugged terrain found in the South African sugar industry. (So. African Water Info. Center)
W78-00942

RESERVOIR CAPACITY FOR PERIODIC-STOCHASTIC INPUT AND PERIODIC OUTPUT,
Colorado State Univ., Fort Collins.
K. N. Mutreja.
Hydrology Papers No. 86, September 1976. 42 p, 34 fig, 20 tab, 36 ref.

Descriptors: *Reservoir storage, *Model studies, *Inflow, Water storage, Reservoir operation, Reservoir releases, Hydrology, Reservoirs, Stochastic processes, Markov processes.
Identifiers: *Periodic-stochastic input, Periodic output, Flow regulation, High-order autoregressive model, Reservoir capacity, Difference storage, Stochastic storage.

A methodology was developed for designing capacities of large reservoirs with sufficiently high levels of development by using the concept of maximum deficit rather than the range and short-interval flow records, particularly daily flows. Daily river flow, composed of periodic and stochastic components, are inputs into reservoirs. The output was assumed to be a deterministic process, either constant or periodic. Difference storage is due to periodic components of both input and output. The advantage of the use of difference storage is that it is approximately constant for large sample sizes. Therefore, difference storage can be estimated for different sample sizes by generating a relatively short series of daily flows. The parameters of asymptotic distribution of statistics of partial sums can be obtained by equating the higher-order autoregressive models to an equivalent first-order autoregressive model with its rho sub 1 equal to the sum of all the autoregressive coefficients of the higher-order model. This is valid for all storage problems of practical interest. (Lee-ISWS)
W78-01012

DRAINING THE WATER PROJECTS OUT OF THE PORK BARREL,
J. D. Kirschten.
National Journal, Vol. 9, No. 15, p 540-548, April 9, 1977.

Descriptors: *Water policy, *Federal-State water rights conflicts, *Federal project policy, *Water resources development, *Colorado River basin, *Arizona, Federal government, Project purposes, Project feasibility, Colorado River, Water resources, Arid lands, Southwest, Water conservation, Environmental effects, Planning, Hoover Dam.
Identifiers: *Central Arizona project.

The attempt of the Carter Administration to shape a comprehensive national water policy is discussed. Problems resulting from past water policies are coming to a head in many areas of the country, perhaps most dramatically in the water-short Colorado River Basin. The particular problems of the Colorado River Basin are discussed from a historical perspective. (Ullery-Arizona)
W78-01045

USER REQUIREMENTS AND USER ACCEPTANCE OF CURRENT AND NEXT-GENERATION SATELLITE MISSION AND SENSOR COMPLEMENT, ORIENTED TOWARD THE MONITORING OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W78-01155

4B. Groundwater Management

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
Camp, Dresser and McKee, Belmont, CA. Water Resources Div.
H. O. Banks.
Water and Sewage Works, Vol 124, No 10, p 73-75, October, 1977. 7 ref.

Descriptors: *Groundwater, *Water policy, *Water law, *Water management(Applied), Water resources development, Administrative agencies, Governments, Water pollution control, Conjunctive use, Surface-groundwater relationships.
Identifiers: *National Water Commission, US Geological Survey.

Recommendations made by the National Water Commission offer a sound basis for management of the nation's ground water resources, including protection of ground water quality. However, it appears that little has been done to implement those recommendations since the Commission's report in 1973. NWC considered a wide variety of subjects relating to the water resources of the nation, including considerable emphasis on management of ground water resources and protection of ground water quality. Of particular interest were reports on state water laws, ground water law and administration, and on ground water management. The first steps toward full implementation of the Commission's recommendations should include (1) encouraging each state to enact the necessary body of law to achieve comprehensive, integrated management and control of its surface and ground water resources, and (2) reviewing and revising as necessary the several federal water resource programs to accord with the concept of comprehensive water resource management. (Eberle-NWWA)
W78-00966

GROUND-WATER RESOURCES OF THE LOWER SANTIAM RIVER BASIN, MIDDLE WILAMETTE VALLEY, OREGON,
Geological Survey, Sacramento, CA. Water Resources Div.; and Geological Survey, Portland, OR. Water Resources Div.
D. C. Helm, and A. R. Leonard.
Oregon Water Resources Department Ground-Water Report No 25, 1977. 75 p, 15 fig, 1 plate, 13 tab, 46 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Oregon, Hydrologic data, Water wells, Well data, Water yield, Irrigation, Drawdown, Groundwater recharge, Water level fluctuations, Alluvium aquifers, Groundwater availability, Projections, Maps.
Identifiers: *Lower Santiam River basin(Oreg), *Willamette Valley.

The lower Santiam River basin includes a 600-sq mi area in the middle Willamette River valley and adjacent foothills of the Cascade Range. Most ground-water development is in the 200-sq mi valley plains where alluvial aquifers contain about 2 million acre-ft of water. Those aquifers are recharged by winter precipitation, and the seasonal change in storage is about 190,000 acre-ft. In 1967, about 35,000 acre-ft of ground water was pumped, 85 percent for irrigation. The alluvial aquifers can sustain large additional withdrawals, at the expense of local evapotranspiration and seepage to streams. Volcanic and marine sedimentary rocks in the uplands serve as minor aquifers that yield adequate ground water for stock and domestic supplies. In one small area, the Columbia River Basalt Group yields water for irrigation, but water levels in the area are declining. Water in the lower Santiam basin generally is chemically suitable for drinking, irrigation, and most other uses. Saline water occurs locally in the consolidated rocks. (Woodard-USGS)
W78-01084

SUMMARY OF GROUND-WATER CONDITIONS IN THE JAFFNA PENINSULA, REPUBLIC OF SRI LANKA, WITH A PLAN FOR INVESTIGATING FEASIBILITY OF GROUND-WATER DEVELOPMENT,
Geological Survey, Trenton, NJ. Water Resources Div.
H. Meisler.

Open-file report 77-558, 1977. 47 p, 2 fig, 3 tab, 10 ref.

Descriptors: *Water resources development, *Groundwater resources, *Aquifer characteristics, *Saline water-freshwater interfaces, Foreign projects, Water wells, Pumping, Irrigation, Drawdown, Groundwater recharge, Springs, Monsoons, Wet seasons, Limestones, Karst, Lagoons, Hydrogeology, Water balance, Saline water intrusion, Evaluation, Groundwater availability.
Identifiers: *Ceylon, Sri Lanka, Jaffna Peninsula.

Ground water in the Jaffna Peninsula of Sri Lanka, Ceylon, occurs within solution openings of the Jaffna Limestone of Miocene age. The freshwater forms a complex of lenses up to 25 meters thick overlying saline water derived from the sea. Salt-water intrusion and upconing of the salt water has occurred at several locations primarily along the coast. Recharge to the aquifer occurs during October-December. Discharge is primarily to wells and to springs along the north coast. Spring discharge is small compared to withdrawal from wells. Pumping from wells in an intensively studied 142-square-kilometer area of the Peninsula was 55.5 million cubic meters in 1976, whereas discharge to visible springs was an estimated 9.3 million cubic meters. Pumping during January-September removes water from storage causing heads to decline and the salt water-freshwater interface to rise. The storage is replenished as heads increase and the interface is depressed during the following October-December. Consequently, most of the recharge goes into storage rather than discharging to the sea. (Woodard-USGS)
W78-01093

4C. Effects On Water Of Man's Non-Water Activities

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
H. F. Wise.
Water and Sewage Works, Vol 124, No 10, p 84-85, October, 1977.

Descriptors: *Groundwater, *Urbanization, City planning, Legislation, Land use, Community development.
Identifiers: *Non-point sources of pollution.

Planning agencies in the United States are progressively turning away from end-state planning and are looking into planning for gradual development by stages. Cost of urban sprawl and strength of various pieces of federal legislation on environment and resource control have helped bring this about. In addition, HUD has signed agreements reconciling its planning assistance programs and land use planning requirements to several important environmental agencies and programs: Section 208 of the Federal Water Pollution Control Act deserves special mention in this regard. Around the country, the implications of non-point source contributions of pollutants to the quality of the streams and lakes of the nation are just beginning to be understood. Management of non-point sources will be critical in maintaining ground water quality in the future. On the whole, however, signs are positive for increasing attention to environmental issues in land use planning. (Eberle-NWWA)
W78-00958

THE IMPACT OF SECOND-HOME DEVELOPMENT ON WATER AVAILABILITY IN NORTH CENTRAL ARIZONA,
Arizona State Univ., Tempe. Bureau of Business and Economic Research.
M. E. Bond, and R. H. Dunikoski.
Eisenhower Consortium Institutional Series Report No 1, April, 1977. 88 p, 1 fig, 20 tab, 35 ref, 3 append.

Descriptors: *Groundwater availability, *Water demand, *Arizona, *Waste water disposal, *Recreation, Forest management, Data collections, Water resources, Water availability, Overdraft, Waste water(Pollution), Water pollution, Wells, Surface water availability, Water supply, Water policy, Forecasting, Future planning(Projected), Arid lands, Water consumption.
Identifiers: Housing, Second-home development.

Objectives, designed for their relevance to the State of Arizona and the U.S. Forest Service, include a second home inventory and future projections, estimates of construction needs; data on current water requirements and waste water volume, projections of future water demands and wastes for various types of second homes; data on water availability; and a comparison of demand estimates with water availability as a basis for evaluating the impact of alternative types of second-home developments on water availability and quality in those areas of Arizona where such development is concentrated. The report defines a 'second-home,' describes trends in their development, and identifies development issues. The literature is reviewed of development trends and water consumption; the methodology employed in estimating the inventory is discussed; 1974 water consumption data estimating waste water is presented; future water demands for 1980 and 1985 are estimated; and the effect of the water supply issue in Arizona on future development is discussed. (Ullery-Arizona)
W78-01052

4D. Watershed Protection

FRICTION FACTORS FOR VEGETATED WATERWAYS OF SMALL SLOPE,
Agricultural Research Service, Stiliwater, OK. Water Conservation Structures Lab.
For primary bibliographic entry see Field 2E.
W78-01031

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SWAN MORTALITY DUE TO CERTAIN HEAVY METALS IN THE MISSION LAKE AREA, IDAHO,
Idaho State Dept. of Health and Welfare, Boise. Community Study on Pesticides.
For primary bibliographic entry see Field 5C.
W78-00903

PATELLA VULGATA: A BIOLOGICAL MONITOR OF COASTAL METAL POLLUTION - A PRELIMINARY STUDY,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
J. Navrot, A. J. Amiel, and J. Kronfeld.
Environmental Pollution, Vol. 7, p. 303-308, 1974. 2 fig, 1 tab, 11 ref.

Descriptors: *Trace elements, *Monitoring, *Heavy metals, *Silver, *Mercury, *Chromium, *Nickel, *Copper, *Zinc, *Mollusks, *Waste water(Pollution), *Strontium, *Carbonates, Water analysis, Water chemistry, Path of pollutants, Water pollution sources, Water pollution effects, *Bioindicators.
Identifiers: Tissue analysis, Bioaccumulation, *Limpet, Patella.

The measurement of trace element concentrations in the living tissue of the limpet Patella vulgata was proposed as a rapid and inexpensive technique for monitoring pollution of coastal water. Preliminary investigation of the heavy metal content, including Ag, Hg, Cr, Ni, Cu, and Zn, of both the skeletal and living parts of this common coastal mollusc was carried out on samples collected along the shore from Tel-Aviv at the Reading sewage pipe, to Dor. While the trace metal content of the carbonate skeletal material remained constant over this interval, significant variations were noted in the soft parts. The decrease in metal uptake appeared to be a function of increasing distance from the main source of contamination. (Katz)
W78-00906

MEASUREMENT OF PERIODIC OPEN AND SHUT SHELL MOVEMENT OF BIVALVES BY THE STRAIN-GAUGE METHOD,
Thoku Region Fisheries Research Lab., Shiogama (Japan).
For primary bibliographic entry see Field 7B.
W78-00911

SPECTROPHOTOMETRIC DETERMINATION OF MINERAL OILS IN WATER, (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Sverdlovsk (USSR).
G. A. Sereda, and V. A. Artemova.
Gig Sanit 9. 69-71. 1976.

Descriptors: *Mineral oils, *Spectrophotometry, Sewage.

High sensitivity, accuracy and reproducibility were estabilshed for the method. Sensitivity for transformer oil was 0.4 microg/ml, for turbine oil 1.2 microg/ml and for compressor oil 0.8 microg/ml. Since organic admixtures and inorganic salts used in water purification did not affect the analysis, the method can be considered to be sufficiently selective and can be used for quantitative analysis of mineral oils in sewage.--Copyright 1977, Biological Abstracts, Inc.
W78-00912

A PLEXIGLASS SUBSAMPLING BOX FOR LARGE BENTHOS SAMPLES,
QLM Labs., Inc., Oswego, NY.
For primary bibliographic entry see Field 7B.
W78-00913

A SALTWATER FLOW-THROUGH BIOASSAY METHOD WITH CONTROLLED TEMPERATURE AND SALINITY,
Environmental Research Lab., Gulf Breeze, FL.
L. H. Bahner, C. D. Craft, and D. R. Nimmo.
The Progressive Fish-Culturist, Vol 37, No 3, p 126-129, 1975. 1 fig, 5 ref.

Descriptors: *Design, *Research equipment, *Research and development, *Bioassay, *Salinity, *Temperature, Methodology, Shrimp, Crustaceans, Costs, Laboratory tests, Saltwater.
Identifiers: *Flow-through bioassay, Pink shrimp, Penaeus sp.

A saltwater flow-through bioassay system was developed with mechanisms for temperature and salinity controls so that experimental conditions could be accurately repeated. The system was used in bioassays with the pink shrimp, Penaeus duorarum, and the grass shrimp, P. pugio. Design, cost, and operational instructions were given. (Katz)
W78-00917

RESIDUE ANALYSES ON 2-AMINO-4-PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES -- III METABOLISM IN RAINBOW TROUT AND CARP,
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.

A. Suzuki, M. Shimura, T. Kikuchi, and Y. Sekizawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 7, p 837-847, 1977. 9 fig, 2 tab, 6 ref.

Descriptors: *Rainbow trout, Fish physiology, *Metabolism, *Chemical analysis, *Carp, *Chromatography, *Spectroscopy, *Radiochemical analysis, *Tritium, *Traces, Analytical techniques, Organic compounds, Qualitative analysis, Radioisotopes, Water analysis, Aquiculture, *Pollutant identification.
Identifiers: Biotransformation, *Anesthetics, Tissue analysis.

The major biotransformation product of 2-amino-4-phenylthiazole in rainbow trout (Salmo gairdneri irideus) was isolated from water following exposure to the anesthetic. The isolated crystalline metabolite was shown by means of ultraviolet, infrared and optical rotatory dispersion spectroscopy and gas chromatography to be identical to 2-amino-4-phenylthiazole-2-N-beta-mono-d-glucopyranosiduronic acid, the major biotransformation product previously found in medaka (killifish, Oryzias latipes). The major biotransformation product in carp (Cyprinus carpio) was also identified as 2-amino-4-phenylthiazole-2-N-beta-mono-D-glucopyranosiduronic acid. Conversion of 2-amino-4-phenylthiazole to the N-glucuronyl conjugate was 8 and 12%, respectively, in rainbow trout and carp. (Katz)
W78-00923

A SIMPLE PORTABLE VACUUM PUMP,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Botany.
R. D. King.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 63, 1976. 1 fig.

Descriptors: Vacuum pumps, Equipment, Description, *Pumps, *Sampling, On-site tests.

A vacuum pump is described which was used for long periods at a remote field station where very few facilities are available (Nuffield Lake Kariba Research Station, Rhodesia). The pump had to be simple, cheap to build and operate, and maintained by unskilled personnel. A further requirement was that the pump be operated in a small boat so that samples could be filtered immediately after collection (e.g., algae filtered on to glass fiber discs and placed into methanol for photosynthetic pigment extraction within 10 minutes of being collected.) This was necessary because of the high ambient air temperatures in the Zambezi Valley and the lack of accessible refrigeration equipment for sample storage. (So. Africa Water Info. Center)
W78-00931

ALGAL BIOASSAYS AND NITROGEN FIXATION,
National Inst. for Water Research, Pretoria (South Africa).
R. D. Walmsley, and D. F. Toerien.
South African Journal of Science, Vol 71, p 313-314, October 1975. 2 fig, 10 ref.

Descriptors: *Algae, *Nitrogen fixation, *Eutrophication, Phosphorus, Nutrients, *Bioassay.
Identifiers: Selenastrum, Anabaena.

The algal bioassay procedure used to establish the eutrophication level of Rietvlei dam is discussed. Selenastrum capricornutum and Anabaena flos-aquae were used. S. capricornutum the was the more convenient organism for the freshwater bioassays. (So. African Water Info. Center)
W78-00940

THE USE OF THE ISOTOPE 32P IN THE STUDY OF SOME ECOLOGICAL ASPECTS OF A LABORATORY STREAM ECOSYSTEM (IN AFRIKAANS),
Randse Afrikaanse Univ., Johannesburg (South Africa). Navorsingsgroep vir Varswaterbiologie.
H. J. Schoonbee, J. H. Swanepoel, and J. J. M. Van Graan.
Tydskrif vir Natuurwetenskappe, Vol. 15, No. 2, p 48-66, 1975. 7 fig, 9 tab, 24 ref. (English summary).

Descriptors: *Eutrophication, Sediments, Invertebrates, Fish, *Benthic flora, *Phosphorus radioisotopes, Laboratory tests, Ecosystems.
Identifiers: South Africa, Witwatersrand, Potamogeton pectinatus, Aplocheilichthys johnstonii.

A laboratory stream consisting of two stream sections interrupted by two pools was filled with a mixture of tap water and organically enriched water from rivers nearby. Bottom sediment material, Potamogeton pectinatus, macroinvertebrate organisms, as well as the mosquito fish, Aplocheilichthys johnstonni were collected from rivers around Johannesburg and introduced into the laboratory stream. After initial acclimatization, the distribution of the isotope 32P through this laboratory stream was followed. Absorption of this isotope by benthic algae, Potamogeton pectinatus, several macro-invertebrate organisms as well as Aplocheilichthys johnstonii was recorded. (So. African Water Info. Center)
W78-00945

SPECTROFLUOROMETRIC DIFFERENTIATION OF THE RED TIDE ALGA, GONYAULAX TAMARENSIS FROM OTHER ALGAE COMMON TO NEW ENGLAND WATERS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5C.
W78-00950

WATER QUALITY STUDIES OF SIXTEEN MINNESOTA RIVERS TRIBUTARY TO LAKE SUPERIOR,
Reserve Mining Co., Silver Bay, MN.
D. M. Wagner, R. S. Lemire, and D. W. Anderson.
Journal of Great Lakes Research, Vol. 2, No. 1, p 111-123, July 1976. 1 fig, 6 tab, 12 ref.

Descriptors: *Water quality, *Rivers, *Lake Superior, *Surveys, *Minnesota, Pollutants, Dissolved solids, Conductivity, Hydrogen ion concentration, Coliforms, Nutrients, Heavy metals, Silica, Chlorides, Calcium, Magnesium, Sodium, Potassium, Sulfates, Water pollution, Lakes, Water chemistry.

Water quality characteristics of 16 Minnesota rivers tributary to Lake Superior were studied during the period June 1971 to June 1972. Chemical, physical, and biological measurements included 8 major and 13 minor parameters, pH, conductivity, and coliform bacteria. The results of the one-year survey indicated which parameters exhibit seasonal differences, that there is an apparent cultural influence on some of the rivers studied, and that heavy rainfalls of short duration cause immediate and pronounced water quality changes. The spring thaw was characterized by an initial increase in the concentrations of dissolved constituents in the rivers, followed by a substantial decrease as the melt runoff period progressed. Quantities of soluble chemical constituents discharged to Lake Superior during the study period from all rivers sampled were calculated using published and computed annual discharge data. The total quantity of dissolved solids discharged to Lake Superior by the 16 rivers was approximately 339,600 metric tons per year. (Sims-ISWS)
W78-01036

DETROIT RIVER FLOW CHARACTERISTIC AND THEIR APPLICATION TO CHEMICAL LOADING ESTIMATES,
National Oceanic and Atmospheric Administration Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2E.
W78-01037

APPLICATION OF ECOSYSTEM MODELING METHODOLOGIES TO DREDGED MATERIAL RESEARCH,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects, Lab.
R. W. Hall, H. E. Westerdahl, and R. L. Eley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 207, Price codes: A04 in paper copy, A01 in microfiche. Technical Report D-76-3, June 1976. 66 p, 1 tab, 98 ref.

Descriptors: *Aquatic environment, *Ecosystems, *Dredged material, *Mathematical models, Methodology, Bioassay, Dissolved oxygen, Phytoplankton, Disposal, Systems analysis, Water quality.
Identifiers: *Physical models, Dredged material disposal.

Considered is the applicability of physical and mathematical ecosystem modeling methodologies to environmental problems associated with dredging and disposal operations. Three categories of physical models are discussed: bioassays, microcosms, and scaled ecosystem models. Mathematical models can be divided into classes, e.g., those predicting effects of allochthonous loadings on the dissolved oxygen budget or those determining the partitioning and dynamics of chemical constituents. Physical models can be used to quantify effects of environmental perturbations that cannot be adequately studied under field conditions and to serve as data generators and test systems for the development and evaluation of certain types of mathematical models. Physical models are most appropriate where processes are not adequately understood or quantified or where the resulting mathematical relationship are unsolvable with present numerical techniques. Mathematical modeling should be used in summarizing and analyzing large amounts of data and complex interactions to aid in predicting future events. Few model applications have been made to environmental problems related to dredging and disposal operations. Research should include concurrent laboratory, field, and modeling studies. Specific modeling approaches are recommended for research problem areas associated with dredged material disposal: colonization and ecological succession, biological productivity, material cycling, etc. The choice of modeling approach depends on many factors; most existing models will require modification, adaptation, and verification before use. (Bell-Cornell)
W78-01070

ANALYSIS OF STREET SWEEPINGS, PORTLAND, OREGON,
Geological Survey, Oklahoma City, OK. Water Resources Div.
T. L. Miller, J. F. Rinella, S. W. McKenzie, and J. Parmenter.
Open-file report, 1977. 16 p, 1 fig, 2 tab, 8 ref.

Descriptors: *Urban runoff, *Roads, *Dusts, *Chemical analysis, *Water pollution sources, River basins, Oregon, Analytical techniques, Methodology, Data collections.
Identifiers: *Street sweepings, *Portland(Oreg), *Willamette River basin.

Analysis of street sweepings provides data on physical, chemical, and biological characteristics of dust and dirt accumulating on Portland streets. Most of the analyses selected were based on the pollutant loads predicted by the Storage, Treat-

ment, Overflow, and Runoff Model (STORM). Five different basins were selected for sampling, and samples were collected three times in each basin. Sampling plots on streets were selected to reflect different land uses within the basin and different basin sizes. The sweepings from each plot were composited into one bag for the basin. The analytical determinations made for each dust and dirt sample included: total dry sample weight, dry sieving, percent moisture, percent ash, percent settleable solids, biochemical oxygen demand (BOD), total phosphorus, total nitrogen, and indicator bacteria analysis. A few samples were selected for lead and zinc analysis. Subsamples of the <2-mm wet material were placed directly in BOD bottles and mixed with Willamette River water. The Willamette River is the major receiving stream for most of the basins sampled. Therefore, using Willamette water gives some indication of the effect that street material might have on the river water. (Woodard-USGS)
W78-01077

ANALYSIS AND CHARACTERIZATION OF SUSPENDED SOLIDS IN PULP AND PAPER MILL EFFLUENT,
B. C. Research Ltd., Vancouver.
E. G-H. Lee, J. C. Mueller, and C. C. Walden.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 19-25, 4 fig, 8 ref, 6 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Water analysis, Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Filters, Effluents, Pulp and paper industry, Lime, Filtration, Dissolved solids, Biochemical oxygen demand, Environmental effects, Fish, Toxicity, Waste water(Pollution), Water pollution, Pollutant identification.
Identifiers: Filter paper, Kraft mills, Bleached pulp mills.

Suspended solids values were determined in raw, clarified, and limed and/or biotreated bleached kraft pulp mill effluents. The type of filter paper used in suspended solids analysis affected the suspended solids values. On raw bleached kraft pulp effluents the recommended Whatman GF/C filter (pore size 1.2 micrometers) produced similar traditional Reeve Angel 202 filter (pore size 25-45 micrometers) produced similar suspended solids values. However, the finer pore size filters produced up to 33 times greater suspended solids values on limed clarified bleached kraft mill effluents, and up to ten times greater values on biotreated bleached kraft mill effluents. The use of the Whatman GF/C or equivalent filter imposes a far more stringent definition of suspended solids on mills with lime neutralization and biotreatment systems than on other mills. The present regulatory analytical procedure was time-consuming when applied to limed and biotreated effluents, because the predominant suspended solids (calcium-lignin and biomass) plugged the filter and reduced filtration rates. Evidence indicated that on lime and biotreated effluents the standard procedure captures dissolved solids, thus distorting suspended solids values. Nonsedimenting solids originating during lime neutralization or biotreatment will settle and degrade slowly in receiving waters. Their 30-day BOD and nutrient loading (N and P) are low. They are not acutely toxic to fish. Thus, the environmental impact of these nonsedimenting solids is believed to be minor. (Swichtenberg-IPC)
W78-01102

INSTRUMENTS FOR THE DETECTION OF FIBER CONTENT IN EFFLUENTS AND FOR THE CLASSIFICATION OF RECYCLED FIBROUS MATERIAL,
Swedish Forest Products Research Lab., Stockholm.
L. Eriksson, and J. Hill.
British Paper and Board Industry Federation, Technical Section, Waste Utilization Symposium, Manchester, England, January 22-23, 1975 (Preprinted Proceedings), p 180-198. 10 fig.

Descriptors: *Instrumentation, *Pulp wastes, *Water analysis, *Fibers(Plant), Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Monitoring, Water quality, Pollutant identification.

The Fiberlog device was developed to continuously monitor the fiber content of paper mill effluents. The feasibility of using this device to monitor fibers in the reject stream from a pulp-cleaning screen is discussed. From data obtained, it is apparent that the Fiberlog can monitor the amount of good fibers in an environment enriched with fines and fillers. Similarly it can monitor the amount of fibers in an environment of shives. The performance of different alternatives for the processing of reclaimed fibers can be evaluated by the Swedish Forest Products Research Laboratory shives analyzer, which can also be used to evaluate the quality of a reclaimed stock in regard to pulp cleanness. (Sykes-IPC)
W78-01113

STUDIES ON LOW MOLECULAR WEIGHT COMPOUNDS IN KRAFT BLEACHING LIQUOR (IN JAPANESE),
Tokyo Univ. (Japan).
K. Kanazawa, S. Hosoya, and J. Nakano.
Japan Tappi, Vol 31, No 7, p 399-403, July, 1977. 8 fig, 2 tab, 4 ref. (English summary).

Descriptors: *Bleaching wastes, *Water analysis, *Organic compounds, *Pollutant identification, Pulp wastes, Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Gas chromatography, Mass spectrometry, Lignins, Effluents, Pollutants.
Identifiers: Kraft mills.

Low-molecular weight organic compounds identified in kraft pulp spent chlorination liquor by gas chromatography and mass spectrometry of methylated products included glycolic, fumaric, chloromaleic, and chlorofumaric acid (all originating from lignin). Major unidentified constituents, present in larger amounts that the identified compounds, are probably aliphatic carboxylic acids with conjugated double bonds, including two chloro-organic compounds. The succinic acid which was detected in spect chlorination liquor from unbleached kraft pulp probably derived from a nonlignin component. (Brown-IPC)
W78-01117

ASCORBIMETRIC DETERMINATION OF OXYGEN CONTENT IN WATER (ASKORBINOMETRYCZNA METODA OZNACZANIA ZAWARTOSCI TLENU W WODZIE),
Instytut Celulozowo-Papierniczy, Warsaw (Poland).
B. Lebska.
Przeglad Papierniczy, Vol 33, No 4, p 123-127, April, 1977. 6 tab, 7 ref. (English summary).

Descriptors: *Water analysis, *Dissolved oxygen, Analytical techniques, Water properties, Water chemistry, Lignins, Activated sludge, Effluents, Pulp and paper industry, Industrial wastes, Oxygen.
Identifiers: *Ascorbimetry, Spent sulfite liquors, Black liquors, Ascorbic acid.

Both the classical Winkler method and the Leithe method (oxidation of ferrous ions to ferric ions and titration of excess ferrous ions with permanganate) for the determination of dissolved oxygen have the drawback of not being applicable to colored solutions because of the difficulty in establishing the end point of titration. This drawback is eliminated in a modified Winkler method, in which titration of iodine is done with ascorbic acid solution. The procedure of ascorbimetry is described. When applied to distilled water, this method was simple and reproducible, and gave values close to those obtained by the Leithe method and the standard Winkler method. Similar conclusions were reached when the ascorbimetric method was applied to the determination of oxygen in dilute solutions of lignin, spent sulfite liquor, and black liquor. The intense violet color of the indicator makes it possible to use ascorbimetry for the analysis of colored solutions. Further tests of the method are needed in the presence of activated sludge, to determine its applicability to effluents subjected to biological purification. (Stapinski-IPC)
W78-01119

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS -- A MANAGEABLE PROBLEM,
B.C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W78-01127

NEW STATE-OF-THE-ART AUTOMATIC MICROELECTROPHORESIS INSTRUMENTATION,
Pen Kem, Inc., Croton-on-Hudson, NY.
J. G. Penniman.
TAPPI Papermakers Conference Papers, Chicago, April 18-20, 1977 (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 43-48. 8 fig, 1 tab, 9 ref.

Descriptors: *Instrumentation, *Water purification, *Zeta potential, *Electrophoresis, Waste water treatment, Analytical techniques, Colloids, Flocculation, Chemical precipitation, Pulp wastes, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry.

An automatic microelectrophoresis analyzer designated the Laser Zee system 3000 is described. This instrument is capable of providing mean mobility and mobility histogram data for a wide variety of colloids. The advantages of the grating microelectrophoresis analyzer over the laser doppler technique are cited. A description is given of optionally available modules which can provide a variety of sophisticated research and process control functions. Applications of the instrument to control paper machine wet-end chemistry and to improve waste water clarification are discussed. (Witt-IPC)
W78-01132

OBSERVATION OF BILINEAR SYSTEMS WITH APPLICATION TO BIOLOGICAL CONTROL,
New South Wales Univ., Kensington (Australia). Dept. of Systems and Control.
D. Williamson.
Automatica, Vol. 13, No. 3, p 243-254, May, 1977. 2 fig, 20 ref.

Descriptors: *Mathematical models, *Equations, *Estimating equations, *Biological treatment, *Microorganisms, Nutrient removal, Monitoring, Model studies, Theoretical analysis, Industrial wastes, Waste water treatment, Growth rates.

A series of bilinear equations are presented to describe the microbial cell growth and product formation of various waste treatment and fermentation systems. The model was developed for use when reliable monitoring devices are not available, to allow on-line estimates of components of biomass, substrate, and product formation other than the total biomass concentration and the concentration of a specific nutrient. Existing models which describe the rate of product synthesis are discussed. The application of the model to a situation in which the growth rate is nonlinear is presented. (Schulz-FIRL)
W78-01183

5B. Sources Of Pollution

PATELLA VULGATA: A BIOLOGICAL MONITOR OF COASTAL METAL POLLUTION - A PRELIMINARY STUDY,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 5A.
W78-00906

CONTENT AND UPTAKE OF TRACE METALS IN BENTHIC ALGAE, ENTEROMORPHA AND PORPHYRA I. MEASUREMENT AND VARIATION OF TRACE METAL CONTENT OF PORPHYRA GROWN IN NATURAL ENVIRONMENT,
Hiroshima Univ., (Japan). Faculty of Fisheries and Animal Husbandry.
T. Fujiyama, and M. Maeda.
Journal of the Faculty of Fisheries and Animal Husbandry, Hiroshima University, Vol. 16, No. 1, p 23-32, 1977. 9 fig, 1 tab, 12 ref.

Descriptors: *Algae, *Distribution, *Metals, *Trace elements, *Benthic flora, *On-site-investigation, Sampling, Analytical techniques, Absorption, Seasonal, *Iron, *Zinc, *Manganese, *Copper, *Lead, *Cadmium, Metabolism.
Identifiers: Bioaccumulation, Porphyra, Tissue analysis, Trace metals.

Trace metals in Porphyra were recovered more than 95% by the treatment of the alga with HNO3-HClO4-HCl. Ten to 20% of the standard deviations were obtained by the analyses of alga. The trace metals in Porphyra were divided into two groups according to their tendencies of seasonal and regional variations, one group being Fe, Zn, Mn, and Cu and the other group, Pb and Cd. The variation of chlorophyll a content was quite similar to that of Fe. The content of metals was different in Porphyra collected from regions other than the fixed stations. (Klein)
W78-00908

TEMPORAL CHANGES IN THE PLANKTON OF AN INDUSTRIALIZED ESTUARY,
University Coll. of Swansea (Wales). Dept. of Zoology.
P. L. Gabriel, N. S. Dias, and A. Nelson-Smith.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 145-151, 1975. 1 fig, 2 tab, 14 ref.

Descriptors: *Plankton, *Oil pollution, *Distribution patterns, *Ecological distribution, Population, Estuaries, Estuarine environment, Seasonal, Water pollution effects, Water pollution sources, Distribution, Environmental effects, Plankton, *Zooplankton, *Phytoplankton.
Identifiers: *Decapods, Milford Haven, Oil ports.

The distribution and seasonal succession of plankton in Milford Haven (Pembrokeshire) was described, in an attempt to detect changes which may have occurred as a result of pollution following the establishment of a major oil port in the estuary. Several species have disappeared or declined since 1960, although replacement species have appeared, and the abundance of plankton in the Haven as not diminished. Changes which have occurred are no greater than might have been produced by natural environmental change and population dynamics. (Katz)
W78-00914

CONTENT AND UPTAKE OF TRACE METALS IN BENTHIC ALGAE, ENTEROMORPHA AND PORPHYRA II. STUDIES ON THE ALGAE CULTURED IN SEA WATER SUPPLEMENTED WITH VARIOUS METALS,
Hiroshima Univ. (Japan). Dept. of Fisheries.
M. Maeda, and T. Fujiyama.
Journal of Faculty of Fisheries and Animal Husbandry, Hiroshima University, Vol. 16, No. 1, p 33-44, 1977. 7 fig, 7 tab, 14 ref.

Descriptors: *Manganese, *Cadmium, *Metals, *Algae, *Benthic flora, *Sea water, *Absorption, Metabolism, Biorhythms, Cycles, Behavior, Water quality, Laboratory tests, Analytical techniques, Plant physiology, Photoperiodism.
Identifiers: Porphyra, Enteromorpha, Bioaccumulation, Tissue analysis.

In the culture of Porphyra in sea water supplemented with metals, the uptakes of Mn and Cd were relatively high and increased in proportion to culture time when the metal concentration in water was high. Fe distributed evenly in all the three parts of fronds. Mn was concentrated in surface and middle layer, while Cd was accumulated mainly in the middle layer and a little in the surface layer. In general the uptake was high in the middle layer. In the uptake of Mn there was a clear distinction between light and dark conditions, that is, Mn was absorbed only during light period while Cd was absorbed regardless of light and dark periods. (Katz)
W78-00924

METHYLATION OF MERCURY IN A TERRESTRIAL ENVIRONMENT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
R. D. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 221, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/3-75-014, October 1975. 13 p, 1 fig, 6 tab, 25 ref.

Descriptors: *Metals, *Mercury, *Organic compounds, *Chemical reactions, *Soil properties, Ions, Soils, Soil texture, Soil moisture, Soil types, Mode of action, Environmental effects, Analytical techniques, Water pollution sources.
Identifiers: *Methylmercury, Terrestrial environment.

Methylation of applied divalent mercury ion was found to occur in terrestrial soil systems. The production of methylmercury was affected by soil texture, soil moisture content, soil temperature, concentration of the ionic mercury amendment, and time. Methylation was directly proportional to percent clay content, moisture content, temperature, and mercury concentration. After an initial buildup of methylmercury in the soil, there appeared to be a mechanism that decreased the methylmercury content with increasing time. (Klein)
W78-00926

TOXICITY TO FISH OF CYANIDES AND RELATED COMPOUNDS -- A REVIEW,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-00927

TRACE ELEMENT CONCENTRATIONS IN MARINE ORGANISMS FROM THE CAPE WEST COAST,
Atomic Energy Board, Pretoria (South Africa).
D. Van As, H. O. Fourie, and C. M. Vleggaar.
South African Journal of Science, Vol 71 No 5, p 151-154, 1975. 4 tab, 7 ref.

Descriptors: *Heavy metals, *Trace elements, Marine animals, *Marine fish, Marine plants, South Africa, Path of pollutants, Radioactive wastes.

The accumulation of trace elements by marine organisms is an important marine ecological parameter. Radioactive effluent releases to the sea make a knowledge of these concentration factors of the utmost importance. Marine organisms studied in this survey include Chloromytillus meridionalis, Donax serra, Haliotus midae, Jasus lalandii, Parechinus, Pyura, Ulva, Ecklonia, Porphyra, Suhria and Gigarina. Seventeen species of line, white and pelagic fish were included in the analyses, as well as seawater and plankton samples. Details of sample treatment and the results of analysis for Cr, Fe, Zn, Co, Mn, Sb and Cs are described. (So. African Water Info. Center)
W78-00937

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
M. R. Scalf, W. J. Dunlap, and J. F. Kreissl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 702, Price codes: A03 in paper copy, A01 in microfiche. EPA-600/3-77-096, Ecological Research Series, August, 1977. 43 p, 11 fig, 4 tab, 22 ref.

Descriptors: *Septic tanks, *Environmental effects, *Water pollution sources, *Sewage disposal, Waste water disposal, Groundwater, Regulation, Design, Groundwater movement, Soil properties, Porosity, Permeability, Human population, Sludge, Leaching.
Identifiers: *Soil absorption fields.

Septic tank-soil absorption systems are the most widely-used method of on-site domestic waste disposal in the U.S., and their total number continues to increase. Because of their widespread use in unsuitable situations, however, they have in many cases demonstrated the potential for contamination of ground and surface waters. Among the reasons for failure of septic tank-soil absorption system to function safely are: (1) unsuitable soils for conventional systems, perhaps in as much as one-half of the U.S. (2) lack of scientific basis for state and local codes governing system design and construction (3) density of population. Proper modification for problem areas and greater attention to zoning and land use planning can greatly reduce the pollution hazards of this valuable waste disposal alternative. Further research into septic system design and movement of pollutants through various types of soils is recommended. (Eberle-NWWA)
W78-00967

HOW RECENT FEDERAL LEGISLATION HAS MOVED TOWARD GREATER PROTECTION OF GROUNDWATER RESOURCES.
Geraghty and Miller, Inc., Port Washington, NY.
For primary bibliographic entry see Field 6E.
W78-00969

EFFECT OF VARIOUS TECHNOLOGICAL FACTORS ON THE COLOR OF PULP MILL EFFLUENTS (WPLYW ROZNYCH CZYNNIKOW TECHNOLOGICZNYCH NA BARWE SCIEKOW POCELULOZOWYCH),
C. Leszczynski, and J. Zielinski.
Przeglad Papierniczy, Vol. 30, No. 8, p 290-296, August, 1974. 5 fig, 9 tab, 25 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Color, *Bleaching wastes, Hydrogen ion concentration, Pulp and paper industry, Chlorination, Industrial wastes.

A review of the pertinent literature shows that studies of the effects of technological, physical, chemical, and biochemical factors on the color of pulping effluents were rather fragmentary, and as a result the industry does not have sufficient data which would allow a proper selection of treatment methods to conform to increasingly strict requirements concerning the color of effluents discharged into waterways. In an attempt to fill existing gaps in this area, the effects of the following factors on the effluent color were determined: pH, concentration, visible and UV radiation, iron salts, chlorine compounds, and biological purification by the activated sludge method. The study was conducted on dilute kraft black liquor and dilute

spent sulfite liquor, effluents from chlorination of kraft and sulfite pulps, and effluents from alkaline extraction of these two pulps. Data on the changes in color (degree and direction) resulting from pH variations, dilution, addition of iron salts, etc. make it possible to predict the changes of the color of water in the waterway into which an effluent is discharged. Generally, the pH is an important factor determining the color intensity and as a rule the color intensity increases with the pH. Purification by the activated sludge method does not reduce the color intensity and in some cases may increase it. The removal of color by treatment with chlorine compounds is uneconomical. (Stapinski-IPC)
W78-00989

SANITARY LANDFILLS, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-01004

RESEARCH ON THE WATER QUALITY OF THE RIVER TARO FROM FORNOVA TO THE MOUTH (IN ITALIAN),
Parma Univ. (Italy).
E. Bellelli, U. Bracchi, and G. Sansebastiano.
Ateneo Parmense Acta Nat 12(3): 213-238. 1976. (English summary).

Descriptors: *Organic matter, *Rivers, Phenols, Viruses, Bacteria, Italy.

From Dec. 1972-Nov. 1973 researchers on the water quality of the river Taro, Italy, from beginning of the alluvial cone to the mouth, were performed, with special reference to organic loads, phenols, viral and bacterial concentrations. Between the confluence of the tributary, Ceno, and the S. Quirico bridge, the chemical parameters of organic contamination maintain fairly low levels while the total bacterial count at 20 and at 37 C and the count of total and fecal coliforms appear constantly high. Downstream of the tributary, Stirone, most part of the analytical parameters increase in significant concentrations. Most of the polluted loads (organic matters and phenols) apparently are between the S. Quirico and the Taro mouth, and are mainly conveyed by the Stirone. The bacterial content otherwise is constantly high upstream and exceeds the proposed limits for recreation and bathing use. Along the observed tract of the river, Salmonellas were frequently isolated, while viruses only at S. Quirico sampling station.--Copyright 1977, Biological Abstracts, Inc.
W78-01016

POLLUTANT TRANSFER INTO WATER BODIES,
Pennsylvania State Univ., University Park. Dept. of Chemical Engineering.
W. J. Brtko, and R. L. Kabel.
Water, Air, and Soil Pollution, Vol 6, No 1, p 71-95, August, 1976. 10 fig, 51 ref. EPA-R005168 and EPA-R800397.

Descriptors: *Path of pollutants, *Mass transfer, *Model studies, Diffusion, Dispersion, Turbulence, Flow, Mixing, Reynolds number, Turbulent flow, Eddies, Equations, Air pollution, Air-water interfaces.
Identifiers: *Eddy cell models.

Two mathematical models for determination of the liquid mass transfer coefficient in turbulent fluid were presented as a part of a study on the uptake of atmospheric pollutants by water bodies. The eddy cell model and the large eddy model were compared to determine which was more efficient in predicting the overall liquid phase mass transfer coefficient. This was done on the basis of the Reynolds number (Re1) for valves of turbulence in the energy containing range. For values of Re1 less than 60, the use of the large eddy model was recommended, while for values of Re1 greater than 425, the eddy cell model was recommended. For intermediate values of Re1 either model could be used. The drawbacks of the models lie in the fact that they take the friction velocity as being logarithmic, while it actually varies with the wind. Moreover, the models are based on the assumption that the liquid surface remains flat with no wave formation. Thirdly, the models assume the existence of thermal neutrality in the liquid phase. The predicted values of the liquid phase mass coefficient for either model deviate from experimental results. The deviation can vary from 15% when the turbulence can be closely characterized, to 100% when the circumstances in actual field situations must be approximated. (Harris-Wisconsin)
W78-01019

WATER POLLUTION INVESTIGATION: LOWER GREEN BAY AND LOWER FOX RIVER,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Standards.
D. J. Patterson, E. Epstein, and J. McEvoy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 615, Price codes: A17 in paper copy, A01 in microfiche. Report EPA/905/9-74/017 June 1975. 371 p, 83 fig, 25 tab, 30 ref, 6 append. EPA-905/9-74-017, EPA 68-01-1572.

Descriptors: *Water quality, *Water pollution sources, *Baseline studies, Wisconsin, Rivers, Bays, Algae, Plankton, Nutrients, Nitrogen, Eutrophication, Phosphorus, Dissolved oxygen, Permits, Regulation, Ice cover, Effluents, Industrial wastes, Computer models.
Identifiers: *Green Bay(WI), *Fox River(WI).

An extensive survey of water quality in the lower third of Green Bay and the Lower Fox River (WI) was conducted September 1973-September 1974 in connection with enforcement actions against industrial and municipal waste discharges. Fifteen chemical and physical parameters were monitored at 68 sampling sites in Lower Green Bay; effluent information for the Lower Fox, Peshtigo, Oconto, and Menomonie rivers was derived from surveys carried out from 1939-1973. The most critical dissolved oxygen condition occurs during summer low flow in the Lower Fox River, when little or no DO is present. Winter ice cover (January-April), together with high organic loadings and nearly zero reaeration, have caused as much as 150 sp mi of lower Green Bay to suffer severe dissolved oxygen (DO) depletion. Long-term biochemical oxygen demand is the prime determinant of the severity of the winter DO deficit. Lake Winnebago is the largest source of nitrogen and phosphorus in the Lower Fox River; ammonia toxicity may continue to be a problem even if treatment plants remove ammonia from effluents. Since nitrification in the river is not substantial, little DO change will result from removing ammonia. Blooms of nitrogen-fixing blue-green algae (Aphanizamenon) predominated in July, probably controlled by the phosphorus concentration, which is high in the spring. These algae add large quantities of nitrogen to the bay. Survey results are given in tabular form, along with a description of computer models developed to evaluate discharge permits. (Lynch-Wisconsin)
W78-01022

METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF POLLUTANTS.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 303, Price codes: A08 in paper copy, A01 in microfiche. EPA-430/9-73-014, October 1973. 269 p, 29 fig, 24 tab, 366 ref.

Descriptors: *Pollutants, *Water pollution sources, *Sediments, *Water pollution, *Water quality, Thermal pollution, Pesticide residues, Agricultural chemicals, Pesticides, Surface waters, Forest management, Agriculture, Mining, Construction, Acid mine water, Nutrients, Evaluation, Groundwater.
Identifiers: *Non-point pollution sources, Acid drainage, Microbial pollution, Pollutant transport.

The study was undertaken to provide documentation of presently available knowledge of the pollution potential to surface and groundwaters from agricultural, silvicultural, construction, and mining activities. The study was concerned with the nature (kinds of pollutants, their sources, and their relative importance) and extent (the magnitude of pollutant emissions: quantities, concentrations) of nonpoint water pollution. Particularly important are factors which relate an emitted pollutant to its source, for the study was designed to assist the planner/engineer in evaluating nonpoint sources of pollutants and their effects on water quality in regional planning areas. The following were investigated as sources of pollution: (1) Agriculture-croplands, grasslands, and livestock; (2) Silviculture-forest culture, harvesting, and logging practices; (3) Mining-new, current, and abandoned surface and subsurface mines, and associated sites and facilities; and (4) Construction-land development, highways and roads, and other heavy construction. (Henley-ISWS)
W78-01024

NUMERICAL MODELING OF POLLUTANT TRANSPORT USING A LAGRANGIAN MARKER PARTICLE TECHNIQUE,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 5G.
W78-01069

ANALYSIS OF STREET SWEEPINGS, PORTLAND, OREGON,
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-01077

NITROGEN LOADS AND CONCENTRATIONS IN FLORIDA STREAMS,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01082

WATER AND RELATED PROBLEMS IN COAL-MINE AREAS OF ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
A. L. Knight, and J. G. Newton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 527/AS, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-130, April 1977. 51 p, 22 fig, 1 tab, 36 ref.

Descriptors: *Water pollution, *Coal mine wastes, *Mine acids, *Sedimentation, *Alabama, Streams, Water quality, Dissolved solids, Sulfates, Hydrogen ion concentration, Hardness(Water), Evaluation, Forecasting, Strip mines, Water pollution sources, Path of pollutants.
Identifiers: Plateau coal field, Warrior coal field, Cahaba coal field, Coosa coal field.

Water-resource problems or potential problems in Alabama resulting from surface and subsurface coal mining include erosion and sedimentation, flooding, diversion of drainage, decline in water level, land subsidence, and the degradation of water quality. The degradation of water quality is the most serious and widespread coal-mine related problem in Alabama. The chemical quality of water in numerous streams draining coal-mine

areas has been altered drastically. The pH of water draining from mined areas commonly ranges from 2.1 to 5.0, generally has high sulfate and dissolved solids concentrations, is hard to very hard, and may contain objectionable amounts of iron. The detrimental quality of water in some streams may persist for decades after mining has ceased. Without proper safeguards, additional mining may cause a significant deterioration in the quality of water in major streams where the more mineralized mine waters are now diluted. (Woodard-USGS)
W78-01094

CLOSING UP KRAFT MILL SYSTEMS -- REDUCTION OF EFFLUENTS AND CONTROL OF MATERIAL BALANCES,
Swedish Forest Products Research Lab., Stockholm
For primary bibliographic entry see Field 3E.
W78-01108

THE ROLE OF TOXIC COMPOUNDS IN THE REVISION OF THE 1983 EFFLUENT GUIDELINES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-01122

OUTFALL DIFFUSER SYSTEMS -- DESIGN AND INSTALLATION,
Simons (H. A.) International Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 8B.
W78-01126

TOXICITY, BOD, AND COLOUR OF EFFLUENTS FROM THE KRAFT PULPING OF BOLE WOOD CONTAINING HIGH QUANTITIES OF BARK,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 89-97. 4 fig, 5 tab, 21 ref.

Descriptors: *Pulp wastes, *Bark, *Toxicity, *Color, *Biochemical oxygen demand, *Effluents, Pulp and paper industry, Wastes, Industrial wastes, Chemical oxygen demand, Hardwood, Softwood, Effluents.
Identifiers: *Kraft pulping, Black liquors, Trembling aspen(Populus tremuloides), Black spruce(Picea mariana), Jack pine(Pinus banksiana), Western red-cedar(Thuja plicata).

Kraft pulping of Populus tremuloides, Picea mariana, Pinus banksiana, and Thuja plicata wood without and with 15% bark was studied under single set of pulping conditions (e.g., effective alkali and sulfide based on wood and total H-factor) for a given species. No attempts were made to optimize the pulping of wood with bark by varying the pulping conditions. Preliminary results indicated that the toxicities of black liquors from trembling aspen, black spruce, and western red-cedar increased significantly when the wood contained bark. There was no detectable difference in the toxicity of black liquor between pulping 100% jack pine and pulping jack pine with bark. BOD and COD loadings of the simulated brown stock decker filtrate did not appear to be increased markedly by the pulping of wood and bark mixtures. However, color loadings were increased by an average of 65% for the four species. (Witt-IPC)
W78-01128

EFFECTS OF URBAN LAKES ON SURFACE RUNOFF AND WATER QUALITY,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W78-01135

WATER POLLUTION CAUSED BY INACTIVE ORE AND MINERAL MINES - A NATIONAL ASSESSMENT,
Toups Corp. Santa Ana, CA.
H. W. Martin, and W. R. Mills, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 936, Price codes: A09 in paper copy, A01 in microfiche. EPA-600/2-76-298. December 1976. 195 p, 17 fig, 15 tab, 4 append.

Descriptors: *Water pollution sources, *Mine drainage, *Mine wastes, *Mine acids, *Mining, Metals, Erosion control, Slope protection, Sediment control, Regional analysis, Environmental effects, Pollution abatement, Industrial wastes.

A 12-month study was conducted between July 1975 and July 1976 to identify the extent of water pollution caused by inactive mines, define present water pollution abatement technology, and examine the use and effectiveness of current waste water treatment methods. The study indicated that 70% of the associated streams were affected by acid mine drainage (AMD) and heavy metals and 50% were affected by sedimentation. Economic geology and production methods are discussed, including mining, mineral processing, processing technology for major commodities, and waste disposal and production. Factors affecting acid and metals in receiving waters are discussed, including natural buffering systems in stream systems, sulfate as an indication of AMD, and transportation and removal of pollutants in streams. Studies on toxicities and biological effects of pollutants are examined with respect to aquatic life and municipal and agricultural uses. A national summary of the impact of mining is presented. Existing types of control technology which are assessed include infiltration control, retention and regulation of mine drainage, treatment of AMD, erosion prevention, and sedimentation basins. Research and development is suggested for the effects of mine drainage on groundwater quality, assessment of mercury in surface waters from gold milling, improvement of pollution monitoring techniques, chemistry related to mine drainage, air and erosion prevention technology, natural mineral formations as traps for dissolved ions, botanical treatment, physical chemical treatment, and the effects of mining techniques on pollution control. (Schulz-FIRL)
W78-01158

FOLLOW-UP INVESTIGATION ON CYANIDE COMPLEX DETECTED FROM PULP SLUDGE (SEISI SURAGI KARA KENSHUTSU SARETA SHIAN KAGOBUTSU NI TSUITE NO TSUISEKI CHOSA),
Shizuoka Prefectural Inst. of Public Health (Japan).
T. Nagano, S. Hattori, T. Nagai, Y. Ukishima, and C. Unno.
Eisei Kagaku, Vol. 23, No. 2, p 121-124, 1977. 1 fig, 3 tab, 8 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Analytical techniques, *Nitrogen compounds, Organic wastes, Chemical wastes, Path of pollutants, Industrial wastes, Waste water treatment.
Identifiers: Cyanide, Ink.

Various parameters were measured in pulp wastes sampled from June 1973 to June 1974 at a location which receives discharges from many pulp and paper industries in Fuji City, Japan. Soluble and percolated solutions of the sludges were analyzed for color, pH, COD, BOD, total mercury, lead, cyanide, and PCB. Cyanide ion concentrations were measured in pulp sludges obtained from nine factories. Significant levels of cyanide were detected in four of the sludges and the values ranged from 0.01 to 5.3 ppm. Additional analyses were performed for samples collected at various points within the factory having the highest cyanide concentration, and values obtained with the pyridine-pylazolone and ion-electrode methods were compared. The analyses indicated that the highest cyanide levels are expected in the pulp sludge and in pulp produced from waste paper without prior removal of the ink. The de-inking, aggregation, and sedimentation processes resulted in cyanide concentration in the sludge. (Schulz-FIRL)
W78-01174

5C. Effects Of Pollution

TOXICITIES OF 'EXCESSIVELY' CHLORINATED ORGANIC COMPOUNDS,
Florida Inst. of Tech., Melbourne. Dept. of Biological Sciences.
B. M. Katz, and G. M. Cohen.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 6, p 644-650, 1976. 5 fig, 1 tab, 10 ref.

Descriptors: *Toxicity, *Organic compounds, *Chlorine, *Chlorination, *Water chemistry, Farm wastes, Industrial wastes, Chemical reaction, Water pollution sources, Mortality, Phenols, Fish physiology, Bioassay, Water treatment, Water quality, Sewage treatment.
Identifiers: *Mosquito fish, Gambusia, Tryptophan, Tannic acid.

Chemical tests were performed on several classes of common compounds before and after excessive chlorination to determine whether such treatment could transform relatively innocuous substances into toxic ones or potentiate pre-existing toxicities. Chlorination caused phenol and tryptophan to become exceedingly toxic to mosquito fish. In addition, fish placed in excessively chlorinated tap water (10 ppm) quickly died. The excessive Cl apparently reacted with the fish bodies to form one or more stable and highly toxic organochlorine compounds as evidenced by the continued toxicity of the test water after the elimination of the residual chlorine. In contrast to tryptophan and phenol, excessive chlorination of tannic acid reduced toxicity. The toxicity of 14 other diverse compounds was unaltered by excessive chlorination. (Katz)
W78-00901

EGG MORTALITIES IN WILD POPULATIONS OF THE DUNGENESS CRAB IN CENTRAL AND NORTHERN CALIFORNIA,
California Univ., Bodega Bay. Bodega Marine Lab.
W. S. Fisher, and D. E. Wickham.
Fishery Bulletin, Vol. 75, No. 1, p. 235-237, 1977. 1 tab, 6 ref.

Descriptors: *Crabs, *Mortality, *Embryonic growth stage, *Nutrients, Biological membranes, Water pollution effects, Pathology, Commercial shellfish, Crustaceans, Growth stages, Animal physiology, California, Commercial shellfish.
Identifiers: Cancer, *Epibiotic fouling, Dungeness crab, Crab eggs.

Crab eggs were sampled from four regions of the California Coast. The samples were then used to compute peripheral and overall mortality estimates for each region. The results were consistent between regions except for the area closet to San Francisco Bay, which had much higher mortalities. Earlier research by the authors suggested that nutrients from S.F. Bay were carried northward by the prevailing coastal current causing an increase in epibiotic fouling which restricted gaseous exchange across the egg membrane and increased egg mortalities. (Katz)
W78-00902

SWAN MORTALITY DUE TO CERTAIN HEAVY METALS IN THE MISSION LAKE AREA, IDAHO,
Idaho State Dept. of Health and Welfare, Boise. Community Study on Pesticides.
W. W. Benson, D. W. Brock, J. Gabica, and M. Loomis.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 2, p. 171-174, 1976. 1 tab, 11 ref.

Descriptors: *Heavy metals, *Mine wastes, *Lead, *Swans, *Whistling swan, *Toxicity, *Mortality, Spectrophotometry, Pollutants, Animal physiology, Water birds, Pathology, Water pollution effects, Analytical techniques, Idaho.
Identifiers: Tissue analysis, *Lead poisoning.

Thirteen swans found dead were autopsied and their tissues were analyzed for lead. All swans exhibited typical signs associated with lead poisoning. Lead residues in bone was indicative of chronic exposure. The intestinal tracts had a blue-gray or greenish cast, which denotes the presence of lead sulfide. Only one bird had lead shot in the gizzard indicating that these birds did not die from ingestion of pellets. It appears that high lead levels were related to ingestion of vegetation which was contaminated with lead. (Katz)
W78-00903

FENITROTHION TOXICITY TO THE FRESHWATER CRAYFISH, ORCONECTES LIMOSUS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
D. W. McLeese.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p. 411-416, 1976. 2 tab, 10 ref.

Descriptors: *Toxicity, *Mortality, *Lethal limit, Pesticides, *Lobsters, *Crayfish, *Organophosphorous pesticides, Phosphothioate pesticides, *Pesticide toxicity, *Pesticide kinetics, Crustaceans, Shellfish, Water pollution effects.
Identifiers: *Fenitrothion, Orconectes.

Fenitrothion has been routinely used as an aerial forest spray for spruce budworm control. Following spraying, concentrations of up to 4.8 ppb were found in streams. This study attempted to ascertain whether the sensitivity of the freshwater crayfish to Fenitrothion was as extreme as related to marine crustaceans. It was determined that there is a definite size effect, the large crayfish having longer resistance times at a particular lethal concentration and having a higher lethal threshold than small ones. The lethal threshold values were 4ppb for small and 20 ppb for large crayfish, values much higher than those for the lobster. (Katz)
W78-00904

RELATIONSHIPS BETWEEN THE BIVALVE MACOMA BALTHICA AND BACTERIA IN INTERTIDAL SEDIMENTS: MINAS BASIN, BAY OF FUNDY,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
V. Tunnicliffe, and M. J. Risk.
Journal of Marine Research, Vol. 35, No. 3, p. 499-507, 1977. 2 fig, 1 tab, 37 ref.

Descriptors: *Intertidal areas, *Littoral, *Tidal effects, *Benthic fauna, *Sediments, Particle size, Population, *Bacteria, Density, Variability, *Biological communities, Sediment-water interfaces, *Bottom sediments, Nitrogen, Molluscs, *Public health, *Clams.
Identifiers: Macoma, *Bay of Fundy.

The extensive intertidal flats of the Minas Basin, Bay of Fundy, support some of the highest population densities of Macoma balthica ever recorded. Densities were positively correlated with density of bacteria in the sediment; correlations with tidal elevation and organic carbon content of the sediment were not significant. Macoma density appeared to be related to the amount of fine material present in the sediment. Although Macoma feeds on the bacteria within the sediment, it must supplement its diet by suspension-feeding during high tide in order to acquire sufficient protien. (Katz)
W78-00905

QUANTITATIVE STUDIES ON MARINE BIODEGRADATION OF OIL, III. COMPARISON OF DIFFERENT CRUDE OIL RESIDUES AND EFFECTS OF SEA WATER SOURCE,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
S. J. Davis, C. F. Gibbs, and K. B. Pugh.
Environmental Pollution, Vol. 13, p. 203-215, 1977. 5 fig, 3 tab, 5 ref.

Descriptors: *Oil, *Oil pollution, *Nitrogen, *Nitrogen compounds, *Nitrates, *Nutrient removal, *Biodegradation, *Microbial degradation, *Oxygen demand, *Oxidation, *Chemical degradation, Laboratory equipment, Persistence, Water pollution, Analytical techniques, Chemical analysis, Temperature.
Identifiers: Respirometer, *Crude oil residues, Kuwait crude oil, North Sea crude oil.

A respirometric method, which had been used previously for studying the degradation of Kuwait crude oil residue in local sea water, was used again with two different crude oil residues as substrates. However, the differences found appeared to be due mainly to the sample of sea water rather than to the type of oil. This may be due to microbial adaption to the nutrient regimes of winter sea water contrasted with summer sea water. The supply of available nitrogen appeared to be the limiting factor at any given temperature, as was the case in the earlier work, but nitrate was not reduce to such very low concentrations. Also in comparison with this earlier work, there was rather less oxygen uptake in proportion to nutrient uptake, particularly at the higher temperature, temperature having less effect on this relationship. About half of each crude oil residue appeared almost undegradable. Similar changes in oil properties occurred, but in the case of Forties (North Sea) oil residue, the relative density did not come to exceed that of sea water. Further work is required to find whether degradation and other weathering processes will eventually cause it and other North Sea oils to sink. (Katz)
W78-00907

CONTENT AND UPTAKE OF TRACE METALS IN BENTHIC ALGAE, ENTEROMORPHA AND PORPHYRA I. MEASUREMENT AND VARIATION OF TRACE METAL CONTENT OF PORPHYRA GROWN IN NATURAL ENVIRONMENT,
Hiroshima Univ., (Japan). Faculty of Fisheries and Animal Husbandry.
For primary bibliographic entry see Field 5B.
W78-00908

USE OF SALT (NACL) WATER TO REDUCE MORTALITY OF CHINOOK SALMON SMOLTS, ONCORHYNCHUS TSHAWYTSCHA, DURING HANDLING AND HAULING,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
For primary bibliographic entry see Field 5G.
W78-00909

TEMPORAL CHANGES IN THE PLANKTON OF AN INDUSTRIALIZED ESTUARY,
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-00914

EFFECT OF CHRONIC EXPOSURE OF BROOK TROUT TO SUBLETHAL CONCENTRATIONS OF HYDROGEN CYANIDE,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
W. M. Koenst, L. L. Smith, Jr., and S. J. Borderius.
Environmental Science and Technology, Vol 11, No 9, p 883-887, 1977. 4 tab, 17 ref.

Descriptors: *Brook trout, *Toxicity, *Mortality, *Growth stages, *Spawning, Fish eggs, Juvenile growth stage, Fecundity, Fertility, Trout, Salmonids, Water pollution effects, Path of pollutants, Laboratory tests, Laboratory equipment, Bioassay.
Identifiers: *Hydrogen cyanide, *Cyanide, Sublethal concentrations, Continuous flow, Bioassay.

Brook trout, Salvelinus fontinalis (Mitchell), were exposed to various concentrations of hydrogen cyanide to determine the effects of continuous exposure on survival, growth, and reproduction. Continuous flow experiments were begun with adults 144 days prior to spawning and were continued through a 90-day growth period of the second generation. The maximum acceptable toxicant concentration (MATC) of hydrogen cyanide was between 5.7 and 11.2 micro g/l based on the spawning data. (Katz)
W78-00915

THE INFLUENCE OF AMMONIA ON THE OXYGEN DELIVERY SYSTEM OF COHO SALMON HEMOGLOBIN,
Rhode Island Univ., Kingston. Dept. of Animal Science.
R. J. Sousa, and T. L. Meade.
Comparative Biochemistry and Physiology, Vol 58A, p 23-28, 1977. 3 fig, 4 tab, 29 ref.

Descriptors: *Oxygen, *Ammonia, *Respiration, *Oxygen requirements, *Salmon, *Acid-base equilibrium, *Hydrogen ion concentration, Spectrophotometry, Nitrogen compounds, Metabolism, Fish physiology, Growth stages, Bioassay, Toxicity, Carbohydrates.
Identifiers: Hemoglobin, Glycolysis.

Prolonged exposure of coho salmon to elevated levels of environmental ammonia causes a progressive acidemia which, sequentially, has a negative effect on the oxygen carrying capacity of the blood pigment - hemoglobin. The toxic effect is induced by accumulation of acid metabolites brought about by an enzymatic stimulation of glycolysis by NH4+ and the simultaneous suppression of TCA cycle activity. As HCO3- is removed from the blood system to neutralize excess hydrogen ions generated by these acids, the ratio between HCO3- and PCO2 is distributed and the blood pH decreases. The resulting acidemia causes oxygen to be prematurely released from hemoglobin by abnormally shifting the equilibrium curve to the right and simultaneously reducing the maximum saturation of hemoglobin for oxygen. If the oxygen tension in the external environment is not immediately increased to compensate for the shift in the equilibrium curve, or if the ammonia stress is not diminished, the organism is susceptible to death by suffocation. (Katz)
W78-00916

A SALTWATER FLOW-THROUGH BIOASSAY METHOD WITH CONTROLLED TEMPERATURE AND SALINITY,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-00917

ROLE OF UN-IONIZED AMMONIA IN PREDISPOSING GILL APPARATUS OF ALBURNUS ALBURNUS ALBORELLA TO FUNGAL AND BACTERIAL DISEASES,
Istituto Italiano di Idrobiologia, Pallanza.

G. Giussani, I. Borroni, and E. Grimaldi.
Memorie dell'Instituto Italiano de Idrobiologia, Vol 33, p 161-175, 1976. 11 fig, 1 tab, 29 ref.

Descriptors: *Mortality, *Ammonia, *Myxobacteria, *Fish diseases, *Eutrophication, *Pathogenic bacteria, *Pathogenic fungi, Water pollution effects, Organic matter, Pathology, Bacteria, Fishkill, Fish populations, Fungi.
Identifiers: *Tissue analysis, *Bleak, Alburnus, Branchiomyces, Gill disease, Lake Maggiore(Italy).

Mass mortalities of fungal and bacterial origin occurring in bleak population (Alburnus alburnus alborella) in Lago Maggiore (Northern Italy) did coincide with very sharp peaks of un-ionized ammonia. It was hypothesized that the pathogenic conditions observed in the bleak were not due to a direct toxic action of un-ionized ammonia but rather were attributable to its noxious stimulus role. This action predisposed the gill apparatus to the attack of different pathogens. Possible relationships with the eutrophication process were also discussed. (Katz)
W78-00918

ACUTE TOXICITY OF FOUR ORGANOPHOSPHORUS INSECTICIDES TO A FRESHWATER TELEOST CHANNA PUNCTATUS (BLOCH),
University of the Panjab, Lahore (Pakistan). Dept. of Zoology.
M. A. Anees.
Pakistan Journal of Zoology, Vol 7, No 2, p 135-141, 1975. 4 fig, 2 tab, 29 ref.

Descriptors: *Bioassay, *Toxicity, *Organophosphorous pesticides, *Insecticides, *Diazinon, Teleosts, Pesticides, Lethal limit, Freshwater fish, Water pollution effects, Water pollution sources, Environmental effects, Fishkill.
Identifiers: *Malathion, *Parathion, *Dimethoate, Channa.

Static bioassays were carried out to determine the acute toxicity of four organophosphorus insecticides to a freshwater teleost Channa punctatus (Bloch). 96-hr median tolerance limit (TLm) was in the following orders; diazinon (0.455 ppm), malathion (0.920 ppm), methyl parathion (2.150 ppm), and dimethoate (20.500 ppm). Behavioral symptoms of acute intoxication in fish were similar to those reported to appear after inhibition of acetylchloinesterase by organophosphates. Mechanism of death by, and variations in species susceptibility to organophosphorus insecticides were discussed. (Katz)
W78-00919

PHYTOPLANKTON, PHYTOPLANKTON GROWTH AND BIOMASS CYCLES IN AN UNPOLLUTED AND IN A POLLUTED POLAR LAKE,
J. Kalff, H. J. Kling, S. H. Holmgren, and H. E. Welch.
Verhandlungen Internationale Verein fur theoretische und ungewandte Limnologie, Vol. 19, p 487-495, 1975. 6 fig, 1 tab, 14 ref.

Descriptors: *Phytoplankton, *Growth rates, *Biomass, *Seasonal, *Eutrophication, *Oligotrophy, Aquatic microorganisms, Population, Biological communities, Lake ice, Lake stages, Lakes, Water pollution effects, Sewage, Domestic wastes, Phytoplankton, Biomass.
Identifiers: Ultraoligotrophic lakes, Char Lake, Meretta Lake.

This paper compared the biomass and biomass cycles as well as community and some species growth rates in ultraoligotrophic Char Lake and sewage polluted Meretta Lake (Canada). The phytoplankton biomass varied 5.5 fold between a low of 30 mg m-3 close to the end of the polar night and a summer maximum of 166 mg m-3 in unpolluted Char Lake and ranged 63 fold in sewage polluted Meretta Lake where the equivalent range was between 104 and 6560 mg m3 during the May 1969 to March 1971 study period. The maximum Char and Meretta Lake biomass values indicate that Char Lake is ultraoligotrophic and Meretta Lake is mildly eutrophic. Maximum community growth rates (k) computed from primary production rates and biomass are quite similar at approximately 0.13 and 0.17, respectively, in the ultraoligotrophic and the polluted lake and indicate a similar metabolic activity per cell. (Katz)
W78-00920

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENT AND OVERLYING WATER,
R. B. Davis, D. L. Thurlow, and F. E. Brewster.
Verhandlungen Internationale Verein fur theoretische und ungewandte Limnologie, Vol. 19, p 382-394, 1975. 10 fig, 5 tab, 17 ref.

Descriptors: *Phosphorus, *Radiochemical analysis, *Tracers, *Phosphorus, Radioisotopes, *Tubificids, Bottom sediments, *Lake sediments, *Sediment-water interfaces, Radioactivity techniques, Worms, Aquatic animals, Bottom sampling, Chemical analysis, Eutrophication, Productivity.
Identifiers: *Bioturbation.

Radioactive phosphoric acid introduced into water overlying undisturbed sediment was taken up rapidly by the sediment where most of the 32P became aluminum- and iron-bound. Tubificids accelerated the decrease of 32P in the water and the depth of penetration of the sediment, but much of the mobility of 32P was due to diffusion. Release of 32P from the sediment to overlying water with or without oxygen occurred but was impeded near the interface especially when oxygen was present. The worms did not affect the release of 32P to the water. The worms reduced the proportion of PO4-P in the interstitial water of the uppermost sediment, probably due to their effect of increasing Eh there. However, most of the mobile-32P was in some form other than PO4 which was probably redox-insensitive. The moderate effects in these experiments probably reflect the moderate populations of worms used. Under some eutrophic conditions, populations in excess of 10,000/m2 occur. (Katz)
W78-00921

ECOLOGICAL ASPECTS OF COOLING WATER DISCHARGES. (IN SWEDISH),
Entomol. Avd., Uppsala, Swed.
Ulf. Grimas.
Fauna Flora (Stockh) 70(2): 50-55. 1975. (English summary).

Descriptors: *Cooling water, *Heated water, Nuclear powerplants, *Environmental effects, Organic matter, Discharge(Water).

The heat of the cooling water from fossil fueled and nuclear power plants might lead to serious effects in the environment. There is a direct local effect on the activity of organisms and on the combination of species in the communities, which affects the catchability of fish. The increased temperature stimulates the incorporation of toxic matter as heavy metals and biocides in organic material, leading to a conservation of products in the waters, which cover a much larger area than heat itself. Negative effects in a regional scale can also be apprehended by the favorable effects of heat on fish parasites and diseases. The heat increases the rate of decomposition of organic matter in the receiving water and the induced flow of water permits transportation of, e.g., O2. Management of cooling water systems requires detailed information on the ecological function of the affected water body and an increased experience of synergistic effects.--Copyright 1977, Biological Abstracts, Inc.
W78-00922

RESIDUE ANALYSES ON 2-AMINO-4-PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES -- III METABOLISM IN RAINBOW TROUT AND CARP,
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.
For primary bibliographic entry see Field 5A.
W78-00923

CONTENT AND UPTAKE OF TRACE METALS IN BENTHIC ALGAE, ENTEROMORPHA AND PORPHYRA II. STUDIES ON THE ALGAE CULTURED IN SEA WATER SUPPLEMENTED WITH VARIOUS METALS,
Hiroshima Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5B.
W78-00924

EFFECT OF HYDROGEN SULFIDE ON FISH AND INVERTEBRATES PART II-HYDROGEN SULFIDE DETERMINATION AND RELATIONSHIP BETWEEN PH AND SULFIDE TOXICITY,
Minnesota Univ., St. Paul, MN. Dept. of Entomology, Fisheries and Wildlife.
S. J. Broderius, and L. L. Smith, Jr.
Report EPA-600/3-76-0626, 1976. 109 p, 3 fig, 17 tab, 65 ref, append.

Descriptors: *Analytical techniques, *Methodology, *Hydrogen sulfide, *Hydrogen ion concentration, *Toxicity, *Freshwater fish, *Minnows, Temperature, Mortality, Bioassay, Colorimetry, Equilibrium, Environmental effects, Water properties.
Identifiers: *Fathead minnows.

Analytical techniques were used to define the relationship between pH and sulfide toxicity to the fathead minnow. Within the pH range of 7.1 to 8.7, 96-hr LC50 values for molecular H2S decreased linearly from 57.3 to 14.9 micro g/liter with increasing pH. However, the log 96-hr LC50 values of dissolved sulfide increased linearly from 64.0 to 780.1 micro g/liter with increasing test pH ranging from 6.5 to 8.7. (Katz)
W78-00925

METHYLATION OF MERCURY IN A TERRESTRIAL ENVIRONMENT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5B.
W78-00926

TOXICITY TO FISH OF CYANIDES AND RELATED COMPOUNDS -- A REVIEW,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
P. Doudoroff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 528, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-038, April 1976. 154 p, 123 ref.

Descriptors: *Nitrogen compounds, *Toxicity, *Lethal limit, *Water quality standards, *Water pollution effects, *Path of pollutants, *Fish physiology, *Fish behavior, Hydrogen ion concentration, Temperature, Animal growth, Dissolved oxygen, *Bibliographies, *Reviews.
Identifiers: *Cyanides, *Nitriles, Cyanogen chloride, Thiocyanates, *Cyanates, Sublethal effects.

The world literature on the toxicity to fish of simple and complex cyanides, nitriles, cyanogen chloride, thiocyanates, and cyanates was was reviewed critically and interpretively. Differently determined limits of toxicant concentrations tolerated by various fishes were compared, and

their variation with exposure time, the pH, temperature, and dissolved oxygen and mineral content of the water, body size, age, acclimation, etc. was examined. Interactions of free cyanide with other toxic water pollutants also were considered. Available data on effects of sublethal levels of free cyanide on growth, food consumption and utilization, swimming ability, behavior, etc., and observations on avoidance reactions of fish to the toxicant were summarized and their ecological significance were discussed. (Katz)
W78-00927

ALGAL BIOASSAYS AND NITROGEN FIXATION,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-00940

THE USE OF THE ISOTOPE 32P IN THE STUDY OF SOME ECOLOGICAL ASPECTS OF A LABORATORY STREAM ECOSYSTEM (IN AFRIKAANS),
Randse Afrikaanse Univ., Johannesburg (South Africa). Navorsingsgroep vir Varswaterbiologie.
For primary bibliographic entry see Field 5A.
W78-00945

SPECTROFLUOROMETRIC DIFFERENTIATION OF THE RED TIDE ALGA, GONYAULAX TAMARENSIS FROM OTHER ALGAE COMMON TO NEW ENGLAND WATERS,
Massachusetts Inst. of Tech., Cambridge.
S. Ezekiel, B. Kerfoot, and G. White.
Massachusetts Institute of Technology Sea Grant Report No. MITSG 77-18, Index No. 77-318-Efw, September 1977. 56 p, 24 fig, 2 tab, 17 ref, append. SG-04-6-158-44081.

Descriptors: *Red tide, *Algae, Toxins, Pollutant identification, *Shellfish, Monitoring, New England.
Identifiers: Spectrofluorometry, Gonyaulax tamarensis, Shellfish poisoning, Saxitoxin.

Cutlures of Gonyaulax tamarensis were subject to spectrofluorometric analyses for discimination from common endemic algae of the New England area for possible use in an airborne spectrofluorometric system. Extracts of G. tamarensis and other dinoflagellates display a fluorescence emission different from other algae tested. Live cultures did not display the unique emission with a laser of excitation source limited frequencies. Detection limits of G. tamarensis by chlorophyll a determination is 60 cells per milliliter in live cultures. (NOAA)
W78-00950

THE RIVER SKAWA: WATER CHEMISTRY AND EUTROPHICATION, (IN POLISH),
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
For primary bibliographic entry see Field 2K.
W78-00990

NITROGEN YIELD COEFFICIENT OF THE GREEN ALGA, SELENASTRUM CAPRICORNUTUM PRINTZ,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien, D. J. Steyn, and S. I. Kohlmeyer.
South African Journal of Science, Vol 71, p 217-218, July 1975. 1 fig, 1 tab.

Descriptors: Algal growth, Algae bioassay, Eutrophication, Algae cultures, Algae yield, Dams, Growth curve, Nitrogen yield coefficient, Nitrogen phosphorus ratio, Phosphorus, Nitrogen.
Identifiers: Selenastrum capricornutum, Hartebeestpoort, Rietvlei, Roodeplaat, Vaal dam, South Africa.

Algal bioassays carried out during studies on the eutrophication levels of the Hartebeestpoort, Roodeplaat, Rietvlei and Vaal dams provided data from which the nitrogen yield coefficient could be estimated, and the growth curves of S. capricornutum under nitrogen limiting conditions could be predicted. (So. African Water Info. Center)
W78-01000

PRELIMINARY RESULTS OF A SURVEY OF FRESHWATER NEMATODES IN SOUTH AFRICA,
Randse Afrikaanse Univ., Johannesburg (South Africa).
J. Heyns.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 43-45, 1976. 5 tab, 1 ref.

Descriptors: Nematodes, Freshwater biology, Aquatic habitat, Species composition, Species diversity, Species abundance, Water pollution, Frequency distribution.
Identifiers: South Africa, Tobrilus, Monhystera.

An extensive survey of the freshwater nematodes of South Africa was initiated in 1973, and 170 samples have been processed to date. Of these 107 came from the Vaal Triangle, the other 63 from rural areas in the Transvaal (Rustenburg, Groblersdal and Nelspruit/Barberton), the Vaal River in the Parys area, the Eastern Cape Province in the vicinity of Port Elizabeth and Humansdorp, and the Western Cape Province from Hermanus to Clanwillian. Preliminary results revealed that most habitats yield relatively small numbers of species, and that this tendency is more pronounced in polluted areas. Whereas the incidence of most nematode groups showed a marked decrease under polluted conditions, the genera Tobrilus and Monhystera appeared to thrive in these areas. (So. African Water Info. Center)
W78-01005

RECENT EVOLUTION OF THE DIFFERENT LEVELS OF MARINE POLLUTION OF THE SOFT SUBSTRATUM LINKED WITH THE BIG SEWER OF MARSEILLE-CORTIOU. (IN FRENCH),
G. Bellan, R. A. Kaim-Malka, and J. Picard.
Bull Ecol 6(2): 57-66. 1975. (English summary).

Descriptors: *Marine animals, *Water pollution effects, France, *Sewers, Outlets.

The marine populations established on the soft substratum near the sea outlet of the big sewer of the city of Marseilles (France) have shown considerable modification during the last 3 yr. The classical effect of pollution (the effect on the level of populations by a large extension of the so-called subnormal area) is joined to a deflector effect. The construction of a stable and extended flow of detritus modified the currents on the bottom and removed some populations (e.g., Leptometra phalangium).--Copyright 1977, Biological Abstracts, Inc.
W78-01015

EUTROPHICATION OF LAKES,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
L. Landner.
World Health Organization, Regional Office for Europe, December, 1976. 78 p, 11 tab, 310 ref.

Descriptors: *Eutrophication, *Lakes, *Bibliographies, *Reviews, Documentation, Publications, Ecosystems, Water quality control, Nutrients.
Identifiers: Lake restoration.

This review of the literature of lake eutrophication includes works from 1968 to 1973, with an update to January 1976. For literature prior to 1968 two earlier reviews are cited. In this report, eutrophication control measures are emphasized, with less attention given to causes of eutrophication. Major sections include aging of lakes, eutrophication symptoms and indices, causes of eutrophication, nutrient sources, eutrophication effects, and lake rehabilitation techniques. A 22-page bibliography follows the extensive literature summary. The subject of eutrophication is at present going through an extremely dynamic research phase, and in many cases the contributions cited have enabled causes and control measures to be identified. As lakes are very complex ecosystems, some kind of simplification has been needed to conceptualize these systems. Vollenweider (1975) has developed a sophisticated set of black box models requiring only inputs and outputs, by which it is possible to predict dangerous phosphorus and nitrogen loadings of lakes relative to the 'mean depth-water fill-in time' ratio. Much fundamental research is still needed for a satisfactory biological understanding of eutrophication. In particular, the complex interactions among the different causes of eutrophication are poorly known. (Lynch-Wisconsin)
W78-01020

FATAL DISEASE,
Cornell Univ., Ithaca, NY.
S. A. Carter.
Environment, Vol. 19, No. 3, p 16-20. April 1977, 22 ref.

Descriptors: *Human pathology, *Epidemiology, *Public health, *Human diseases, Water pollution sources, Protozoa, Diseases, Bacteria, Thermal pollution, Soil microorganisms, Sewage, Organic compounds, Hatching.
Identifiers: *Primary amoebic menigoencephalitis(PAME), Amoebae, *Naegleria.

The role of water pollution in the development of amoebae causing a newly-recognized human disease called primary amoebic menigoencephalitis (PAME) is discussed. Seventy-five cases, many in young children, have been reported in the last 20 years. Symptoms include severe headaches, low-level fever, elevated white cell counts in the spinal fluid, and meningeal irritation. Symptoms usually appear within a few days to a week after contact with contaminated water. Amoebae of the genus Naegleria have been implicated as a cause of the disease. The presence of certain bacteria is necessary for development of several kinds of soil amoebae. Large amounts of organic matter in soil will favor an extensive development of bacteria, which will be accompanied by an abundance of protozoa such as Naegleria. Soil containing amoebae can reach bodies of water from dust raised by plowing, wind, or cars. The cysts (nonpathogenic resting stage of the amoebae) may reach warm, polluted waters through these sources. The high bacterial concentrations in many streams and lakes, due to raised temperatures caused by thermal pollution, can stimulate 'hatching' of amoebae into pathogenic forms, capable of infecting humans. (Spaeth-Wisconsin)
W78-01021

ENVIRONMENTAL IMPACT ASSESSMENTS FOR U.S. AND CANADIAN INDUSTRIES,
Jordan (Edward C.), Inc., Portland, ME.
W. H. Parker, III, and B. A. Patrie.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 1-6, 6 tab.

Descriptors: *Environmental effects, *Canada, *United States, *Pulp wastes, Water pollution sources, Pulp and paper industry, Legislation, Economic impact, Social impact, Water quality standards, Foreign countries, Toxicity, Air pollution.
Identifiers: Kraft mills, Bleached pulp mills.

Environmental impact assessment statements (prepared by Edward C. Jordan Co., Maine) for a proposed Canadian and an American bleached kraft pulp mill demonstrate the comprehensive approach to such studies and illustrate differences between Canada's and the U.S.A.'s environmental programs. Both studies have a similar broad-based perspective on environmental impacts, which include not only media impacts (air/land/water) but also social and economic impacts resulting from project construction and operation. Notable differences in the two study programs are: (1) the Canadian and American mill sites have two dissimilar receiving waters (oceans vs. stream) for treated effluent disposal. (2) Differences in Canadian and U.S. water quality protection programs allow for a discrepancy in the water treatment systems recommended for the two similar mills. Canadian water quality guidelines include effluent limits for the conventional pollution parameters and stringent effluent toxicity limits. The U.S. standards are based on more detailed and stringent effluent limits but do not consider toxicity. (3) Air quality criteria for the canadian assessment are guidelines while U.S. Federal and State criteria are requirements. (Swichtenberg-IPC)
W78-01099

ANALYSIS AND CHARACTERIZATION OF SUSPENDED SOLIDS IN PULP AND PAPER MILL EFFLUENT,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W78-01102

CONTRIBUTION TO THE PHYTOPLANKTON OF THE BAKANSKE RAMENO, A TRIBUTARY OF THE DANUBE RIVER (IN CZECH),
Slovenska Narodne Muzeum, Bratislava (Czechoslovakia).
S. Juris.
Zb Slov Nar Nuz Prir Vedy 21: 55-70. 1975. (Germany summary).

Descriptors: *Phytoplankton, Rivers, Czechoslovakia, Danube River.
Identifiers: Rameno, River, Tributary.

The results of a qualitative and quantitative study of the phytoplankton of the Danube tributary, Bakanske Rameno, which empties into the Danube are presented. These results, obtained in 1971, carry data on the developmental dynamics of the phytoplankton in this, the largest affluent to the Danubian flooding zone in Czechoslovakia. Reports on the presence or absence of a large number of species are given for various dates. This is followed by quantitative charts for total phytoplankton.--Copyright Biological Abstracts, Inc. 1977
W78-01116

WATER POLLUTION CAUSED BY INACTIVE ORE AND MINERAL MINES - A NATIONAL ASSESSMENT,
Toups Corp. Santa Ana, CA.
For primary bibliographic entry see Field 5B.
W78-01158

5D. Waste Treatment Processes

MICROBIAL SELF-PURIFICATION BY THE LAGOON METHOD, (IN FRENCH),
Lille-1 Univ., Villeneuve d'Ascq (France).
J. Walker, B. Carbonnelle, and H. Leclerc.
Water Res 11(1), 17-30. 1977.

Descriptors: *Self-purification, Salmonella, *Oxidation lagoons, Lagoons.

The technique of water purification by the lagoon method was studied on the microbiological plane after injecting Salmonella and mycobacteria (both of an animal strain) over a period of 44 days into an experimental basin. Parallel experiments were made with the tracer dye rhodamine. The survival of the microorganisms in the water was periodically tested in the laboratory in order to determine the biological factors playing a part during purification. The results are significant to phenomena of particle retention and diffusion, and for the elimination of pathogenic bacteria. The factors that may influence the survival of Salmonella are the charge of organic matter and the bacterial charge. The organic charge favors bacterial survival. When the microbial charge corresponds to an indigenous flora, activity contributes to the elimination of the pathogens. The mycobacteria are rapidly eliminated. None of the samples taken from the effluent contained myobacteria.--Copyright 1977, Biological Abstracts, Inc.
W78-00910

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-00967

CONTINUOUS CHLORINATION OF CONTAMINATED WATER,
Ecodyne Corp., St. Paul, MN. Lindsay Div.
E. E. Finder.
Water Well Journal, Vol 31, No 10, p 41-42, October, 1977. 1 fig, 2 tab.

Descriptors: *Water treatment, *Chlorination, Water wells, Disinfection.
Identifiers: *Individual water systems, Bacterial kill factor.

The process of continuous chlorination will, under normal circumstances, usually provide bacteriologically safe water for drinking and other household uses when contamination of an individual water supply exists. Since the health of the persons drinking chlorinated water depends upon proper maintenance and monitoring of treatment equipment, laboratory testing of chlorinated water is advised. Effective amounts of chlorine in water normally are not toxic to humans or animals. Concentrations great enough to be potentially harmful would be so unpalatable that such water would not be consumed. Feed pump systems to provide chlorination operate simultaneously with water well pumps. The chlorine solution is fed at a point between the water pump and the pressure tank. Depending upon the amount of contact time needed for a given situation, coiled lengths of pipe may be added to the system to delay the arrival of water from the chlorine pump to the pressure tank to insure complete disinfection. Filters of activated charcoal can be used to remove chlorine taste and odor from the water once the treatment process is completed. (Eberle-NWWA)
W78-00971

EXPERIMENTS ON THE OPTIMIZATION OF SOLIDS RECOVERY FROM EXCESS RECIRCULATED PAPER MILL WHITE WATER IN SVEEN-PEDERSEN SAVEALLS (INCERCARI DE OPTIMIZARE A PROCESULUI DE RECUPERARE A MATERIALULUI DIN APELE RE RECIRCULATIE EXCEDENTARE DE LA FABRICAREA HIRTIEI, LA RECUPERATORUL SVEEN-PEDERSEN),
F. Talis, A. Popovici, and C. Casariu.
Celuloza si Hirtie, Vol. 23, No. 2, p 80-85, February, 1974. 4 tab, 7 fig, 10 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Suspended solids, *Fibers(Plant), Mathematical models, Recirculated water, Industrial water, Pulp and paper industry, Operations research, Statistical models, Filtration.
Identifiers: *White water, *Fillers, Savealls(Filters).

A mathematical model for fiber (fines) and filler recovery from white water in Sveen-Perdersen savealls is presented, along with experimental data obtained from a paper machine making filled papers from 100% bleached pulp. The results were analyzed statistically in order to arrive at optimum operating conditions. (Brown-IPC)
W78-00982

STUDY OF FACTORS INFLUENCING THE PHYSICO-CHEMICAL PURIFICATION OF PULP AND PAPER INDUSTRY WASTE WATERS WITH ALUMINUM SULFATE (STUDIUL FACTORILOR CARE INFLUENTEAZA EPURAREA FIZICO-CHIMICA A APELOR REZIDUALE DIN INDUSTRIA CELULOZEI SI HIRTIEI),
G. Rozmarin, and M. Totolin.
Celuloza si Hirtie, Vol. 23, No. 2, p 66-72, February, 1974. 3 tab, 5 fig, 8 ref.

Descriptors: *Pulp wastes, *Chemical precipitation, *Aluminum, *Sulfates, *Lime, *Waste water treatment, Separation techniques, Sedimentation, Coagulation, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Pulp and paper industry.
Identifiers: *Aluminum sulfate.

Statistical analysis and regression equations were used to evaluate laboratory experiments conducted under static conditions in order to find those varialbes of greatest significance to the treatment of pulp and paper mill effluents by chemical coagulation/sedimentation. At a constant settling time of 30 minutes, 98.5% of the variations in sedimented solids were attributable to alum dosage (36%), Ca0 dosage (13%), homogenization (mixing) time (4%), initial suspended solids content (39%), and interaction of these parameters (balance). Variations of solids suspended in the purified water were 96.8% accountable for by these variables; variations in COD, 95.88%; and variations in 5-day BOD, 99%. The Alum dosage was responsible for 66.7% of the Variability in suspended solids and BOD and for 69.7% of the COD variation. (Brown-IPC)
W78-00983

CHEMICAL PRECIPITATION AND SEDIMENTATION OF WALLBOARD MILL WASTE WATER (KJEMISK FELLING OG SEDIMENTERING AV WALLBOARDVANN),
Norwegian Pulp and Paper Research Inst., Oslo.
O. Ronning, and G. Rodland.
Norsk Skogindustri, Vol. 28, No. 12, p 368-369, 373, December, 1974. 4 fig, 6 tab, 1 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Water purification, *Flocculation, *Chemical precipitation, Aluminum, Sulfates, Hydrogen ion concentration, Alkalis(Bases), Calcium hydroxide, Polyelectrolytes, Sludge disposal.
Identifiers: Building board, Sodium hydroxide, Sodium aluminate, Wallboard, Aluminum sulfate.

Effluents from a fiber building board factory have been clarified by flocculation with AVR (Fe-containing aluminum sulfate) and pH adjustment with NaOH, calcium hydroxide, or sodium aluminate. The combination of calcium hydroxide with AVR achieved the best purification under optimum flocculating conditions, and was also the most economical alternative. Further addition of a polyelectrolyte reduced the sludge volume and increased its sedimentation rate. Attempts to recirculate the sedimented sludge to the furnish via a secondary headbox indicated a promising approach to the sludge-disposal problem. (Brown-IPC)
W78-00984

CONSIDERATIONS AND POSSIBILITIES OF OPTIMIZING THE WATER CIRCUITS OF THE BRAILA PULP AND PAPER MILL

(CONSIDERATII SI POSSIBILITATI PRIVIND OPTIMIZAREA CIRCUITELOR APELOR DE FABRICATIE LA C.C.H.-BRAILA),
For primary bibliographic entry see Field 3E.
W78-00985

CHEMICAL AGENTS USED IN THE EFFLUENT TREATMENT PLANT (POMOCNE CHEMICKE PROSTREDKY V CISTIRNE ODPADNICH VOD),
M. Milichovsky, and P. Vymazal.
Papir a Celuloza, Vol 29, No 10, p 243-244, 1974. 1 fig, 5 ref.

Descriptors: *Filtration, *Pulp wastes, *Waste water treatment, *Water purification, *Sludge treatment, Industrial wastes, Sludge, Aluminum, Sulfates, Separation techniques, Lime.
Identifiers: Percol 140, Polyacrylamide, Polymin SN, Polyethylenimine.

A mechanical treatment plant for the effluent from a board mill is described. The plant consists of two parallel operating clarifiers. The sludge-handling part consists of drum filters for the separation of the fibrous fraction which is reused, and Wagner filters for the fine fraction which is disposed of in a landfill. The treatment process uses a combination of alum and Percol 140 (polyacrylamide) added ahead of the clarifiers. The water is neutralized with CaO. The fine sludge conditioning to improve the separation is done with Polymin SN added in the amount of 30 g/kg of dry sludge. To achieve a good retention of fine particles on the wire, alum is also added to the stock. (Trubacek-IPC)
W78-00987

FLOCCULATING AGENTS DERIVED FROM KRAFT LIGNIN,
British Columbia Research Council, Vancouver.
A. B. McKague.
Journal of Applied Chemistry and Biotechnology, Vol 24, No 10, p 607-615, October, 1974. 4 tab, 12 ref

Descriptors: *Lignins, *Flocculation, *Pulp wastes, *Color, Ammonium salts, Aluminum, Sulfates, Organic compounds, Colloids.
Identifiers: *Indulin AT, 4-propylguaiacol, Mannich reaction.

The Mannich reaction product, a dihydrooxazine, and a quaternary ammonium salt were prepared in high yield from the lignin model compound, 4-propylguaiacol. Extension of the same reactions to the purified kraft lignin, Indulin AT, gave products which flocculated and removed color from bleached kraft mill effluent. Color removal was most efficient with the Indulin AT quaternary ammonium derivative where, in one case, a dose of 250 mg/liter at pH 7.2 removed 95% of the color. The product from the dihydrooxazine preparation had the poorest flocculating characteristics; the Indulin AT Mannich base was intermediate. None of the lignin materials was as efficient as aluminum sulfate in removing color. (Witt-IPC)
W78-00988

ELECTRICITY INDEPENDENCE FOR TWO MUNICIPAL SERVICES.
Gas and Oil Power, Vol. 68, No. 775, p 180-183, Winter, 1972. 6 fig.

Descriptors: *Treatment facilities, *Sewerage, Floods, Cities, Flow rates, Sludge digestion, Pumping plants, Electrical power.
Identifiers: Bristol, England, Sludge gas, Fuel requirements, Sewage pumping.

In the municipal area of Bristol, England, the problem of river pollution due to increased population is being checked by regular improvement and extensions to the sewer system and new sewage pumping and treatment works. The storm water interceptor tunnel, designed to relieve flooding in parts of the city, is used also to convey sewage from the out-lying areas. The main pumping station is designed for an ultimate mean dry weather flow of 2.05 cu m/sec and a maximum flow of 12.25 cu m/sec. Providing base-load elctrical power to meet the requirements of the sewage treatment plant and main pumping station are four naturally aspirated dual-fuel engines each coupled to a 494kW, 3.3kV, 500 rev/min alternator of the self-regulating type. With the use of waste heat recovery, an overall thermal utilization of 82 percent is achieved at full load. Investigations to assess the future works' load and pumping load indicate that extensions to the generating station would meet the increasing loads. Additional fuel to meet the increased requirements of the extended powerplant installation will be provided by extensions to the works' sludge digestion tanks and gas recovery plant. On completion, sludge gas yield will be sufficient to meet the fuel requirements of the engines when the alternator sets are providing base-load power for the sewage works and incinerator. The dual-fuel operation of the latest engines employs a hydralically operated gas inlet valve fed from a high-pressure pump via a camshaft-driven distributor. (Sandoski-FIRL)
W78-00991

INTERCEPTOR INSTALLATION FOR YUBA CITY, CALIFORNIA.
Water and Sewage Works, Vol 120, No 1, p 80-82, January, 1973. 2 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Interceptor sewers, Pipes, Construction, Plastic pipes, California.
Identifiers: Yuba City(Calif), Techite.

A reinforced plactic mortar interceptor for a regional waste water treatment plant is part of a planned, staged development project for upgrading the sewage treatment capability of Yuba City, California. The interceptor, which is 1.8 miles long, is connected at its beginning to the new treatment plant under construction and traverses a depth of from 18 feet to 14 feet. The line contains 2950 feet of 42-inch inner diameter gravity pipe, and 6175 feet of 36-inch inner diameter gravity pipe, 325 feet of 25-inch inner diameter gravity pipe, and 315 feet of 18-inch inner diameter force main pressure rated at 150 feet per head. The Techite reinforced plastic mortar pipe, manufactured by United Technology Center of Riverside, California, was purchased and trucked to the site in 20 foot lengths. (Sanoski-FIRL)
W78-00994

DISSOLVED AIR FLOTATION FOR COMBINED SEWER OVERFLOWS,
Engineering-Science, Inc., Arcadia, CA.
R. L. White, and T. G. Cole.
Public Works, Vol 104, No 2, p 50-54, February, 1973. 2 fig, 2 tab.

Descriptors: *Combined sewers, Waste water treatment, Storm water, Cities, Construction, Effluent, Treatment facilities, Sedimentation, Outfall sewers, California.
Identifiers: San Francisco(California), Dissolved air flotation.

The City and County of San Francisco in its program for upgrading the quality of wet-weather discharges from its combined sewer system financed the development of a comprehensive program for control of wet-weather flow. The program consisted of design construction, operation, and evaluation of a demonstration dissolved air flotation facility for overflow treatment. The demonstration facility is located near the principal municipal marina on the northern shoreline of the city. The overall project was divided into three phases extending from 1968 to 1971: (1) preconstruction studies on quantity and quality relationships of combined sewer flows and receiving waters; (2) design and construction of a dissolved air flotation (DAF) facility; and, (3) postconstruction studies on operation and evaluation of the DAF facility and receiving waters. The automated 24 mgd facility is provided with trash racks, short-term sedimentation for removal of settleable solids, dissolved air flotation for removal of flotable materials, and disinfection by chlorination with the effluent discharged to the Bay through a submerged outfall sewer. Monitoring the evaluation programs conducted during the 1970-1971 wet-weather season resulted in minor modifications and additions ro the DAF facility to be constructed in time for the 1972-1973 wet-weather season. (Sandoski-FIRL)
W78-00995

SEWAGE PURIFICATION.
Australian Patent 431,067. Issued January 4, 1973. Official Journal of Patents, Trade Marks and Designs, Vol 42, No 49, p 4793, January 4, 1973.

Descriptors: *Sewage treatment, *Sewage, *Activated sludge, Oxygen, Patents, Waste water treatment, Aeration.
Identifiers: Surface aerator.

An installation for the purification of sewage by means of the activated sludge method has been patented. The system comprises an annualr, horizontally disposed circuit adapted to receive the sewage to be purified and two communication sections interconnecting said portions. A surface aerator mounted in one of the communication sections so as to be partially submerged in the sewage received is rotated about a vertical axis to add oxygen to the sewage in the circuit. A partition arranged in the circuit near the surface aerator is closed off on one side of the aerator whereby said surface aerator brings the sewage into circulation within the circuit. (Sandoski-FIRL)
W78-00996

DEVELOPMENT OF AN UNCONVENTIONAL APPROACH TO NITRIFICATION-DENITRIFICATION,
Texas Tech Univ., Lubbock. Water Resources Center.
E. D. Smith, R. M. Sweazy, M. L. Peeples, R. C. Baskett, and R. H. Ramsey, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 398, Price codes: A08 in paper copy, A01 in microfiche. Final Report WRT-77-2, September 1977, 162 p, 36 fig, 25 tab, 62 ref, 4 append. OWRT A-035-TEX(1). 14-34-0001-6045, 7091, 7092.

Descriptors: Municipal water, Nitrates, Aquifers, Texas, Nitrification, Denitrification, Nitrites, Sewage effluents, *Waste water treatment, Lime.
Identifiers: *Texas High Plains, Lime treatment.

In water-short regions such as the Texas High Plains, municipal wastewater is frequently used to combat irrigation water shortages. One problem resulting from this practice is nitrate pollution of underlying aquifers. Nitrate pollution manifests itself primarily in public health problems and eutrophication. Studies were conducted to evaluate the feasibility of using an unconventional system for nitrifying and denitrifying sewage effluent. The research plan was to stop the nitrification process at the nitrite step, at which point denitrification was promoted. Theoretically, in this manner, less oxygen will be used to convert the ammonia than is required in conventional systems, and less supplemental carbon will have to be supplied for denitrification from the nitrite form. The primary nitrification study showed that a large, stable, reproducible population of nitrite-forming bacteria may be cultured and maintained by a daily input of ammonium sulfate feed solution to a complete-mix treatment regime. Good process control (pH) was required to ensure the biological transformation of ammonia-N to nitrite without simultaneous production of nitrate-N. Biological

nitrification by this system was a reliable process for accumulating relatively high concentrations of nitrite. The preliminary and primary denitrification studies validated the fact that strain 39 of Achromobacter liquefaciens was capable of reducing relatively high concentrations of nitrite-N. The draw-and-fill mode of continuous operation in the primary study indicated that this form of non-conventional denitrification was a reliable process for removing nitrites from wastewater. A hypothetical flow diagram for such a retrofit system was outlined, with a design sequence using lime treatment as a first stage. The results of these studies indicate that this type of unconventional nitrification-denitrification system exhibits potential for the development of an economic and effective method of nitrogen control.
W78-01002

RECENT EVOLUTION OF THE DIFFERENT LEVELS OF MARINE POLLUTION OF THE SOFT SUBSTRATUM LINKED WITH THE BIG SEWER OF MARSEILLE-CORTIOU. (IN FRENCH),
For primary bibliographic entry see Field 5C.
W78-01015

SAMPLING OF INDUSTRIAL WASTEWATER HELPS MEET DISCHARGE STANDARDS,
Clinton Bogert Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 7B.
W78-01073

TREATMENT SYSTEM IS INNOVATIVE FOR COAL STORAGE FACILITY,
Goodkind and O'Dea, Inc., Clifton, NJ.
M. Kaneletz, and J. J. Hess.
Water and Wastes Engineering, Vol. 14, No. 5, p 28-32, May, 1977. 3 fig, 1 tab.

Descriptors: *Leachate, *Surface runoff, *Coals, *Multi-purpose projects, *Water reuse, Dusts, Industrial water, Clarification, Flocculation, Water storage, Industrial wastes, Waste water treatment.
Identifiers: Coal storage, Dust control, Fire protection, Leachate treatment.

The water treatment facility at the Superior, Wisconsin, coal terminal was designed to treat runoff and leachate from the coal storage piles at the 194-acre facility for discharge to the St. Louis Bay. The plant also provides water for dust control and fire protection at the coal handling facility. The State of Wisconsin Division of Natural Resources required that effluents from the facility meet existing water standards for Lake Superior as well as an average monthly suspended solids content of 15 mg/liter. The treatment process chosen for the leachate included flocculation with lime and an anionic polyelectrolyte followed by pH neutralization with sulfuric acid after sedimentation removes solids. Water destined for use in dust supression and fire protection is passed through a microstrainer to remove all suspended solids 150 microns or larger. The runoff and leachate treatment system, which is activated when the quantity of water exceeds the amount required for plant operation, includes storm water detention and conveyance facilities, a clarifier-flocculator, a chemical feed and storage facility, laboratory facilities, two sludge pumps, and two sludge lagoons. The dust suppression and fire protection system is activated on demand and includes a raw water intake system two microstrainer lift pumps, a microstrainer, a 50,000-gal water storage tank, four split-case high pressure pumps, two 7,500-gal hydro-pneumatic tanks and air compressors, and a surfactant feed system. (Schulz-FIRL)
W78-01074

ENSO-BIOX METHOD -- A BIOLOGICAL METHOD FOR PURIFYING KRAFT PULP MILL CONDENSATES,
Enso-Gutzeit Oy, Imatra (Finland).
I. Vettenranta.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 7-12, 3 fig, 4 tab, 4 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Waste treatment, Foreign countries, Filtration, Filters, Bark, Pulp and paper industry, Nutrients, Sulfur bacteria, Sulfur compounds, Effluents, Water pollution control, Softwood, Europe.
Identifiers: Finland, Condensates, Kraft mills.

The Enso-Gutzeit Oy. Research Center in Imatra, Finland, has developed a biological filtering method for removing sulfur compounds from condensates of the kraft pulping process. The first mill-size unit was built at Uimaharju kraft pulp mill. The liquid and gas filters use a filtering medium of softwood bark treated with a nutrient mixture to support growth of the sulfur bacteria. After being purified in the liquid units, the condensates are clean enough to be released into the water system. Because the air which is blown through the liquid units becomes contaminated in the process, it is purified in the gas filter unit before being released into the atmosphere. Mill tests show that over 90% of the malodorous sulfur compounds of evaporator and digester condensates were removed. (Swichtenberg-IPC)
W78-01100

ADJUSTMENTS AND INNOVATION IN A FRENCH PAPER MILL (ADJUSTEMENTS ET INNOVATIONS DANS UNE PAPETERIE FRANCAISE),
Aussedat-Rey Papeteries de France, Saillat.
J. Rodeaud.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 13-18, 3 fig, 3 tab, 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Sludge, Incineration, Aerated lagoons, Mixing, Treatment facilities, Europe.
Identifiers: France, Kraft mills, Bleached pulp mills.

Pollution-control facilities at the integrated bleached kraft mill of Aussedat-Rey/Papeteries de France at Saillat, France are described. Emphasis is on the incineration of primary sludge in the lime kiln and on biological effluent treatment in aeration lagoons of the canal type with low level of mixing. (Speckhard-IPC)
W78-01101

ENERGY VS. ENVIRONMENT -- FRIENDS OR FOES,
Ekono, Helsinki (Finland).
H. Mannisto, E. Sebbas, and E. N. Westerberg.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 27-34, 8 fig, 3 tab, 7 ref.

Descriptors: *Water pollution control, *Energy, *Pulp and paper industry, Steam, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Waste water treatment, Electric power demand, Effluents, Pulp wastes, Pollution abatement.
Identifiers: *Kraft mills.

A case study of a single-line bleached kraft mill with a batch digester shows that a reduction in the pollutant load of effluents can be accomplished by inplant controls and external treatment without increasing mill energy consumption. Inplant measures to minimize the water pollutant load include: closing the water system of the wet drum barkers, increasing the active alkali charge to the digester, closing the water system for pulp screening and adjusting water usage to an optimum dilution factor, closing the bleach plant water system, stripping the condensates from the digester and evaporator to allow reuse in brown stock washing and causticizing, and collecting and returning spills to process streams. The increase in the process heat consumption due to the in-plant measures is about 850,000 Btu/short ton (sht) of air-dry bleached pulp. The increase in power consumption is estimated to be 15 and 20 kw-hr/sht for in-plant measures and external treatment, respectively. Because of more efficient recovery of the dissolved dry solids, the steam generation in the recovery boiler is increased by about 1,000,000 Btu/sht. The power required for combined in-plant measures and external treatment can be generated as the by-product power. The heat consumption to generate 3 5 kw-hr/sht is about 130,000 Btu/sht, assuming heat consumption for back-pressur e power generation is 3600 Btu/kw-hr. After power generation, the increase in steam generation is thus 870,000 Btu/sht, which corresponds almost exactly to the increase in process heat consumption. (Swichtenberg-IPC)
W78-01103

NEW IN-PLANT TECHNOLOGY TO REDUCE POLLUTION FROM A SODIUM-BASE SULFITE MILL,
MoDoCell A.B., Ornskoldsvik (Sweden).
R. Brannland, R. Gustafsson, and B. Hultman.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 49-53, 7 fig, 1 tab, 8 ref.

Descriptors: *Pollution abatement, *Pulp wastes, *Bleaching wastes, *Sulfite liquors, Air pollution, Water pollution control, Pulp and paper industry, Water pollution sources, Water quality control, Foreign countries, Wastes, Industrial wastes, Bleaching wastes, Chemical oxygen demand, Biochemical oxygen demand, Chlorides, Waste water treatment, Waste treatment, Europe, Water reuse, Sodium chloride, Industrial water, Chlorides.
Identifiers: *Sulfite pulp mills, Sweden, Chemical recovery, Spent sulfite liquors, Condensates.

In-plant measures taken to reduce air and water pollution at a Swedish sulfite pulp mill are described. A flow diagram is presented of the Stora chemical recovery process used at the sodium-base sulfite pulp mill. Prior to evaporation, before and after the alcohol fermentation plant, the acidic spent sulfite liquor is treated with alkali (viz., sodium bicarbonate, NaOH, or oxidized green liquor) to raise the pH to 4.5-5.0 and 6.5 in the pre-evaporation and the final evaporation processes, respectively. Neutralization of the spent sulfite liquor decreases the transfer of acetic acid to the total condensate by 70%, thus decreasing the 7-day BOD from 25 to 12 kg/ton of pulp. The condensate is reused in the cooking liquor and for final pulp wash time in the bleach plant. Changing the bleaching sequence from CEHD to ECHD allows the extraction effluent to be returned to the recovery furnace via the screen room and unbleached pulp washing plant. Bleach effluent color and COD are significantly reduced compared to the previous CEHD sequence. The BOD reduction is not so impressive, but it is at least equivalent to that leaving a kraft pulp CEHDED bleachery incorporating ion-exchange treatment of the first extraction-stage effluent. Chloride concentration should not be more than 0.8 g NaCl/liter in the cooking acid if chemical recovery is to be effective. A chloride removal system is described involving scrubbing of flue gas containing HCl formed from the reaction of oxygen, sulfur dioxide, and NaCl. (Swichtenberg-IPC)

W78-01104

WASTE HEAT FOR EVAPORATION OF EFFLUENTS,
Ekono, Helsinki (Finland).
J. Orivuori, E. Sebbas, and E. N. Westerberg.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 55-60, 6 fig, 5 tab, 5 ref.

Descriptors: *Pulp wastes, *Evaporation, *Energy, *Waste water treatment, *Heat balance, Wastes, Industrial wastes, Water pollution treatment, Effluents, Puulp and paper industry, Costs, Temperature, Industrial water, Water reuse.
Identifiers: *Heat recovery, *Newsprint mills, *Closed systems.

A newsprint mill using 80% groundwood and 20% chemical pulp furnish examined the feasibility of using waste heat generated in a closed water system for effluent evaporation. Heat balance calculations for the groundwood mill (power consumption 1200 kw-hr/short ton (sht) of air-dry product with 15% loss to the atmosphere and 30% to vapor flash) show that there is a waste heat of 2,300,000 Btu/sht which has to be removed by cooling of the groundwood mill's recycled water. The amount of water recirculating in the groundwood pulp mill is about 13,000 gal/sht. This water volume must be cooled from 158 F (maximum allowable temperature of the groundwood pulp slurry) to 136 F (temperature of the paper machine white water) in order to keep the in- and out-going process heat flows in balance. Since there is no need for hot process water, and the temperature of the waste heat is relatively high, it is possible to utilize the heat for evaporation of the effluent. The reuse water from the groundwater mill is cooled in a heat exchanger and the waste heat is transferred to the effluent evaporator. An evaporation plant using waste heat would consume abouut 30-40 kw-hr/1000 gal water. Preliminary cost estimates show costs of waste heat evaporation comparable with costs of external treatment methods. (Swichtenberg-IPC)
W78-01105

PROCESS CONCEPTS FOR OXYGEN DELIGNIFICATION,
MoDoCell A.B., Ornskoldsvik (Sweden).
R. Hillstrom, B. Lindqvist, L. Smedman, and A. Jamieson.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 61-65, 7 fig, 4 tab, 5 ref.

Descriptors: *Water pollution control, *Oxygen, *Bleaching wastes, Pulp and paper industry, Foreign countries, Biochemical oxygen demand, Color, Chlorine, Bleaching wastes, Capital costs, Pulp wastes, Europe, Effluents, Carbon dioxide.
Identifiers: *Kraft mills, *Deligrification, Sweden, Turpentine, Carbon monoxide.

Based on measurements made on total effluents at MoDoCell AB. and Munksjo AB., Sweden, a kraft mill with closed screening, condensate treatment, and OC/DEDED bleaching (compared to CEHDED bleaching) can achieve a 53% reduction in 7-day BOD (from 38 to 18 kg/ton of pulp), a 72% reduction in effluent color (from 250 to 70 kg Pt/ton of pulp), and a 62% reduction in organically bound chlorine (6.5 to 2.5 kg/ton of pulp). A system designed by MoDoCell removes flammable CO and turpentine from the oxygen reactor by catalytic oxidation of these gases to carbon dioxide in a circulating gas stream connected to the oxygen reactor. The exhaust gas is then cooled and recirculated to the oxygen reactor. The carbon dioxide is absorbed in and discharged with the pulp. Temperature control of oxygen delignification by the same system is also described. A simplified oxygen bleaching system operating at low consistency and with equipment coupled directly to the continuous digester reduces capital costs. (Swichtenberg-IPC)
W78-01106

EFFLUENT QUALITY IMPROVEMENT IN A BLEACHED KRAFT PULP MILL,
MacMillan Bloedel Ltd., Nanaimo (British Columbia).
N. A. Eckstein.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 67-73, 4 fig, 5 tab.

Descriptors: *Pulp wastes, *Water pollution control, Wastes, Industrial wastes, Water pollution sources, Suspended solids, Foaming, Color, Odor, Filters, Outlets, Pulp and paper industry, Effluents, Pollution abatement, Waste dilution, Foreign countries, Canada, Fly ash, Water quality control, Diffusion, Pipelines.
Identifiers: Spills, Clarifiers, Kraft mills, Bleached pulp mills.

An effluent quality improvement program begun in 1970 at the Harmac Division of MacMillan Bloedel Ltd., B.C., resulted in substantial reductions in suspended solids, inorganic and organic chemical spillage, and elimination of foam, color, and odor from the surface of the receiving waters. Discharges of suspended solids were reduced in the recausticizing plant by installation of a Dorr-Oliver green dregs filter and a clarifier to handle dust from four slaker vents. Steam-plant, woodroom, and screen-room discharges were similarly lowered by installation of a clarifier to remove solids in fly ash from multiclone gas cleaners, woodroom and screen-room reject streams. Probes for level control were installed in various trenches in the recausticizing area to avoid chemical spillage. A diffuser was placed on the end of a 3200 ft pipeline at a depth of 320 ft in the Northumberland Channel to dilute the effluent and eliminate surface water contamination. (Swichtenberg-IPC)
W78-01107

BIO-TREATMENT OF EFFLUENTS WITH BOD BELOW 100 MG/LITER,
Research Association for the Paper and Board, Printing and Packaging Industries, Leatherhead (England).
W. G. Cobbett.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 87-93, 7 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, *Biochemical oxygen demand, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Percolation, Filters, Activated sludge, Land, Hydrogen ion concentration, Microorganisms, Phosphorus, Sludge, Fungi, Pulp and paper industry, Europe, Effluents.
Identifiers: England.

Treatment of the weak effluent from two paper mills in the United Kingdom has been successful in pilot bio-treatment plants using the percolating filter or activated sludge systems. The study showed that all units could process double the coventionsl BOD loading to give a final effluent BOD of less than 10 mg/liter. Operational difficulties encountered with the pilot plants are described. The land requirement for full-scale plants at the mills was assessed. For these weak effluents, the percolating filter systems would occupy less than 3 times the area needed for an equivalent activated sludge plant. Plant performances were studied under various typical conditions of mill operation. Both the systems could overcome the problem of periodic shutdowns and recover quickly after shock loads of strong paper mill chemicals if the application was moderate. Variation in effluent pH influenced the population of microorganisms but had little effect on plant efficiency. The minimum total P content of the effluent for satisfactory biological action in BOD removal was a P:BOD ratio of 0.55:100, which applied to both percolating filrters and activated sludge units. The amount of secondary sludge obtained from the bio-treatment plants was less than 10% of the mill primary sludge. Sewage fungus growth, prevalent at one of the participating mills, was reduced to the level commonly found in the receiving stream as a result of bio-treatment. (Swichtenberg-IPC)
W78-01109

LIME TREATMENT OF BLEACHERY EFFLUENT,
CIP Research Ltd., Hawkesbury (Ontario).
F. M. A. Nicolle, R. Shamash, K. V. Nayak, and J. A. Histed.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings (Montreal, P.Q.), p 95-101, 5 fig, 5 tab, 11 ref.

Descriptors: *Bleaching wastes, *Waste water treatment, *Lime, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp wastes, Pulp and paper industry, Effluents, Color, Chemical oxygen demand, Fish, Toxicity, Hydrogen ion concentration, Sludge, Recycling, Dewatering, Alkalinity, Waste treatment.

An improved lime treatment process for bleach plant effluents is described which requires only one clarifier. Some lime is added to the chlorination filtrate (obtained by countercurrent washing in the C/DEHDED sequence) to provide Ca ions prior to the additin of the extraction-stage filtrate. Following a second addition of lime to the combined chlorination and extraction effluents, Ca precipitation permits fast sedimenting of the lime to occur. Over 80% color removal and 40% COD reduction can be achieved. Fish toxicity is also reduced. Pollutant reduction increases with increasing lime addition and proportion of chlorination effluent treated. Sludge recycling adversely affects color and toxicity reduction and decreases the pH. The alkalinity of the final effluent increases with increasing lime addition and proportion of chlorination effluent treated. Sludge recycling is not recommended, since fresh lime requirements of the system are not reduced. Three alternative schemes for the dewatering of clarifier sludge are discussed. (Swichtenberg-IPC)
W78-01110

TREATMENT OF PULP AND PAPER MILL EFFLUENTS USING PHYSICAL-CHEMICAL TECHNIQUES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, and S. Prahacs.
Canadian Pulp and Paper Association, Technical Section, Environment Improvement Conference, Montreal, October 6-8, 1976, Preprinted Proceedings, (Montreal, P.Q.), p 103-109, 2 fig, 6 tab, 28 ref.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Biochemical oxygen demand, Toxicity, Color, Carbon, Adsorption, Foam separation, Lime, Centrifugation, Oxidation, Catalysts, Oxygen, Ozone, Operating costs, Pulp and paper industry, Effluents, Waste treatment, Chlorine.
Identifiers: Hydrogen peroxide, Kraft mills.

Physical-chemical treatment (PCT) can provide effective reduction of toxicity and color from pulp mill effluents. However, BOD reduction remains a limiting factor for full-scale use at the present time. Physical-chemical detoxification processes for bleached kraft mill effluents (BKME) reviewed include the Pulp and Paper Research Institute of Canada carbon treatment process, granular carbon adsorption, foam separation, and the lime treatment process. Physical-chemical detoxification of mechanical pulping and woodroom effluents is briefly discussed. Adsorption onto polymers and ultracentrifugation are discussed as PCT processes for decoloration of BKME. Reuse of treated effluents introduced chlorine buildup as a major problem. Catalytic oxidation of BKME by hydrogen peroxide, oxygen, or ozone to reduce BOD are reviewed. Operating costs are estimated for each PCT process. (Swichtenberg-IPC)
W78-01111

SEPARATION AND REUSE OF WASTE SOLIDS FROM LIQUID EFFLUENTS,
S. J. Hill, and G. A. Griffiths.
British Paper and Board Industry Federation, Technical Section, Waste Utilization Symposium, Manchester, England, January 22-23, 1975 (Preprinted Proceedings), p 159-162.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Flotation, Sedimentation, Filtration, Equipment, Filters, Water pollution control, Water pollution sources, Water pollution treatment, Foreign countries, Europe, Pulp and paper industry, Effluents, Water purification.
Identifiers: White water(Paper machines), Savealls, Fiber recovery, Newsprint mills, United Kingdom.

The on-machine system used by Aylesford Paper Mills (United Kingdom) for the recovery of white water solids involves flotation, sedimentation, and filtration principles. In the savealls, air is mixed with white water under pressure. The air is dissolved in the water, and when the pressure is released on entry into the saveall tank, small air bubbles are formed which lift the solids to the surface of the vessel. Solids are removed by a continuous variable-speed scraper mechanism which pushes the recovered solids into a collection vat at the far end of the tank, the clarified water being removed through a perforated pipe at the bottom of the tank. De Noel towers were installed on two newsprint machines in which white water was fed into the top of the tower and the solids settled to the apex of the cone. The clarified water flowed outward and upward to be recovered over the launder at the top of the tower, and the solids which had thickened at the bottom of the tower were fed back into the machines by gravity, using the head of water in the tower. The filtration units have a number of vertical disks covered with a filtering material mounted on a horizontal shaft, and driven by variable-or constant-speed motors. The disks rotate in a vat filled with sweetened white water. Vacuum is applied, and when the mat is first formed, cloudy filtrate is produced. After the disk emerges from the vat, the vacuum is released and the mat removed by a set of sprays. Experiences with off-machine solids/liquid separation in clarifieres are also outlined. (Sykes-IPC)
W78-01112

DISPOSAL AND RECYCLING OF REJECTS FROM WASTE PAPER AND CLOSED WATER SYSTEMS,
Escher Wyss G.m.b.H. Ravensburg (West Germany).
For primary bibliographic entry see Field 3E.
W78-01114

UTILIZATION OF SOLIDS FROM WASTE WATER TREATMENT PLANTS IN BOARD MANUFACTURE,
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
K. A. Morch.
British Paper and Board Industry Federation, Technical Section, Waste Utilization Symposium, Manchester, England, January 22-23, 1975 (Preprinted Proceedings), p 78-94. 2 fig, 6 tab.

Descriptors: *Pulp wastes, *Water reuse, *Waste water treatment, Industrial water, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Foreign countries, Europe, Sedimentation, Biological treatment, Water purification, Recycling, Waste treatment.
Identifiers: *Board mills, Germany, Waste paper, Paper converting industry.

The Herzberger Papierfabrik, Ludwig Osthushenrich KG. group (Germany), is comprised of two integrated board-producing/coverting mills and one other facility which is only a board-converting operation. Waste paper accounts for more than 75% of the total raw material used on five paper and board machines. Waste water purification procedures are outlined. Following sedimentation biological purification, and chemical treatment, the thick-stock material from the waste water treatment plant is sent back to the mixed waste paper pulper for one of the board-manufacturing lines, while another uses chemical-mechanical preclarification plus biological treatment. The influence of recycled solids on board quality and production is also considered. (Sykes-IPC)
W78-01115

MECHANICAL DEWATERING OF SEDIMENTS FROM ROOFING BOARD FACTORY EFFLUENTS (OPYT MEKHANICHESKOGO OBEZVOZHIVANIYA OSADKOV STOCHNYKH VOD KARTONNO-RUBEROIDNYKH ZAVODOV),
Academy of Municipal Economy, Moscow (USSR). Research of Public Water Supply, Water Purification.
For primary bibliographic entry see Field 5E.
W78-01120

TREATMENT PLANT FOR EFFLUENT FROM THE ALBBRUCK PAPER MILL,
F. Barlog.
Sulzer Technical Review, No. 4, p 173-176, 1976. 4 fig, 3 tab, 1 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Foreign countries, Europe, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Flocculation, Sludge, Pulp and paper industry, Effluents, Mixing, Circulation, Coagulation, Sedimentation.
Identifiers: Germany.

The effluent treatment plant installed at Papierfabrik Albbruck (Germany) is described. The plant employs Sulzer-Opur sludge contact flocculation and operates with external sludge circulation. The system combines the physiocochemical treatment stages of mixing, circulation, coagulation, flocculation, sedmentation, and preliminary thickening in one compact apparatus. (Speckhard-IPC)
W78-01121

RESULTS OF AN NCASI PILOT PLANT STUDY OF MECHANICAL DEWATERING ALTERNATIVES FOR WASTE ACTIVATED SLUDGE,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, MI.
R. A. Miner, D. W. Marshall, and I. Gellman.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 11-24. 4 fig, 6 tab, 8 ref.

Descriptors: *Activated sludge, *Sludge treatment, *Dewatering, *Pulp wastes, Wastes, Industrial wastes, Pulp and paper industry, Filtration, Centrifugation, Sludge, Water pollution treatment, Water pollution sources, Waste treatment, Pilot plants, Solid wastes.
Identifiers: Ultrafiltration.

A pilot investigation of biological sludge thickening and dewatering alternatives including pressure filtration, precoat vacuum filtration, filter belt pressing, capillary suction dewatering, gravity filtration, centrifugation, and ultrafiltration, was conducted on waste activated sludge resulting from the treatment of effluent from an integrated bleached kraft-fine paper mill. Based on criterion of attainable cake consistency, three levels of performance are indicated: (1) pressure filtration and precoat vacuum filtration generating the driest cakes, (2) filter belt pressing yielding intermediate cake consistencies, and (3) gravity filtration, centrifugation, and ultrafiltration resulting in relatively low cake consistencies. In general, performance was severely affected by changes in feed sludge consistency, the amount of sludge conditioning, and the sludge's specific reisitance to filtration. The type and amount of sludge conditioning required is variable, depending upon the dewatering technique used, and the consistency and nature of the sludge. (Witt-IPC)
W78-01123

TOTAL WATER SYSTEM (AT) COSHOCTON MILL (OF) STONE CONTAINER CORPORATION,
Stone Container Corp., Coshocton, OH.
For primary bibliographic entry see Field 3E.
W78-01124

PHYSICAL-CHEMICAL TREATMENT SYSTEM AT FITCHBURG, MASSACHUSETTS,
Camp, Dresser and McKee, Inc., Boston, MA.
W. F. Callahan, and A. B. Pincince.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 33-37. 4 tab, 4 ref.

Descriptors: *Pulp wastes, *Municipal wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Activated carbon, Lime, Aeration, Biochemical oxygen demand, Suspended solids, Hydrogen sulfide, Sodium compounds, Massachusetts, Adsorption, Waste treatment.
Identifiers: Aluminum sulfate, Sodium hydroxide, Sodium nitrate.

The city of Fitchburg, Massachusetts, has constructed and placed in operation two advanced waste treatment plants. The East Plant uses a two-stage activated sludge process to treat largely domestic waste water. The West Plant, located 6 miles (9.6 km) upstream of the East Plant, uses a physical-chemical activated carbon process to treat mainly paper mill effluents (plus domestic waste water). The West Plant's performance is examined based on available data. The industrial and municipal waste waters enter the plant via separate sewers. After comminution and metering, the municipal waste water enters separate municipal clarifiers where it is chlorinated (sodium hypochlorite). From the municipal clarifiers, the effluent is mixed with the industrial waste waters and chemicals (lime and alum), and then flows to two flocculation basins and then to two industrial clarifiers. The clarified effluent is pumped through carbon filters and then to a post-aeration basin before discharge to the Nashua River. The treatment facilities were designed for an average daily flow of 15,300,000 gal/day (57,000 cu m/day) with a BOD loading of 9,700 lb/day (4,400 kg/day) and 48,000 lb/day (21,800 kg/day) of suspended solids. Pilot plant studies showed that both NaOH and sodium nitrate successfully controlled hydrogen

sulfide generation in the carbon filters. The pilot plant and its operation are described, and the effects of the chemicals on the adsorptive properties of the carbon are considered. (Will-IPC)
W78-01125

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS -- A MANAGEABLE PROBLEM,
B.C. Research Ltd., Vancouver.
J. C. Mueller, J. M. Leach, and C. C. Walden.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 77-81. 4 fig, 4 tab, 13 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Pulp and paper industry, Effluents, Biological treatment, Aerated lagoons, Activated sludge, Nutrients, Oxygen, Mixing, Hydrogen ion concentration, Carbon, Foam separation, Pollutants.
Identifiers: Kraft mills, Bleached pulp mills, Aluminum sulfate.

The major toxic constituents in bleached kraft mill effluents have been identified. The biodegradabilities of representative toxicants are, in declining order, dehydroabietic acid, pimaric acid, tetrachloroguaiacol (after adaptation of microorganisms), pimarol, monochlorodehydroabietic acid, dichlorodehydroabietic acid, and trichloroguaiacol. The capacity of various biological treatment systems for detoxification of bleached draft mill effluents was examined. Aerated lagoons and extended activated sludge systems performed well, provided that the supplies of nutrients and oxygen, mixing, and pH were controlled adequately. High-rate activated sludge systems detoxified effluent only 50-70% of the time and required protection against toxicity shock to achieve better than 90% detoxification rates. Physicochemical detoxification techniques, such as activated carbon-alum treatment and foam separation, have been developed to pilot plant scale. (Witt-IPC)
W78-01127

START-UP AND OPERATING EXPERIENCE WITH A TWIN WIRE MOVING BELT PRESS FOR PRIMARY SLUDGE,
Glatfelter Co., Spring Grove, PA.
P. M. Keener, and L. R. Metzger.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 103-107. 1 tab.

Descriptors: *Pulp wastes, *Sludge treatment, *Dewatering, Wastes, Industrial wastes, Waste water treatment, Water pollution sources, Water pollution treatment, Sludge, Pennsylvania, Pulp and paper industry, Operation and maintenance, Waste treatment.

Effluent sludge at P.H. Glatfelter Company (Spring Grove, Pennsylvania) is being dewatered on a Tait-Andritz sludge-dewatering machine. With throughout rates at times exceeding 50 oven-dry tons/day, the solids leaving the machine have been averaging 35% on an oven-dry basis while requiring 2.5 lb of polymer/oven-dry ton of sludge. (Witt-IPC)
W78-01129

WATER QUALITY PROTECTION AT THE (SIMPSON PAPER COMPANY) SHASTA MILL,
Simpson Paper Co., Anderson, CA.
O. A. Narum, and D. J. Moeller.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.). p 109-116. 3 fig, 4 tab, 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, California, Effluents, Pulp and paper industry, Water reuse, Water conservation, Oxidation ponds, Sewage treatment, Biochemical oxygen demand, Suspended solids, Irrigation, Operation and maintenance, Design criteria, Water quality control.
Identifiers: Kraft mills.

In January 1974, Simpson Lee Paper Co. (now known as the Simpson Paper Company decided to enlarge its recently acquired integrated bleached kraft pulp and paper mill near Anerson, California. The company concluded that conventional effluent treatment methods would not assure compliance with the new National Pollution Discharge Elimination System (NPDES) permit issued by a State agency for the expanded operations. Consequently, the company undertook a four-part program, including greater internal reuse of process water, upgrading of existing primary waste treatment facilities, a new low-rate aerated stabilization basin as secondary waste treatment system, and use of the secondary effluent for irrigation of grain crops. Design criteria and operating performance of the secondary treatment system are detailed. Overall 5-day BOD removal is about 94%, with the final effluent well below the NPDES permit requirement. Total suspended solids do not meet permit limits, but compliance has been achieved by using up to 40% of the secondary effluent for irrigation. (Witt-IPC)
W78-01130

COLOR INCREASE OF TREATED KRAFT MILL EFFLUENTS,
Saint Regis Paper Co., Pensacola, FL.
E. W. Lang, and R. L. Miller.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 117-124. 3 fig, 3 tab, 9 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Color, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Lime, Carbon, Ozone, Adsorption, Effluents, Pulp and paper industry, Waste treatment, Water properties.
Identifiers: Aluminum sulfate, Kraft mills.

The 1983 Environmental Protection Agency guidelines for discharge of color in effluents from kraft pulp and paper mills require major reductions of color loading. Color reduction processes that have been evaluated in pilot and full-scale plants have been shown to achieve color reductions of primary effluents needed to meet the 1983 guidelines. However, color reversions after color removal and before final discharge of the effluent have often been sufficiently great to exceed the guideline level. Results are reported on studies of color increases of bleached and unbleached kraft mill effluents after treatment with lime, alum, carbon, and ozone. Increases of color after lime treatment are generally sufficiently great to limit its use ahead of secondary treatment. Alum treatment results in smaller increases of color. Color increases were also noted for effluent decolorized by ozone, carbon adsorption, and for untreated effluents. Possible causes for the observed color increases and some of the characteristics of the color bodies are discussed. (Witt-IPC)
W78-01131

LEATHER TANNERY WASTE MANAGEMENT THROUGH PROCESS CHANGE, REUSE AND PREATMENT,
Pfister and Vogel Tanning Co., Milwaukee, WI.
J. M. Constantin, and G. B. Stockman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 204, Price codes: A09 in paper copy, A01 in microfiche. EPA-600/2-77-034. January 1977. 181 p, 33 fig, 52 tab, 68 ref.

Descriptors: *Tannery wastes, *Chromium, *Sulfides, *Flocculation, *Chemical precipitation, Water reuse, Separation techniques, Oily water, Industrial wastes.
Identifiers: Chrome recovery, Tanning processes.

Process modifications and waste water reuse and treatment methods to reduce the total waste load discharged from a large side leather tannery were investigated at the Pfister and Vogel Tanning Company in Milwaukee, Wisconsin. Waste water characteristics for the 1.42 mgd produced daily in the processing of 4,350 cattlehides are presented. Laboratory and pilot-scale investigations were used to design a system for the recovery and reuse of chromium-based tanning agents. The system is based on the chemical precipitation of chromium hydroxide with hydrated lime, caustic, soda, aqueous ammonia, or soda ash. A anionic polyelectrolyte such as Nalcolyte 667 is then used for flocculation, and gravity settling of the lime-precipitated, flocculated chromium hydroxide was suggested as highly successful. A 'straight-through' hair-burn process in which soaking, unhairing, bating, pickling, and tanning is accomplished in a single unit replaced the conventional hair-save method, thereby reducing the beamhouse-tanyard effluent by 50% and eliminating several hide handling steps. The pH decreased from 11.0 to 9.8 and the suspended solids content in the effluent was reduced by 31% with the 50% reduction in lime usage. The increase in sharpeners for hair pulping reduced sulfide loadings by 71%. Substantial reductions in total Kjeldahl nitrogen, volatile suspended solids, and total volatile solids loadings were also observed. Manganese sulfate-catalyzed air oxidation was demonstrated as the most economical means of oxidation of sulfides in unhairing wastes. (Schulz-FIRL)
W78-01156

CATALYTIC WASTE TREATMENT SYSTEMS FOR GREAT LAKE ORE CARRIERS,
Thiokol Corp., Brigham City, UT.
S. E. Moore, R. W. Coleman, and P. E. Lakomski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 362, Price codes: A04 in paper copy, A01 in microfiche. EPA-600/2-76-147. September 1976. 63 p, 14 fig, 14 tab, 1 append.

Descriptors: *Incineration, *Chlorination, *Ships, *Separation techniques, *Domestic wastes, Centrifugation, Industrial wastes, Sewage treatment, Sludge disposal.

A program was conducted to develop and demonstrate physical-chemical waste treatment systems for sanitary, galley, shower, and wash water waste streams aboard an operating ore carrier on the Great Lakes. For treatment purposes sanitary and galley wastes were separated from shower and wash water wastes. The aft waste treatment system included a prescreening device to remove coarse solids, a centrifuge for suspended solids, a catalyst to accelerate the reaction between the oxidizing agent and the organic compounds in the waste stream, and a sludge incinerator and sludge feed system. For shower and wash water treatment, water was sterilized with chlorine manufactured on-site by electrolytic cells which convert salt to hypochlorous acid. The waste water treatment systems were subjected to shore and shipboard test programs. The testing programs indicated the need for pretreatment or separation of galley waste from the sanitary waste treatment system, and demonstrated the feasibility of incineration as a means of shipboard sludge disposal. The addition of grease traps to systems treating combined galley/sanitary wastes was recommended. (Schulz-FIRL)
W78-01157

FEASIBILITY OF ELK CREEK ACID MINE DRAINAGE ABATEMENT PROJECT,
Skelly and Loy, Harrisburg, PA.
L. D. Loy, Jr., and J. W. Gunnett.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 329, Price codes: A05 in paper copy, A01 in microfiche. EPA-600/2-76-128. September 1976. 84 p, 33 fig, 6 ref, 1 append.

Descriptors: *Mine drainage, *Neutralization, *Mine acids, *Spoil banks, *Acid mine water, Groundwater movement, Acid streams, Acid-base equilibrium, Trenches, Pollution abatement, Industrial wastes.
Identifiers: Elk Creek(WV).

The Elk Creek watershed in West Virginia was the site of a feasibility study to examine three acid mine drainage abatement techniques, including alkaline regarding, slurry trenching, and mine roof collapse. Physiographic, geologic, mining, and climatologic descriptions are provided for five individual locations used to test the techniques. Alkaline regarding involves neutralization of deep mine discharges with alkaline overburden. In slurry trenching a narrow trench is excavated in unconsolidated material with the vertical sides maintained by a very viscous water clay slurry. Mine roof collapse serves to retard water flow in the mines and neutralizes acidic mine waters in areas with alkaline overburden. The study indicated that all three techniques were viable in the Elk Creek watershed and that at four of the five study sites pollutant loadings with an average acid loading of 1290 kg/day were sufficient to warrant pollution abatement. The alkalinity of strip mine spoil was measured as sufficient for neutralization. (Schulz-FIRL)
W78-01159

NAVAL STORES WASTEWATER PURIFICATION AND REUSE BY ACTIVATED CARBON TREATMENT,
Hercules Inc., Hattiesburg, MS.
F. H. Gardner, Jr., and A. R. Williamson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 168, Price codes: A03 in paper copy, A01 in microfiche. EPA-600/2-76-227. October 1976. 43 p, 7 fig, 5 tab, 5 ref, 2 append.

Descriptors: *Activated carbon, *Adsorption, *Resins, *Organic wastes, *Chemical wastes, Incineration, Chemical oxygen demand, Costs, Treatment facilities, Pilot plants, Water reuse, Industrial waste.
Identifiers: Turpentine, Terpenes, Multiple-hearth incinerators.

The Hercules, Inc., naval stores operation in Hattiesburg, Mississippi, produces a wide variety of industrial products from gum rosin, turpentine, and terpene oils. At the plant, three sewer systems collect waste water and sanitary waste, kept separate from process wastes, for discharge to a municipal sewer system. Cooling waters bypass the waste water treatment system while process wastes, including process area surface drainage, are retained for 5-6 hrs for equalization and primary clarification in a dissolved air flotation unit. An activated carbon adsorption system was evaluated in laboratory and pilot-scale investigations as a means of secondary treatment to remove organics from the primary treated effluent. The treatment configuration chosen included an upflow, packed-bed adsorption tower design with on-site regeneration of the spent carbon in a multiple-hearth furnace. The adsorption system proved capable of removing an average of 79% of the dissolved organics as TOC or COD from influent waste water. Capital costs for the system were $1,422,000 and operating costs during the evaluation period were $30,186 per month, or $0.31/1000 gal. (Schulz-FIRL)
W78-01160

REVERSE OSMOSIS FIELD TEST: TREATMENT OF WATTS NICKEL RINSE WATERS,
Abcor, Inc., Wilmington, MA.
K. J. McNulty, R. L. Goldsmith, and A. Z. Gollan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 919, Price codes: A03 in paper copy, A01 in microfiche. EPA-600/2-77-039. February 1977. 39 p, 6 fig, 6 tab, 11 ref.

Descriptors: *Nickel, *Metals, *Membrane processes, *Reverse osmosis, *Water reuse, Filtration, Pilot plants, Salts, Industrial water, Industrial wastes.
Identifiers: Plating wastes.

The New England Plating Company in Worcester, Massachusetts, was the site of a field test to evaluate the use of a reverse osmosis membrane in hollow fine fiber configuration for the closed-loop treatment of rinse water from a Watts-type nickel bath. The productivity, or the rate at which permeate is produced with a given system under certain conditions, and the rejection of dissolved species by the membrane were examined to assess the performance of the reverse osmosis system. A schematic diagram of the field test system is presented. Operating conditions for the module were set at a pressure of 28.6 bars, an initial feed flow of 4 gpm, variable conversion and feed concentration, and a temperature of 8-33 C. Rejections observed for nickel, total solids, and conductivity were generally very good, although boric acid was poorly rejected by the membrane because of its ionized form. Rejection for NaCl was 88.5-93.5%. A breakdown of operating costs is presented, with the total annual operating cost projected at $4,172. (Schulz-FIRL)
W78-01161

DIALYSIS FOR CONCENTRATION AND REMOVAL OF INDUSTRIAL WASTES,
Gulf South Research Inst., New Orleans, LA.
J. K. Smith, S. V. Desai, R. E. C. Weaver, and E. Klein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 572, Price codes: A05 in paper copy, A01 in microfiche. EPA-600/2-76-223. October 1976. 87 p, 19 fig, 13 tab, 18 ref, 4 append.

Descriptors: *Dialysis, *Membrane processes, *Separation techniques, *Solvents, *Filtration, Phenols, Organic wastes, Aluminum, Copper, Lead, Chelation, Pilot plants, Chemical wastes, Industrial wastes.

Dialysis was evaluated as an advanced waste water treatment process for the removal of selected organics and metallic ions from industrial wastes. The study focused on 10 solutes which are potential pollutants of the lower Mississippi River water in the New Orleans-Baton Rouge area: organic acids or bases such as aniline, phenol, and ethanolamine; toxic cations such as Al(+++), Cu(++), and Pb(++); and volatile refractory organics such as nitrobenzene, chloroform, ethylene dichloride, and nitrotoluene. Special techniques to enhance conventional dialysis were investigated, including acid and base conjugation for aniline and phenol; the use of a complexing agent such as bis-(2 ethyhexyl) hydrogen phosphate for Al, Cu, and Pb ions; and pervaporation or the removal of a volatile permeant as a vapor on the downstream side of a semipermeable membrane. The rotary batch dialyzer, pervaporation test cell, and membrane used in the study are described. The dialysis system was tested in pilot-scale studies with a Kraton 1101 membrane and a waste stream obtained from an ethylene dichloride manufacturer. (Schulz-FIRL)
W78-01162

WASTE-WATER TREATMENT: ECOLOGICAL, TECHNOLOGICAL AND ECONOMIC ASPECTS (IN GERMAN),
H. A. Weber, and T. Mann.
Naturwissenschaften 64(2): 82-86. 1977 (English summary).

Descriptors: *Water purification, Domestic wastes, Industrial wastes, Waste water treatment, West Germany, Costs, Treatment facilities.

To conserve water and water reserves, waste water must be purified before being discharged. Due to differences in the composition of household and industrial waste, additional physical and chemical purification processes may be required besides the normal biological purification. Variations in legislation in different countries, the high cost of the necessary technical plant expenditures and continually increasing operating costs make the building and operating of wastewater treatment plants extremely problematic.—Copyright 1977 Biological Abstracts, Inc.
W78-01163

FOAM FLOTATION TREATMENT OF HEAVY METALS AND FLUORIDE-BEARING INDUSTRIAL WASTEWATERS,
Vanderbilt Univ., Nashville, TN.
D. J. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 549, Price codes: A05 in paper copy, A01 in microfiche. EPA-600/2-77-072. April 1977. 88 p, 16 fig, 15 tab, 91 ref, 2 append.

Descriptors: *Froth flotation, *Flotation, *Separation techniques, *Heavy metals, *Fluorine, Foam fractionation, Foam separation, Surfactants, Chemical precipitation, Metals, Industrial wastes.

Laboratory studies were used to evaluate floc foam flotation techniques for the reduction of lead, cadmium, mercury, copper, zinc, arsenic, and fluoride in dilute industrial waste waters. A literature review on ion foam fractionation, colloid flotation, and precipitate flotation is presented. Batch laboratory studies examined foam separation for removal of lead, copper, mercury, cadmium, arsenic, and fluoride with sodium laury sulfate (NLS) as the anionic surface-active agent and hexadecyltrimethylammonium bromide (HTA) as the cationic surfactant. Adsorbing colloid flotation was studied with Al(OH)3 and Fe(OH)3. The studies concluded that Cu, Pb, and As could be readily removed with Fe(OH)3 and NLS; zinc and fluoride with Al(OH)3 and NLS; cadmium with CuS, HTA, and FeS; and mercury with CuS and HTA. The effects of dissolved salt concentrations, temperature, floc electric charge, surfactant concentration, and influent floc concentration on foam separation efficiency were calculated according to a Guoy-Chapman model. (Schulz-FIRL)
W78-01164

INNOVATIVE RINSE-AND-RECOVERY SYSTEM FOR METAL FINISHING PROCESSES,
Industrial Filter and Pump Mfg., Cicero, IL.
W. C. Trnka, and C. J. Novotny.
EPA-600/2-77-099. May 1977. 31 p, 5 fig, 7 tab.

Descriptors: *Water reuse, *Recycling, *Chromium, *Metals, *Equipment, Water utilization, Separation techniques, Ion exchange, Solvent extractions, Anion exchange, Industrial wastes, Waste water treatment.
Identifiers: Chrome recovery, Plating wastes, Metal finishing wastes.

The effectiveness of a solvent rinse which is applicable to metal finishing was investigated with a car bumper plating operation. Use of the rinse-and-recovery system is advantageous in the plating industry since it is a closed system and does not result in the discharge of toxic pollutants to the sewer system. Design and construction data for the unit are presented. The unit includes a vapor adsorber, a plating bath, a rinse tank, separation tank, anion column, chiller, Genesolv-D, and a control cabinet. Vapor recovery is accomplished

with adsorption and desorption. The system replaces the conventional multi-stage aqueous rinsing system with a two-stage solvent spray rinse followed by a single-state aqueous immersion rinse. Perchloroethylene was used as the main solvent flush or the immiscible organic displacing fluid to wash off the dragged-out chromic acid. Pilot studies with the system resulted in a final rinse chromium concentration of about 2 ppm after 80 hr of operation. (Schulz-FIRL)
W78-01165

AMMONIUM-CARBONATE LEACHING OF METAL VALUES FROM WATER-TREATMENT SLUDGES,
Battelle Columbus Lab., OH.
J. B. Hallowell, E. S. Bartlett, and R. H. Cherry, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 014, Price codes: A04 in paper copy, A01 in microfiche. EPA-600/2-77-105. June 1977. 67 p, 1 fig, 7 tab, 2 append.

Descriptors: *Metals, *Copper, *Nickel, *Chromium, *Sludge treatment, Ammonium compounds, Heavy metals, Chemical reactions, Leaching, Electrolysis, Chemical precipitation, Industrial wastes, Sludge disposal, Costs.
Identifiers: Metals recovery, Metal-finishing wastes, Ammonium carbonate.

Experiments were conducted to demonstrate that at least 90% of the copper and nickel in metal-finishing sludges could be removed by leaching with ammonium carbonate. Metal-finishing sludges used in the experiments were obtained from the sludge storage lagoon at the Ametek U.S. Gauge Division plant in Sellersville, Pennsylvania. Treatment of the sludges included electrodeposition of the metallic copper and nickel from the ammoniacal leachant and recovery of chromium from the depleted sludge by a carbonate roast followed by water leaching. Four forms of the Ametek sludge were used in the various leaching experiments, including raw sludge with 20% solids; dried sludge which had been comminuted and blended; dried, ball-milled sludge; and dried sludge which had been washed with water to remove 10% of its weight, followed by filtering, redrying, and grinding. Leaching studies examined the effects of sludge pretreatment, leachant type, temperature, leaching time, aeration and CO2 sparging, liquor-enrichment, and oxides and hydroxides. Metal recovery was examined with electrolysis, cementation, and precipitation with sodium aluminate. Studies indicated that raw sludge was best leached without pretreatment, with the preferred leachant being ammonium carbonate. The optimum leaching temperature was 50C. Two-stage leaching at 2-3 hr per stage is recommended to reduce the inhibition of nickel removal from copper-rich sludges. Capital costs for a metals recovery plant which processes 100 tons/day of raw sludge to remove copper, nickel, and anhydrous chromic acid were estimated at $3-5 million. (Schulz-FIRL)
W78-01166

ELIMINATION OF POLLUTION FROM COTTAGE CHEESE WHEY BY DRYING AND UTILIZATION,
Dairy Research and Development Corp., Peekskill, NY.
S. Boxer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 265, Price codes: A04 in paper copy, A01 in microfiche. September 1976. 72 p, 7 fig, 6 tab, 23 ref, 3 append. Technical Report EPA-600/2-76-254.

Descriptors: *Dairies, *Milk, *Feeds, *Recycling, *Drying, *Costs, Food chain, Industrial wastes, Equipment, Nutrient removal, Waste disposal.
Identifiers: Cheese whey, Spray drying.

A spray drying process was evaluated for the processing of the more than 1 million lbs of cottage cheese or acid whey produced in the United States annually. A cottage cheese plant of the Dairylea Cooperative in Vernon, New York, was the site of a study by the Dairy Research and Development Corporation. The study used a modification of a De Laval Separator Company milk dryer to develop a process for drying acid whey to a non-hygroscopic food grade powder. The process involves evaporation of the raw whey, crystallization, spray drying, and packaging of the dry powder. Problems encountered in the pilot study were related to variations in total solids, lactose crystal uniformity, viscosity, and foaming tendency from one batch of raw whey to the next. Capital costs for a plant designed to dry 500,000 lbs of raw whey daily were projected at approximately $3 million, with annual operating costs estimated at $450,000 based on a production of 9 million lbs of whey. The dried end-product of the process has potential uses in the cattle feed, bread, baking, and other food-related industries. (Schulz-FIRL)
W78-01167

STATE OF THE ART: WASTEWATER MANAGEMENT IN THE BEVERAGE INDUSTRY,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Food and Wood Products Branch.
M. E. Joyce, J. F. Scaief, M. W. Cochrane, and K. A. Dostal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 548, Price codes: A07 in paper copy, A01 in microfiche. EPA-600/2-77-048. February 1977. 123 p, 20 fig, 52 tab, 80 ref.

Descriptors: *Food processing industry, *Feeds, *Industrial wastes, *Costs, *Recycling, Water pollution sources, Reviews.
Identifiers: Beverage industry, Malt, Wineries, Distilleries.

A review of the quantity and quality of waste produced by various types of beverage industries and of the waste water management practices used by these industries is presented. Categories of beverage industries which are discussed include malt liquor, malt, wine and brandy, distilled liquors except brandy, canned and bottled soft drinks, and flavorings and extracts. The review concluded that waste water treatment practices in the malt liquor industry were generally different for small and large industries, with small industries less likely to recover and recycle by-products. The majority of the breweries surveyed discharged wastes to the local sewer system instead of maintaining on-site treatment facilities. When by-products are recovered, they are largely used for the production of livestock and poultry feed. Waste water treatment processes used in the wine industry are described as being dependent on the geographic location of the plant and whether or not the winery operates a still. (Schulz-FIRL)
W78-01168

STATE-OF-THE-ART: SWINE WASTE PRODUCTION AND PRETREATMENT PROCESSES,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
M. R. Overcash, and F. J. Humenik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 995, Price code: A09 in paper copy, A01 in microfiche. EPA-600/2-76-290. December 1976. 185 p, 24 fig, 53 tab, 14 ref, 1 append.

Descriptors: *Hogs, *Feed lots, *Livestock, *Farm lagoons, *Oxidation lagoons, Anaerobic digestion, Recycling, Sewage treatment, Separation techniques, Industrial wastes, Reviews.

A review of waste sources and pretreatment processes in the swine processes in the swine processing industry was presented as an overall evaluation of various experimental and demonstration data. Various aspects of swine waste management and swine, production are discussed, including housing types, the magnitude and distribution of swine, and population characteristics. Properties of swine waste and production unit waste load are presented for wastes from drylot and pasture production units and for concrete slab and slotted floor-pit wastes. Factors evaluated include type and size of animal, waste volume, solids content, nitrogen, cations, anions, bacteria, BOD, TOC, COD, and miscellaneous parameters. Various pretreatment processes are discussed with respect to altering the land-limiting constituents (LLC) of swine waste, treatment for partial reuse, and complete recycling or reuse of swine wastes. Treatment processes for altering the LLC include anaerobic lagoons, mechanically aerated lagoons, naturally facultative lagoons, rainfall runoff retention ponds, oxidation ditches, and overland flow. Treatment processes for partial reuse include high-rate anaerobic digestion with methane production, solids separation, pyrolysis, and refeeding processes. (Schulz-FIRL)
W78-01169

EXTRACTION OF CHEMICAL POLLUTANTS FROM INDUSTRIAL WASTEWATERS WITH VOLATILE SOLVENTS,
California Univ., Berkeley. Dept. of Chemical Engineering.
J. P. Earhart, K. W. Won, C. J. King, and J. M. Prausnitz.
EPA-600/2-76-220. December 1976. 530 p, 62 fig, 85 tab, 120 ref, 10 append.

Descriptors: *Solvent extractions, *Separation techniques, *Solvents, *Solutes, *Oil wastes, Phenols, Chemical wastes, Solubility, Pilot plants, Distillation, Recycling, Industrial wastes, Waste water treatment, Equipment.
Identifiers: Styrene, Oxychlorination.

Solvent extraction may be a feasible method for treatment of waste water from petroleum refining on petrochemicals manufacture for which process chemicals are expensive, wastes are difficult to treat biologically, or toxic substances present in the waste stream require special handling. General background information presented includes categories of waste water treatment processes, general considerations in solvent extraction, recovery of phenolic compounds, and types of extraction devices. Steam stripping, volatile solvent extraction, and dual solvent extraction processes are described and compared. A pilot-scale study on the use of solvent extraction to treat organic wastes used wastes from tube oil refining, cresylic acid recovery, ethylene quench water, oxychlorination, phenol-formaldehyde resin manufacture, hydrofiner condensate, and styrene manufacture. Analytical methods, equilibrium determinations, the spray column extractor, the rotating biological contactor, solvent regeneration apparatus, and chemicals used in the experiments are described. Methods of data reduction, dispersed phase choice, volatile solvent choice, solute interactions, loaded solvent regeneration, and overall process feasibility are discussed. Results of experiments with a rotating disc contactor (RDC) and industrial wastes are presented. Study results recommended dual-solvent extraction with n-butyl acetate and isobutylene for phenol, cresols, COD, and phenol-formaldehyde manufacturing wastes. (Schulz-FIRL)
W78-01171

METAL REMOVAL AND CYANIDE DESTRUCTION IN PLATING WASTEWATERS USING PARTICLE BED ELECTRODES,
Rockwell International Corp., Canoga Park, CA.
W. Chen, H. L. Recht, and G. P. Hajela.
EPA-600/2-76-296. December 1976. 59 p, 17 fig, 13 tab, 2 ref.

Descriptors: *Metals, *Heavy metals, *Electrolysis, *Separation techniques, *Water reuse, Electrodes, Pilot plants, Industrial wastes, Nitrogen compounds, Electrolytes, Waste water treatment, Cadmium, Zinc, Salts, Equipment.
Identifiers: Cyanide.

The Atomics International (AI) metal-cyanide removal process which uses particle-bed electrodes to remove heavy metals and cyanide from plating rinse waters was evaluated in pilot-scale studies. The process uses an electrolytic cell with a tin particle-bed cathode, a graphite particle-bed anode, and a cellophane separator in which relatively low voltage DC is used to remove contaminants from metals processing waste water. Various studies were conducted to develop the cell design and examine the effects of current, pH, water conductivity, flow rate, and electrode collector spacing on process performance. Studies indicated that metal and cyanide removals by the process were enhanced by higher current, pH, water conductivity, and flow rate and by the addition of a small amount of salt as a supporting electrolyte. Cyanide removals in the pilot-scale testing program ranged from 49-84% and cadmium removals from 66-98%. In on-site tests with filtered cadmium plating-line rinse water, metal removals were 73-95% with NaCl as the supporting electrolyte and 27-58% with Na2SO4, while cyanide removals were 79-94% and 44-67%, respectively. With zinc plating-line rinse water, metal removals averaged 75% for NaCl and 81% for Na2SO4 while cyanide removals were 78% and 55%, respectively. Cost estimates for the process based on the pilot-plant unit design were projected at $2.11/1000 gal for a 5-gpm recycle system. (Schulz-FIRL)
W78-01173

FOLLOW-UP INVESTIGATION ON CYANIDE COMPLEX DETECTED FROM PULP SLUDGE (SEISI SURAGI KARA KENSHUTSU SARETA SHIAN KAGOBUTSU NI TSUITE NO TSUISEKI CHOSA),
Shizuoka Prefectural Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5B.
W78-01174

EFFECTIVE TEXTILE INDUSTRY EFFLUENT TREATMENT.
International Dyer and Textile Printer, Vol 157, No 4, p 184, February, 1977.

Descriptors: *Oxidation lagoons, *Activated sludge, *Settling basins, *Textiles, *Aeration, Biochemical oxygen demand, Suspended solids, Oxygenation, Industrial wastes, Municipal wastes, Waste water treatment.

Dyeing processes in the textile industry often result in surges of highly toxic waste which can upset conventional waste water treatment systems. The Whitehead and Poole oxidation ditch system is based on the completely mixed, rapid dispersion principle and is designed to accommodate a high sludge:organic load ratio. The rapid dispersion results in rapid transfer of oxygen throughout the tank. The manufacturers report that the Whitehead and Poole oxidation ditch system can produce an effluent which meets the British Royal Commission standards of 20 mg BOD/liter and 30 mg suspended solids/liter. A compact aeration system which operates on the same principles as the oxidation ditch but is contained within a vertical structure of steel or reinforced concrete is also available. (Schulz-FIRL)
W78-01175

SULPHATE REMOVAL FROM CARBONISING AND DYEING WASTE WATERS.
International Dyer and Textile Printer, Vol 157, No 4, p 173, February, 1977.

Descriptors: *Textiles, *Sulfates, *Chemical precipitation, *Lime, *Aluminum, *Sulfur compounds, Chemical reactions, Dyes, Physicochemical properties, Sewerage, Separation techniques, Industrial wastes, Chemical wastes, Waste water treatment.
Identifiers: Carbonizing wastes, Dyeing wastes.

Sulfate ions found in dyeing and carbonizing effluents produced in the wool textile industry can result in the desruction of concrete sewer pipes and the development of anaerobic conditions and hydrogen sulfide. Carbonization, used to break down vegetable matter in highly contaminated wools, typically produces a mixed liquor with a sulfate concentration of approximately 900 mg/liter. Precipitation of the sulfate with lime is limited to concentrations above 1300 mg/liter because of the solubility of calcium sulfate. Precipitation at a pH above 9.5 has been investigated for a mixture of lime and an aluminum salt such as aluminum chlorohydrate or aluminum chloride. Research has indicated that the effluent quality can be controlled by the aluminum and calcium dosages according to the relationship of one cation of aluminum, five cations of calcium, and one anion of sulfate forming an insoluble complex. Since treatment costs may be high, the method is recommended for strong, low-volume effluents. (Schulz-FIRL)
W78-01176

MODERN METHODS OF EFFLUENT TREATMENT,
H. Sandmann.
Brown Boveri Review, Vol. 64, No. 3, p 174-179, March, 1977. 6 fig, 1 tab, 11 ref.

Descriptors: *Effluents, *Chemical precipitation, *Flocculation, *Activated carbon, *Textiles, Industrial wastes, Municipal wastes, Ozone, Ion exchange, Analytical techniques, Waste water treatment.

Various methods of waste water treatment are discussed, including chemical processes, precipitation and flocculation, ozone treatment, adsorption on activated carbon, neutralization, and ion exchange. The use of a combination of processes is described for the treatment of effluents which contain a variety of contaminants. Case studies are presented for the treatment of mixed domestic and industrial effluents and for the treatment of effluents produced by the textile industry. A systems analysis diagram to determine the most effective process combination based on the toxicity, BOD, COD, pH, and C:N:P ratio of the waste water is presented. Effluents at the textile plant were separated for treatment purposes into those which contained heavy dye concentrations and those which were rinse waters and weakly loaded with contaminants. Schematic diagrams of treatment of the two process streams are presented. (Schulz-FIRL)
W78-01177

CAPITAL COST-SAVING SERVICE FOR TEXTILE EFFLUENT TREATMENT.
International Dyer and Textile Printer, Vol. 157, No. 10, p 172-173, February, 1977.

Descriptors: *Adsorption, *Activated carbon, *Dyes, *Color, *Textiles, Treatment facilities, Organic wastes, Filtration, Effluents, Water analyses, Industrial wastes, Waste water treatment.
Identifiers: Carno(Wales), Textile manufacturing wastes.

Chemviron Ltd. of Kingston-on-Thames, Surrey, England, has devised the Chemviron Adsorption Service for the removal of organic pollutants and color from effluents produced by a wide variety of industries, including textiles, pharmaceuticals, detergents, oil refineries, and explosives. The unit has been used by the Laura Ashley textile factory in Carno, Wales, to remove color and organic contaminants from as much as 100,000 gal of effluent per day. The system was implemented in response to a critical water shortage during a recent drought in England. A mobile tanker filled with activated carbon was installed as an interim treatment method to treat dyehouse effluent until the adsorption module was in full operation. The module designed for Laura Ashley included a motor control center comprised of two sand filters, two adsorbers, and a transfer unit for activated carbon replacement. Pressure filters remove solids from the textile factory effluent before it passes through the beds of granular activated carbon. Analyses of effluents and delivery and replacement of activated carbon are included in the Chemviron Adsorption service along with routine maintenance and technical advice. Chemviron maintains its own activated carbon regeneration facilities in Feluy, Belgium. (Schultz-FIRL)
W78-01178

SOME THOUGHTS ON WATER CONSERVATION AND RE-USE OF PROCESS LIQUORS.
International Dyer and Textile Printer, Vol. 157, No. 10, p 170-171, February, 1977. 8 ref.

Descriptors: *Dyes, *Textiles, *Water reuse, *Water utilization, *Membrane processes, Filtration, Color, Organic wastes, Industrial water, Reverse osmosis, Industrial wastes, Waste water treatment.
Identifiers: Textile water reuse, Dyeing wastes.

Increasing demands for industrial and municipal water in the United Kingdom have prefaced this discussion on the reuse of industrial waste waters produced in the textile industry. Current methods of textile water renovation which are being investigated include hyperfiltration or reverse osmosis with polyamide (hollow fine fiber), cellulose acetate (spiral and tubular), and hydrous Zr (IV) oxide-polyacrylate membranes. Costs in the United Kingdom for treatment of textile effluents which are, by convention, treated by local authorities are discussed. Modifications to dyeing equipment to reduce water requirements are discussed. Techniques for conservation of process water used in the wool industry for scouring, rinsing, and dyeing processes are described. A method of dyeing in short liquors based on atomization which was developed by Ciba-Geigy is described. (Schulz-FIRL)
W78-01179

THE ORIGIN, TREATMENT AND DISPOSAL OF TANNERY EFFLUENTS,
D. A. Bailey.
Process Biochemistry, Vol. 12, No. 1, p 13-14, 17-18, 21-22, 24-25, January/February, 1977. 3 fig, 3 tab, 63 ref.

Descriptors: *Tannery wastes, *Effluents, *Chromium, *Sulfides, *Industrial wastes, Biological treatment, Activated sludge, Anaerobic conditions, Oxidation lagoons, Filtration, Sludge treatment, Sludge disposal, Waste water treatment, Water requirements, Waste water disposal, Waste storage.

Various aspects of the origin, treatment, and disposal of tannery wastes are described. Pretanning processes which are described include soaking, dehairing, liming, deliming, bating, and pickling. Tannery processes and the characteristics of wastes produced during dyeing, drying, and finishing are described. Quantities of water used for tanning processes and combined effluent characteristics are presented. Options for the disposal of the industrial effluents produced are compared. Methods of pretreatment prior to discharge to a municipal sewer system are described. Treatment methods for sulfide removal from dehairing and lime liquors with aeration are discussed. Processes for the removal and recovery of trivalent chromium are examined. Waste water

characteristics and available treatment methods are described for leather dressing wastes. The effects of tannery wastes on municipal waste water treatment processes are examined with respect to sulfides, trivalent chromium, anaerobic treatment, and biological processes. Previous studies on various treatment and disposal methods which have been applied to tannery wastes are described, including biological treatment, anaerobic treatment, land treatment and lagooning, high rate bio-filtration, activated sludge treatment, oxidation ditches, and other options for sludge treatment and disposal. (Schulz-FIRL)
W78-01181

THE ADSORPTIVE PURIFICATION OF EFFLUENTS WITH GRANULAR ACTIVATED ALUMINA (DIE ADSORPTIVE REINIGUNG VON ABWAESSERN MIT GEKOERNTER AKTIVTONERDE),
H. Hepp.
Vom Wasser, Vol. 47, p 179-185, 1977. 4 fig, 1 tab, 5 ref.

Descriptors: *Adsorption, *Organic wastes, *Humic acids, *Aluminum, *Chemical precipitation, *Industrial wastes, Lignin, Decaying organic matter, Filtration, Physical properties, Water treatment, Waste water treatment.
Identifiers: Granular activated alumina.

Laboratory experiments were used to evaluate the use of COMPALOX, a variety of granular activated alumina, for the treatment of industrial waste waters and potable water to remove soil-derived humic acids. Lignin sulfonic acid was used in laboratory tests on the adsorption of high molecular weight organic substances in industrial waste waters onto COMPALOX. The experiments indicated that pretreatment affected the degree of adsorption. The pH value of the feed to the system could be used to adjust the internal precipitation on the COMPALOX surface. Pore size distribution is a special feature of COMPALOX. (Schulz-FIRL)
W78-01182

5E. Ultimate Disposal Of Wastes

HOW RECENT FEDERAL LEGISLATION HAS MOVED TOWARD GREATER PROTECTION OF GROUNDWATER RESOURCES.
Geraghty and Miller, Inc., Port Washington, NY.
For primary bibliographic entry see Field 6E.
W78-00969

SANITARY LANDFILLS, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 440, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 77-203, April 1977. 231 p.

Descriptors: *Landfills, *Bibliographies, *Abstracts, Information exchange, Groundwater, Leachate, *Path of pollutants, *Sludge disposal, Sludge treatment, Solid wastes, *Waste disposal, Waste water treatment, Water pollution sources.

This report, containing 259 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 104,878 abstracts covering SWRA through February 1977 (Volume 10, Number 4). Author and subject indexes are included. (See W72-13043 for Volume 1.)
W78-01004

APPLICATION OF ECOSYSTEM MODELING METHODOLOGIES TO DREDGED MATERIAL RESEARCH,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects, Lab.
For primary bibliographic entry see Field 5A.
W78-01070

MECHANICAL DEWATERING OF SEDIMENTS FROM ROOFING BOARD FACTORY EFFLUENTS (OPYT MEKHANICHESKOGO OBEZVOZHIVANIYA OSADKOV STOCHNYKH VOD KARTONNO-RUBEROIDNYKH ZAVODOV),
Academy of Municipal Economy, Moscow (USSR). Research of Public Water Supply, Water Purification.
R. Ya. Agranonik, L. A. Sukhova, and V. R. Sheinkerman.
Stroitel'nye Materialy, No. 9, p 6-7, 1976. 1 tab, 2 ref.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, Wastes, Industrial wastes, Pulp and paper industry, Sludge, Pulp wastes, Waste treatment, Water pollution sources, Water pollution control, Lime.
Identifiers: Polyacrylamide, Roofing felt(Roofing board).

Numerous studies conducted in recent years have shown that the best mechanical method of dewatering sludge from effluents of roofing felt factories is centrifugation. This method reduces the water content of the sludge to 59-67%; the sediment retention is 65-80%. Since 1969, the sludge-drying beds at many plants are being replaced by centrifugal equipment. Such equipment is presently in operation at 6 Soviet plants. The centrifuges used are of the horizontal endless screw type with a rotor 50 cm in diameter. In order to eliminate the detrimental effect of centrifugate recycled to the sedimentation tanks, the retention of sediment should be at least 80%. Thus, the main problem in operating the centrifuges is the increase of retention. This can be best achieved by the addition of coagulants to the sludge. Among several coagulants tested, polyacrylamide was the most effective, the amount required being 0.2%, based on dry solids weight. This amount can be reduced to 0.1% by simultaneous addition of 10% lime. (Stapinski-IPC)
W78-01120

CATALYTIC WASTE TREATMENT SYSTEMS FOR GREAT LAKE ORE CARRIERS,
Thiokol Corp., Brigham City, UT.
For primary bibliographic entry see Field 5D.
W78-01157

ELIMINATION OF POLLUTION FROM COTTAGE CHEESE WHEY BY DRYING AND UTILIZATION,
Dairy Research and Development Corp., Peekskill, NY.
For primary bibliographic entry see Field 5D.
W78-01167

UTILIZATION OF CHEESE WHEY FOR WINE PRODUCTION,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
H. Y. Yang, F. W. Bodyfelt, K. E. Berggren, and P. K. Larson.
EPA-600/2-77-106. June 1977. 27 p, 2 fig, 7 tab, 7 ref.

Descriptors: *Fermentation, *Yeasts, *Dairy industry, *Food processing industry, *Recycling, Nutrient removal, Industrial wastes.
Identifiers: Whey, Wine production.

The use of whey as a fermentation substrate for wine production may offer economic advantages to the dairy and wine industries, as well as a means of disposal for the 90 lbs of whey resulting from the production of 10 lbs of cheese. Whey was obtained from cheese plants in Oregon and Washington for a testing program on the production of whey wine. Studies on the effect of different wine yeast strains on the fermentation rate of whey wine indicated that Montrachet yeast fermented the fastest at 7 days, followed by Champagne, Sherry, Port, and Burgundy. Studies on the effect of fermentation temperatures on fermentation rate and wine flavor revealed that fermentation at room temperature (72 F) resulted in a time of 7 days for completion of fermentation and no adverse effects on taste. Sulfur dioxide at 100 ppm was recommended as a preservative which would not adversely affect flavor. Bentonite at 0.5% was suggested as a clarifying agent. Studies on the possibility of blending fruit and berry wines with whey wine and on the use of synthetic flavoring agents indicated that the raspberry-whey blend wine and the citrus-flavored whey wine were most favored by the participants in a sensory evaluation of whey wines. (Schulz-FIRL)
W78-01170

PYROLYSIS OF INDUSTRIAL WASTES FOR OIL AND ACTIVATED CARBON RECOVERY,
Occidental Research Corp., La Verne, CA.
F. B. Boucher, E. W. Knell, G. T. Preston, and G. M. Mallan.
EPA-600/2-77-091. May 1977. 181 p, 22 fig, 45 tab, 2 ref, 2 append.

Descriptors: *Ultimate disposal, *Pulp and paper industry, *Activated carbon, *Fuels, *Oils, Fibers(Plant), Bark, Trees, Heat treatment, Pilot plants, Animal wastes(Wildlife), Farm wastes, Industrial wastes, Waste disposal.
Identifiers: Pyrolysis, Synthetic fuel oils, Douglas fir, Rice hulls, Grass straw.

A four-phase study evaluated the use of a flash pyrolysis process developed by the Garrett Research and Development Company in La Verne, California, for the production of synthetic fuel oils from municipal and industrial wastes. Laboratory pyrolysis studies with a 5 lb/hr bench-scale reactor were used to examine the conversion of Douglas fir bark, rice hulls, grass straw, and animal feedlot wastes to synthetic fuel oil and activated carbon. Pilot plant studies examined the preparation of feedstock, production of start-up char by direct electrical heating from the reactor walls, product quality, optimum operating conditions, and product char properties. The final phase of the study presented an engineering process design and economic evaluation of the Garrett flash pyrolysis process for the conversion of Douglas fir bark to synthetic fuel oil and saleable char products in the form of briquettes or activated carbon. Acceptable products were obtained from all feedstocks except animal waste because of its high concentrations of nitrogen, sodium, and potassium. Designs are presented for a $13.3 million, 12 dry ton/day tree bark conversion plant which could be operated for $2.9 million per year at a profit of $10/ton of dry bark. A bark quantity of 300 tons/day is recommended as the break-even point for the Garrett process. (Schulz-FIRL)
W78-01172

THE ORIGIN, TREATMENT AND DISPOSAL OF TANNERY EFFLUENTS,
For primary bibliographic entry see Field 5D.
W78-01181

5F. Water Treatment and Quality Alteration

IS YOUR SWIMMING POOL SAFE.
South African Bureau of Standards, Pretoria.
SABS Bulletin, Vol. 6, No. 5, p 97-101, January 1977. 4 fig.

Descriptors: *Swimming pools, Safety hazards.

A code of practice for the safeness of swimming pools on private premises has been prepared by the South African Bureau of Standards. The code lays down responsibilities, principles, methods and planning techniques for the protection of children against the hazards of swimming pools on private premises, and makes recommendations for the design and installation of typical protective devices that are intended to prevent children from gaining unauthorized access to a swimming pool. Enclosures, gates, pool covers and warning devices are discussed in detail. (So. African Water Info. Center)
W78-00932

OZONE: THE WATER CONDITIONING PROCESS OF THE FUTURE TODAY,
Alron Industries, Inc., Rochester, NY.
A. Burris.
Water Well Journal, Vol 31, No 10, p 38-40, October, 1977.

Descriptors: *Ozone, *Water treatment, Water purification, Chlorination, Viruses.
Identifiers: *Individual water systems, Point-of-use water treatment.

Although ozone has been applied to water treatment since the late 1800's and has shown success in large cities throughout the world, only a few American municipalities have used ozone, partly because of a tradition that has enshrined chlorine. Interest in ozone has grown in the U.S., however, because of ozone's superiority to chlorine in several areas: it kills viruses whereas conventional chlorination does not, it does not produce carcinogenic, toxic, and odiferous chlorinated hydrocarbons as byproducts, and it is capable of rendering many common chemical pollutants harmless. Ozone treatment is particularly adaptable to individual water systems. Its many advantages include simplicity, purification without chemical additives, no dosage control problems, and effectiveness over a wide pH range. Initial capital cost for an ozone system is higher than for other treatment systems, but this cost is offset by savings on chemical supplies over a period of years. (Eberle-NWWA)
W78-00953

REMOVING IRON FROM A WATER SUPPLY,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 31, No 10, p 35-36, October, 1977.

Descriptors: *Groundwater, *Water treatment, *Iron compounds, *Water wells, *Iron bacteria, Ion exchange, Filtration, Oxidation, Water softening, Chlorination.

Although iron in a well supply does not normally constitute a health hazard, concentrations of 0.3 ppm or greater can prove very unattractive esthetically and can lead to serious damage of an individual water system. Three basic methods available to eliminate or reduce iron water problems are ion exchange, oxidation-filtration, and chlorination-filtration. In-depth analysis of the specific well problem is necessary before selecting any one method. For ferrous iron concentrations of 5 ppm or less, ion exchange units are adequate. Customarily used in areas with hardness problems, such units operate by exchanging sodium for iron to convert ferrous bicarbonate to sodium bicarbonate. For concentrations of 5-20 ppm, oxidation-filtration by means of a filter bed impregnated with manganese dioxide can frequently be accomplished. For concentrations greater than 20 ppm, chlorination followed by filtration is the most dependable method of removing dissolved iron, and is the only practical means of eliminating iron bacteria from the water. Amount of water used per week, maximum rate of flow, and pH of the water supply source must all be taken into consideration when designing the iron treatment system and scheduling maintenance operations. (Eberle-NWWA)
W78-00954

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 6E.
W78-00955

IMPACT OF ABANDONED WELLS ON GROUND WATER,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 6E.
W78-00968

THE ACTIVITY OF TRACE METALS IN AQUEOUS SYSTEMS AND THE EFFECT OF CORROSION CONTROL INHIBITORS,
Albuquerque Univ., NM.
For primary bibliographic entry see Field 8G.
W78-01057

5G. Water Quality Control

USE OF SALT (NACL) WATER TO REDUCE MORTALITY OF CHINOOK SALMON SMOLTS, ONCORHYNCHUS TSHAWYTSCHA, DURING HANDLING AND HAULING,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
C. W. Long, J. R. McComas, and B. H. Monk.
Marine Fisheries Review, Vol. 39, No. 7, p. 6-9, 1977. 9 fig, 10 ref.

Descriptors: *Mortality, *Salinity, *Columbia River, *Saline water, *Salt tolerance, *Fish diseases, *Chinook salmon, *Smolt, *Fungi, *Pathogenic fungi, Water chemistry, Salts, Metabolism, Sodium compounds, Fish physiology, Fish stocking, Fish passages, Fish barriers, Juvenile growth stage, Aquiculture, Washington.
Identifiers: *Snake River(Wash), *Saprolegnia.

A major research program on the Columbia and Snake Rivers was designed to increase survival of juvenile salmon and trout by capturing them at an upriver dam, transporting them around a series of dams, and releasing them into the Columbia River. Excellent results have been obtained with steelhead trout, Salmo gairdneri. However, the mortality of chinook salmon, Oncorhynchus tshawytscha, immediately following their transportation adversely affected the percentage that return as adults. In a small-scale study conducted in 1975 at Bonneville Dam, adding salt (NaCl) to the water during handling and hauling increased the survival of juvenile chinook salmon and protected test fish against Saprolegnia spp., a fungus that infected several of the control fish. The addition of salt to the water in future transportation studies should reduce delayed mortality of juvenile chinook salmon and thereby increase the percentage that return as adults. (Katz)
W78-00909

TOXICITY TO FISH OF CYANIDES AND RELATED COMPOUNDS -- A REVIEW,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-00927

REPORT OF THE UNITED NATIONS WATER CONFERENCE, MAR DEL PLATA, 14-25 MARCH 1977.
United Nations Water Conference, New York.
For primary bibliographic entry see Field 6E.
W78-00972

WATER POLLUTION INVESTIGATION: LOWER GREEN BAY AND LOWER FOX RIVER,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Standards.
For primary bibliographic entry see Field 5B.
W78-01022

METHODS FOR IDENTIFYING AND EVALUATING THE NATURE AND EXTENT OF NON-POINT SOURCES OF POLLUTANTS.
Environmental Protection Agency, Washington, DC. Office of Air and Water Programs.
For primary bibliographic entry see Field 5B.
W78-01024

NUMERICAL MODELING OF POLLUTANT TRANSPORT USING A LAGRANGIAN MARKER PARTICLE TECHNIQUE,
Rhode Island Univ., Kingston.
M. Spaulding.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-28682, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Memorandum, NASA TM X-73930, National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia, August 1976. 33 p, 11 fig, 2 tab, 14 ref.

Descriptors: *Water pollution control, *Numerical analysis, *Simulation analysis, Pollutants, Wastes, Coasts, Analytical techniques, Flow, Sediments, Equations, Algorithms, Mathematical models, Systems analysis.
Identifiers: *Waste discharge.

A derivation and code have been developed for the three-dimensional mass transport equation, using a particle-in-cell solution technique, to solve coastal zone waste discharge problems where particles are a major component of the waste. Improvements in the particle movement techniques have been suggested and typical examples illustrated. Preliminary model comparisons with analytic solutions for an instantaneous point release in a uniform flow have shown good results in resolving the waste motion. Findings indicate that this computational model will provide a useful technique to study the motion of sediment, dredged spoils, and other particulate waste loads commonly deposited in coastal waters. (Bell-Cornell)
W78-01069

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

MATHEMATICAL MODELING OF NATURAL GROUNDWATER RECHARGE,
Utah International Inc., San Francisco, CA. Environmental Quality Dept.
For primary bibliographic entry see Field 2F.
W78-00974

IMPROVED PROCEDURES FOR VALUATION OF THE CONTRIBUTION OF RECREATION TO NATIONAL ECONOMIC DEVELOPMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
For primary bibliographic entry see Field 6B.
W78-01003

WATER AND RELATED PROBLEMS IN COAL-MINE AREAS OF ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 5B.

W78-01094

6B. Evaluation Process

IRRIGATION OF SUGAR CANE,
South African Sugar Association Experiment Station, Mount Edgecombe.
For primary bibliographic entry see Field 3F.
W78-00928

LEAST COST IRRIGATION SYSTEM SPECIFICATIONS FOR VARIOUS CONDITIONS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-00973

IMPROVED PROCEDURES FOR VALUATION OF THE CONTRIBUTION OF RECREATION TO NATIONAL ECONOMIC DEVELOPMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
J. F. Dwyer, J. R. Kelly, and M. D. Bowes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 446, Price codes: A11 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 128, September 1977. 218 p, 13 fig, 17 tab, 18 ref, 5 append. OWRT C-7525(6237)(1).

Descriptors: *Recreation, *Benefits, *Economics, *Evaluation, *Methodology, Water utilization, Water users, *Cost analysis, *Cost-benefit analysis, Value, Assessments.
Identifiers: *National economic development, Consumers' surplus, Travel cost method, Interview method, Unit day values, *Willingness-to-pay functions, Valuation procedures.

Improved procedures are presented for evaluating the contribution of recreation to national economic development. These procedures are to replace those outlined in the Principles and Standards for Planning Water and Related Land Resources. (See W74-09278) Desirable criteria for valuation procedures are specified. Variation procedures currently used by federal agencies make almost exclusive use of the 'interim unit day value approach,' sometimes augmented by point systems. This approach has little theoretical or empirical justification and modification of the 'interim unit day value approach' and the use of point systems is not a useful method of developing improved procedures. Rather, it is recommended that models be developed to predict individual willingness-to-pay for many types of recreation as functions of site characteristics, the characteristics of the individual user (including the history of previous use), the availability of substitute activities and sites, and the location of the individual in relation to the resources under study. The total value of the resource would then be a function of these variables, the number of users, and the distribution of users within the market areas. These functions may be derived from regional travel cost demand functions (which would also provide estimates of use) or could be explicit willingness-to-pay functions derived from the survey method (which must be supplemented by a use estimate). Examples of the desired models are provided along with guidelines for their development and use. Needs for further research are identified.
W78-01003

TURNING BACK THE TIDES OF LONG-TIME FEDERAL WATER POLICY,
For primary bibliographic entry see Field 6E.
W78-01044

DRAINING THE WATER PROJECTS OUT OF THE PORK BARREL,
For primary bibliographic entry see Field 4A.
W78-01045

HIKER PERCEPTION OF WILDERNESS: A STUDY OF THE SOCIAL CARRYING CAPACITY OF THE GRAND CANYON,
Arizona Univ., Tucson. Div. of Economic and Business Research.
W. Towler.
Arizona Review, Vol. 26, Nos. 8-9, p 1-10, August-September, 1977, 1 fig, 2 tab, 15 ref.

Descriptors: *Recreation, *Arizona, *Environmental effects, *Evaluation, *Recreation facilities, *National parks, Environment, Colorado River, Social needs, Social participation, Conservation, Public lands, Attitudes, Land management, Surveys, Camp sites, Land use.
Identifiers: Grand Canyon.

A study was conducted to determine the socio-economic and demographic characteistics and motivations of trail users in the Grand Canyon National Park, Arizona. An additional purpose was to measure the perception of several attributes of wilderness in the Wilderness Act of 1964. Questionnaires were mailed to users of wilderness permits in 1976. The study draws its conclusions from the 252 responses. Almost every hiker on the wilderness trails perceives the inner canyon as a wilderness area and most feel that man's impact should be minimal. There is overwhelming support for the present National Park Service policy of limiting use on wilderness trails and requiring every backcountry traveler to obtain a permit before entering the canyon. A high proportion of hikers also object to seeing motorized rafts on the Colorado River, and many complained of large groups traveling together, especially in areas where hikers interact with large river raft parties. (Jamail-Arizona)
W78-01047

COMPARATIVE ASSESSMENT OF WATER USE AND ENVIRONMENTAL IMPLICATIONS OF COAL SLURRY PIPELINES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 8A.
W78-01085

WATER CONSUMPTION BY NUCLEAR POWERPLANTS AND SOME HYDROLOGICAL IMPLICATIONS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01097

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WASTE-WATER TREATMENT: ECOLOGICAL, TECHNOLOGICAL AND ECONOMIC ASPECTS (IN GERMAN),
For primary bibliographic entry see Field 5D.
W78-01163

6D. Water Demand

THE IMPACT OF SECOND-HOME DEVELOPMENT ON WATER AVAILABILITY IN NORTH CENTRAL ARIZONA,
Arizona State Univ., Tempe. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 4C.
W78-01052

WATER CONSUMPTION BY NUCLEAR POWERPLANTS AND SOME HYDROLOGICAL IMPLICATIONS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01097

PUBLIC WATER SUPPLIES OF SELECTED MUNICIPALITIES IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. G. Healy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 691/AS, price codes: A14 in paper copy, A01 in microfiche. Water-Resources Investigations 77-53, July 1977. 309 p, 28 fig, 6 tab, 57 ref.

Descriptors: *Water supply, *Municipal water, *Florida, *Surface waters, *Groundwater resources, Aquifers, Water yield, Water utilization, Water quality, Water demand, Cities, Population, Growth rates, Water consumption(Except consumptive use), Reviews, Evaluation.

Water use by 169 municipalities and 5 county water systems in Florida as of December 1975 is summarized. Included in the listing, by city or system, are water use data, sewage data, and chemical analyses of raw and treated water. In addition, miscellaneous public supply data for three small communities and municipalities (population generally less than 5,000) and historical public supply pumpage for selected municipalities for 1945, 1947, 1956, 1965 and 1970-74 are tabulated. Also included is a list of reports published in 1970-75 relating to hydrology, geology, and water resources of the areas where the cities are located. The demand for freshwater for municipal use in Florida increased sharply during 1970-75. Statewide ground-water use for municipal supply increased from 759 mgd in 1970 to 976 mgd in 1975 and surface-water use has increased from 125 mgd in 1970 to 166 mgd in 1975. The 28 percent increase in ground-water use and the 33 percent increase in surface-water use reflects the continuing rapid population growth and the accompanying expanding economic activity in the State. (Woodard-USGS)
W78-01098

6E. Water Law and Institutions

UNDERGROUND INJECTION PROGRAM SET UNDER SAFE DRINKING WATER ACT,
New Mexico State Univ., University Park.
J. W. Hernandez.
Water and Sewage Works, Vol 124, No 10, p 67-69, October, 1977.

Descriptors: *Injection wells, *Waste disposal, *Water pollution sources, *Groundwater, Water pollution control, Aquifers, Water supply, Potable water.
Identifiers: *USS Environmental Protection Agency, *Underground Injection Control, *National Safe Drinking Water Act, Federal Water Pollution Control Act.

The future safety of existing and potential water supply aquifers was one of the principal concerns voiced by Congress in the passage of Public Law 93-523, the National Safe Drinking Water Act of 1974. Although some control of ground water pollution was provided in 1972 through Public Law 92-500, Congress felt that greater protection should be afforded ground water sources of public water supplies, protection that was thus provided in sections 1421-23 of PL93-523 requiring designated states to adopt regulations to control underground injection of pollutants. These states have enforcement responsibility for ground water protection, their injection-control programs being subject to approval by the U.S. EPA. In certain

cases, EPA may, on its own initiative, place constraints on projects in an area having an aquifer which is the sole or principal drinking water supply for that area. More recently, proposed Underground Injection Control (UIC) regulations have been published by the EPA and have been the subject of various hearings across the nation. Questions raised regarding several definitions and the extensive reports required by injection well operators indicate that some modification of the regulations may be warranted. (Eberle-NWWA)
W78-00955

POLICY IMPLICATIONS OF URBAN LAND PRACTICES FOR GROUNDWATER QUALITY,
American Inst. of Planners, Washington, DC.
For primary bibliographic entry see Field 4C.
W78-00958

NATIONAL WATER COMMISSION VIEWS GROUNDWATER PROTECTION,
Camp, Dresser and McKee, Belmont, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-00966

ENVIRONMENTAL EFFECTS OF SEPTIC TANK SYSTEMS,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-00967

IMPACT OF ABANDONED WELLS ON GROUND WATER,
National Water Well Association, Worthington, OH.
T. E. Gass, J. H. Lehr, and H. W. Heiss, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 665, Price codes: A04 in paper copy, A01 in microfiche. EPA-600/3-77-095, Ecological Research Series, August, 1977. 59 p, 3 fig, 20 ref, 2 append. R-803889.

Descriptors: *Wells, *Water pollution control, *Regulation, *Groundwater, Water wells, Oil wells, Drill holes, Well casings, Cement grouting, Legislation, Potable water, Waste disposal, Aquifers, Water pollution sources.
Identifiers: *Well abandonment, *Abandoned wells, *Well sealing.

Although it is recognized that unplugged abandoned wells are a hazard to our nation's potable groundwater supplies, the potential magnitude of the problem is still not fully understood. Case histories of several serious incidents of groundwater pollution due to improperly abandoned wells are discussed. Also provided is a survey of state laws concerning well abandonment procedures which exposes a disparity in such regulations in and among different states. Laws in the traditional oil-producing states are generally up-to-date and effective in dealing with abandoned wells. In the remainder of the states, well abandonment laws are ineffective or non-existent. By examining the model legislation guidelines that are presented, state and local authorities can gain insight and legislative perspective, which will enable them to formulate and enact effective laws to protect their ground water supplies. (Eberle-NWWA)
W78-00968

HOW RECENT FEDERAL LEGISLATION HAS MOVED TOWARD GREATER PROTECTION OF GROUNDWATER RESOURCES.
Geraghty and Miller, Inc., Port Washington, NY.
Special Report, September, 1977. 7 p.

Descriptors: *Water pollution control, *Groundwater, *Waste disposal, *Water law, Water pollution sources, Injection wells, Toxins, Regulation, Pollutants.
Identifiers: Safe Drinking Water Act, Resource Conservation and Recovery Act, Toxic Substances Control Act.

Emphasis on the protection of one resource in an environmental network sooner or later results in transfer of stress to one or all of the neglected resources. Waste disposal regulations to prohibit contamination of air and surface water have thus made ground water a more vulnerable target for pollution. Over the past decade, legislative reaction to this situation has been a series of Acts which have progressively tightened regulations regarding ground water protection: the Safe Drinking Water Act (PL 93-523), the Resource Conservation and Recovery Act (PL 94-580), and the Toxic Substances Control Act (PL 94-469). EPA is now ony beginning to implement some of the provisions of these Acts, but if they are fully enforced, the impact on ground water polluters could be substantial. (Eberle-NWWA)
W78-00969

WATER WELL INDUSTRY CODES AND LICENSING.
Ground Water Age, Vol 10, No 9, p 20-25, May, 1976. 1 tab.

Descriptors: *Drilling, *Water wells, *Well regulations, Permits, Well casings, Plastic pipes.
Identifiers: Pump installation, Pitless adapters.

Ground Water Age completed is second annual survey of state agencies responsible for the water well drilling codes and licensing of well drilling contractors in 1976. Results are presented in tabular form. Four states, Connecticut, Illinois, South Dakota, and Vermont reported that they require a plumber's license in lieu of a well driller's license. (Eberle-NWWA)
W78-00970

REPORT OF THE UNITED NATIONS WATER CONFERENCE, MAR DEL PLATA, 14-25 MARCH 1977.
United Nations Water Conference, New York.
UN Report E/CONF.70/29, 1977. 181 p, UN Sales No. E.77.II.A.12, $7.00.

Descriptors: *Conferences, *United Nations, *Water resources development, *Assessments, Regional analysis, *Water utilization, Pollution abatement, *Water supply, Deserts, *Water policy, Agriculture, Institutions, Financing, Planning, Management, Water pollution, *Environment.
Identifiers: *UN Water Conference(Mar del Plata 1977), *Developing countries, *International cooperation.

The Mar Del Plata Action Plan made recommendations in the following areas: Assessment of water resources; Water use and efficiency; Environment, health and pollution control; Policy, planning and management; Natural hazards; Public information, education, training and research; Regional co-operation; International co-operation; Specific regional recommendations. It also stated resolutions on the following topics: Assessment of water resources; Community water supply; Agricultural water use; Research and development of industrial technologies; Role of water in combating desertification; Technical co-operation among developing countries in the water sector; River commissions; Institutional arrangements for international co-operation in the water sector; Financing arrangements for international co-operation in the water sector; Water policies in the occupied territories.
W78-00972

TURNING BACK THE TIDES OF LONG-TIME FEDERAL WATER POLICY,
J. D. Kirschten.
National Journal, Vol. 9, No. 24, p 900-903, June 11, 1977.

Descriptors: *Water policy, *Federal-State Water Rights Conflicts, *Federal Project Policy, Federal Government, Water resources development, Water demands, Droughts, *Water conservation, U.S. Water Resources Council, Southwest, U.S., Administration agencies, Irrigation efficiency, Cost sharing.
Identifiers: Environmental Protection Agency, U.S. Army Corps of Engineers, Council on Environmental Quality, Office of Management and Budget.

President Carter's proposed comprehensive national water resources policy which would unite the efforts of 25 federal agencies presently dealing with water problems is discussed. Interior Secretary Cecil D. Andrus will lead the water policy review which has as its main purpose a more rational use of water. As many areas of the U.S. are dealing with serious drought conditions, Carter and his aids feel the time is ripe to convince Americans that wise management and conservation may be better answers to water problems than expensive construction projects. The Administration cut the budget for several water projects, but these cuts are being challenged by the legislative branch. Carter's five basic areas for water policy reform (water conservation, cost sharing, economic stimulus, project evaluation, and dam safety) are discussed. Among the reforms investigated are more efficient irrigation practices and new water pricing strategies. Three Federal agencies: Office of Managment and Budget, Council on Environmental Quality, and the Water Resources Council are responsible for the water policy review. The impact of state and local water interests and the creation of a new Department of Natural Resources are also discussed. (Jamail-Arizona)
W78-01044

DRAINING THE WATER PROJECTS OUT OF THE PORK BARREL,
For primary bibliographic entry see Field 4A.
W78-01045

ENVIRONMENTAL IMPACT ASSESSMENTS FOR U.S. AND CANADIAN INDUSTRIES,
Jordan (Edward C.), Inc., Portland, ME.
For primary bibliographic entry see Field 5C.
W78-01099

THE ROLE OF TOXIC COMPOUNDS IN THE REVISION OF THE 1983 EFFLUENT GUIDELINES,
Environmental Protection Agency, Washington, DC.
C. Vogt.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 5-10. 5 tab.

Descriptors: *Legislation, *Toxicity, *Water quality standards, *Pulp wastes, Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Effluents, Pollutants, Public health, Hazards, Waste water treatment, Waste treatment, Economics, Regulation, Water pollution.
Identifiers: Paper converting industry.

The U.S. Environmental Protection Agency (EPA) has established effluent limitations and standards for regulating the discharges from pulp, paper, and paperboard mills. The Agency recently signed a consent decree (June 1976) as a result of litigation brought about by five public interest groups. The consent decree requires the EPA to establish revised effluent limitations and standards regulating the discharge of up to 65 classes of pollutants from pulp, paper, and paperboard mills and converting plants. The regulations must be promulgated within three years and would be applicable to new facilities, to existing facilities (on or before 1983), and to users of publicly owned waste water treatment facilities. The EPA will set the effluent limitations and standards based upon studies

which the Agency has initiated to examine the health and environmental risks of the 65 classes of pollutants, alternative technologies for removal of the pollutants, and economic impacts of the regulations. (Witt-IPC)
W78-01122

6F. Nonstructural Alternatives

TURNING BACK THE TIDES OF LONG-TIME FEDERAL WATER POLICY,
For primary bibliographic entry see Field 6E.
W78-01044

6G. Ecologic Impact Of Water Development

REPORT OF THE UNITED NATIONS WATER CONFERENCE, MAR DEL PLATA, 14-25 MARCH 1977.
United Nations Water Conference, New York.
For primary bibliographic entry see Field 6E.
W78-00972

THE EFFECT OF LARGE DAMS ON RIVER WATER TEMPERATURE BELOW THE DAMS, WITH SPECIAL REFERENCE TO BILHARZIA AND THE VERWOERD DAM,
Bilharzia Field Research Unit, Nelspruit (South Africa).
R. J. Pitchford, and P. S. Visser.
South African Journal of Science, Vol 71, p 212-213, July 1975. 1 tab, 2 ref.

Descriptors: *Temperature effect, *Ecology, Snails, Bilharzia, Mollusks, Schistosomiasis, *Dam design, *Flow control, Sluices.
Identifiers: Verwoerd Dam, South Africa, Orange River, Fish River, Orange River Project.

The majority of large dams are constructed in such a way that the normal water out-flow from them into the rivers below is from sluices below the water surface level of the dam. Depending on the depth below surface level, temperatures of the out-flowing water might be very different from the normal water temperatures existing in comparatively shallow rivers. The effect of water temperature changes on fauna and flora ecology below the dam might be apparent for long distances downstream. Water temperature plays a vital role in Schistosome transmission (1) in permitting a suitable snail population to flourish and (2) in controlling the length of the incubation period of the parasite in the snail. Numerous situations might therefore arise which could alleviate or aggravate either the snail or the parasite population, or both, as a result of a permanent change of water temperature over large areas. Possible changes in the Orange and Fish Rivers due to the existence of the Verwoerd Dam are studied. (So. African Water Info. Center)
W78-00997

ENVIRONMENTAL INVENTORY AND ASSESSMENT OF NAVIGATION POOLS 24, 25, AND 26, UPPER MISSISSIPPI AND LOWER ILLINOIS RIVERS; SUMMARY REPORT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
R. C. Soloman, D. R. Parsons, D. A. Wright, B. K. Colbert, and C. Ferris.
Available from the National Technical Information Serivce, Springfield, VA 22161 as AD-A017 865, Price codes: A05 in paper copy, A01 in microfiche. Technical Report Y-75-1, November 1975. 97 p, 6 fig, 5 tab, 4 map, 46 ref.

Descriptors: *Environment, *Surveys, *Mississippi River, *Mississippi River basin, Geomorphology, Rivers, Vegetation, Wildlife, Aquatic life, Water quality, Sediments, Sediment transport, Dams, Locks, Navigable rivers, Flood plains, Environmental effects, Vegetation effects, Trees, Wetlands, Habitats, Channel improvements, Dredging, Ecology, Stage-discharge relations, Dikes, Bank protection.
Identifiers: *Illinois River, Environmental inventories.

The River and Harbor Act of 3 July 1930 authorized the construction and maintenance of a 9-ft-deep by 300-ft-wide channel for commercial navigation of the Upper Mississippi and Lower Illinois Rivers. Construction of locks and dams supplemented by dredging and bank stabilization was required to maintain the 9-ft depth, particularly during periods of low flow. An investigation was performed by Colorado State University to evaluate the river reaches before and after man-made changes and overall changes in geomorphology. Additionally, trends of future geomorphic changes that could result from existing and potential future developements were addressed with the aid of a mathematical simulation model. Vegetation and vegetative successional patterns of the floodplain were characterized by the Missouri Botanical Gardens. Vegetation maps were produced delineating vegetational communities adjacent to the rivers and on islands. An inventory of the animals and their habitats was conducted by Southern Illinois University. Seven habitats were distinguished in the unprotected floodplain. Based on literature, 49 species of mammals, 286 species of birds, and 81 species and subspecies of amphibians and reptiles were expected to occur in the study area. Members of the Waterways Experiment Sttion study team collected water and sediment samples for chemical and physical analysis and biological samples from four habitat types. The data were subjected to various statistical analyses to determine if there were differences between habitats and sampling dates. Fish samples were collected from the Illinois River by the Illinois Natural History Survey and results were compared with literature to determine temporal and spatial changes in distribution. The overall impacts of operation and maintainance of the 9-ft channel were discussed relative to the effects on the biological, chemical, and physical system in the study area. Recommendations were made for further studies that are needed to define impact more adequately. (Sims-ISWS)
W78-01028

7. RESOURCES DATA

7A. Network Design

HYDROLOGIC ANALYSIS AND RIVER-QUALITY DATA PROGRAMS,
URS Co., Seattle, WA. ; and Geological Survey, Portland, Or. Water Resources Div.
W. G. Hines, D. A. Rickert, and S. W. McKenzie.
Journal of the Water Pollution Control Federation, Vol 49, No 9, p 2031-2041, September 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Water quality, *Investigations, *Rivers, *Analytical techniques, *Data collections, Natural streams, Environmental effects, Flow control, Water pollution sources, Streams, Physical properties, Water temperature, Regression analysis, Evaluation, Network design, Synoptic analysis.

A unified approach is described for the collection of river-quality data. River-quality sampling and analysis programs can be dramatically improved through a de-emphasis of the routine monitoring approach and added emphasis on the following: (1) A competent analysis of the natural and man-controlled aspects of river hydrology as reflected by streamflow and water-temperature pattern and channel morphology, (2) The reanalysis of existing quality data, after their segregation into compatible temporal and spatial units, as derived from the hydrologic analysis, and (3) The use of repetitive synoptic studies tailored to the environmental conditions and problems of interest in each river basin. (Woodard-USGS)
W78-01079

7B. Data Acquisition

MEASUREMENT OF PERIODIC OPEN AND SHUT SHELL MOVEMENT OF BIVALVES BY THE STRAIN-GAUGE METHOD,
Thoku Region Fisheries Research Lab., Shiogama (Japan).
T. Fujii.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43, No 7, p 901, 1977. 1 fig, 7 ref.

Descriptors: *Instrumentation, Equipment, *Strain gauges, Measurement, *Mollusks, *On-site collections, *Biorhythms, Behavior, Analytical techniques, Testing, Frequency, Cycles, Methodology, Laboratory tests.
Identifiers: Quantitative methods, *Tapes japonica.

In this study strain-gauges were adapted to the task of measuring the periodic open and shut movements of the bivalve, Tapes japonica. The advantages and disadvantages of this method of quantifying shell movements in the organism's natural environment were discussed. (Katz)
W78-00911

A PLEXIGLASS SUBSAMPLING BOX FOR LARGE BENTHOS SAMPLES,
QLM Labs., Inc., Oswego, NY.
R. P. Klattenberg.
The Progressive Fish Culturist, Vol 37, No 3, p 165, 1975.

Descriptors: *Sampling, *On-site data collections, *Benthic fauna, *Benthic flora, *Benthos, Invertebrates, *Equipment, *Research equipment, Research and development, Design, Cladaphora, Metrocology, Onsite investigations.

The construction of a plexiglass subsampling box designed to reduce the time required to pick and sort large benthos samples was described. The box was designed primarily for Cladophora samples, but could be easily adapted for other uses. (Katz)
W78-00913

A QUANTITATIVE SAMPLER FOR AQUATIC MACROPHYTES,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Botany.
C. M. Breen, C. Lillig, J. Oliver, and H. D. Furness.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 59-62, 1976. 3 fig, 13 ref.

Descriptors: *Aquatic plants, Macrophytes, *Submerged plants, *Sampling, Design data, Equipment.
Identifiers: Potamogeton crispus, Nymphaea capensis, Ceratophyllum demersum.

A sampler which can be operated single-handed from a boat is described. It is electrically powered and cuts a vertical column of weed as it is lowered through the water. On reaching the bottom, a second system is operated which severs the material. All cut material is retained within the sampler by a system of nets. Results from tests of the effectiveness in three different macrophyte communities are presented. In dense growths, seven samples yield a standard error of less than 10% of the mean. Although the sampler is fairly heavy and may appear cumbersome, it is easily operated by one person in a fairly light boat. Its real advantage is that it samples a defined column, unlike samplers which adopt hooks or grabs as the harvesting principle. It has been used extensively

to yield very satisfactory estimates of seasonal changes in the standing crop of various aquatic macrophytes. (So. African Water Info. Center)
W78-00929

NEUTRON LOGGING METHOD FOR LOCATING THE TOP OF CEMENT BEHIND BOREHOLE CASING,
Oil and Natural Gas Commission, Madras (India).
A. E. Ahmed.
Journal of Petroleum Technology, Vol 29, No 9, p 1089-1090, September, 1977. 4 ref.

Descriptors: *Borehole geophysics, *Logging(Recording), *Cement grouting, Well casings.
Identifiers: *Neutron logging.

Several methods are available today for determining the top of the cement in the annulus around a well casing. Temperature logging and cement bond logging are among the techniques that are used successfully. A new technique involving a neutron log is presented as an alternative for when temperature or cement bond logging is impossible. Besides being sensitive to hydrogen present in borehole fluid and the fluid in the pores of rocks, the neutron log is also sensitive to casing, cement sheath, and borehole diameter. As the neutron device is pulled up in a borehole, a detectable shift in the recorded curve is registered when the tool passes the cemented zone of casing. This neutron method was tested on a well in the Cambay Basin, India, and showed acceptable results. (Eberle-NWWA)
W78-00965

MICROWAVE REMOTE SENSING OF SOIL WATER CONTENT,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2G.
W78-01056

DETECTION OF SOIL MOISTURE AND SOIL CHARACTERISTICS FROM SKYLAB,
Kansas Univ./Center for Research, Inc., Lawrence. Space Technology Center.
J. R. Eagleman, E. C. Pogge, and R. K. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16556, Price codes: A14 in paper copy, A01 in microfiche. Final Report 239-23, October 1975. 312 p, 122 fig, 24 tab, 63 ref, 1 append. NASA NAS9-13273.

Descriptors: *Remote sensing, *Soil moisture, *Snow cover, Instrumentation, Satellites(Artificial), Soil water, Moisture content, Photography, Microwaves, Radar, Radiation, On-site investigations, Data processing.
Identifiers: *Skylab, *Radiometers, Snow characteristics.

The Skylab soil moisture experiment was designed to evaluate the response of the various microwave sensors on Skylab to changing soil moisture patterns on earth. Detailed soil moisture information was collected from test sites in western Texas and eastern Kansas. A total of 2,250 soil samples was collected at 375 different sites and at six layers at each site so that the moisture content of the surface to 15 cm was obtained by 2.5 cm increments. The geographical distribution of soil moisture patterns was obtained throughout the test sites for comparison with the microwave sensors. The response of the S194 L-band radiometer to changing soil moisture conditions was very good for the five complete data sets consisting of three passes across Texas and two passes across Kansas. The comparisons between the L-band radiometer and soil moisture content within the footprint of the radiometer gave correlation coefficients ranging from -0.99 to -0.95 for these five data sets. The performance of the S193 passive radiometer was less consistent than that of the S194 L-band radiometer; however, a data set gave a very high correlation of -0.95. Two data sets were obtained for determine the microwave response to snow characteristics. The S193 scatterometer data indicated a positive correlation between snow depth and scattering coefficient; the variability, however, of the relationship was so great that other factors are clearly important. (Sims-ISWS)
W78-01058

COMPUTER-AIDED ANALYSIS OF SKYLAB MULTISPECTRAL SCANNER DATA IN MOUNTAINOUS TERRAIN FOR LAND USE, FORESTRY, WATER RESOURCE, AND GEOLOGIC APPLICATIONS,
Purdue Univ., Lafayette, IN. Lab. for Applications of Remote Sensing.
R. M. Hoffer.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-19509, Price codes: A17 in paper copy, A01 in microfiche. Final Report, LARS Information Note 121275, December 12, 1975. 394 p, 104 fig, 48 tab, 49 ref. NASA NAS9-13380.

Descriptors: *Remote sensing, *Satellites(Artificial), *Mountains, *Colorado, Land use, Forests, Forestry, Geology, Water resources, Snow cover, Clouds, Computers, Analytical techniques, Infrared radiation, Topography, Geomorphology, Hydrology.
Identifiers: *Skylab, *San Juan Mountains(Colo).

Results are described of an interdisciplinary research project involving the analysis of SKYLAB data obtained over the San Juan Mountains in Colorado. Computer-aided analysis techniques were applied to the S-192 MSS data for purposes of mapping land use, forest cover types, and hydrologic and geologic features of significance. In spite of the vegetative and topographic complexity of the test site, computer classification accuracies of 85% and 71% were obtained for Level II Land Use maps and Forest Cover maps, respectively. Accurate acreage estimates of forest cover were obtained by computer analysis of SKYLAB S-192 data. A detailed wavelength band study clearly indicated the importance of the near infrared wavelengths for vegetation mapping. The value of the improved spectral resolution of the SKYLAB MSS, as compared to LANDSAT, was also shown. SKYLAB MSS data clearly showed for the first time that the middle infrared wavelengths are essential for reliably separating snow from clouds on the basis of spectral response. Forest density and snow melt differences within the snowpack area could be mapped through use of the near infrared wavelengths. Calibration of the thermal infrared band allowed the surface temperature of a high elevation reservoir to be determined accurately from space. Geologic mapping, involving a variety of ratioing and classification techniques, indicated the need for additional study to define better the theoretical basis for use of these analysis procedures, in order to obtain reliable, predictable results. (Sims-ISWS)
W78-01059

AVALANCHE RELEASE AND SNOW CHARACTERISTICS, SAN JUAN MOUNTAINS, COLORADO.
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W78-01062

SAMPLING OF INDUSTRIAL WASTEWATER HELPS MEET DISCHARGE STANDARDS,
Clinton Bogert Associates, Fort Lee, NJ.
A. F. Milletari.
Water and Wastes Engineering, Vol. 14, No. 10, p 52, 55-57, October, 1977. 3 fig.

Descriptors: *Sampling, *Monitoring, *Flow measurement, *Water measurement, *Analytical techniques, On-site data collections, Water analysis, Laboratory tests, Industrial wastes, Waste water treatment, Pumps.
Identifiers: Industrial waste water sampling.

Industrial waste water sampling and monitoring programs are useful in controlling in-plant operations and insuring compliance with water quality regulations. Various aspects of waste water sampling are discussed: location; techniques; equipment; sample preservation; sampling schedules; and basic methods of sampling such as grab sampling, simple composite sampling, discrete composite sampling, and continuous monitoring. Simple grab sampling can be used to characterize waste water generally for a given time when concentration and flow are relatively constant. Simple composite grab sampling obtains representative cross-sections of waste water characteristics. Methods of obtaining flow-proportioned composite samples are described. The use of automatic sampling devices for discrete and continuous sampling is discussed and various types of flowmeters are described. Safety precautions which should be observed during field sampling are presented. (Schulz-FIRL)
W78-01073

COMPARISON OF DIFFERENT METHODS FOR ESTIMATING SNOWCOVER IN FORESTED, MOUNTAINOUS BASINS USING LANDSAT (ERTS) IMAGES,
Geological Survey, Tacoma, WA. Water Resources Div.; and Stanford Research Institute, Menlo Park, CA.
M. F. Meier, and W. E. Evans.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 215-234, 1975. 9 fig, 4 tab, 9 ref.

Descriptors: *Snow cover, *Estimating, *Satellites(Artificial), *Oregon, *Forests, Remote sensing, Analytical techniques, Snowpacks, Snow surveys.

Snow-covered areas on LANDSAT (ERTS) images of the Santiam River basin, Oregon, and other basins in Washington were measured using several operators and methods. Seven methods were used: (1) Snowline tracing followed by measurement with planimeter, (2) mean snowline-altitudes determined from many locations, (3) estimates in 2.5 x 2.5 km boxes of snow-covered area with reference to snow-free images, (4) single radiance-threshold setting locally edited by reference to altitude contours and other images, (6) two-band color-sensitive extraction locally edited as in (5), and (7) digital (spectral) pattern recognition techniques. Methods (4), (5), and (6) used the SRI Electronic Satellite Image Analysis Console (ESIAC). The seven methods are compared in regard to speed of measurement, precision, the ability to recognize snow in deep shadow or in trees, relative cost, and whether useful supplemental data (such as the distribution of snow-covered area with location or altitude) are produced. Standard errors range from about 3 to over 12 percent of the basin area depending on method and the fraction of the basin which is snow covered. (See also W77-10662) (Woodard-USGS)
W78-01095

ADVECTION IN THE PERU CURRENT AS OBSERVED BY SATELLITE,
Hawaii Univ., Honolulu. Dept. of Oceanography.
K. Wyrtki.
Journal of Geophysical Research, Vol. 82, No. 27, p 3939-3943, September 20, 1977. 10 fig, 11 ref.

Descriptors: *Ocean currents, *Water temperature, *Remote sensing, *South America, *Pacific Ocean, Satellites(Artificial), Oceans, Tempera-

ture, Advection, Circulation, Water circulation, Ocean circulation, Oceanography.
Identifiers: *El Nino, *Chile.

Two years of satellite-derived maps of sea surface temperature were used to evaluate their oceanographic applications and to study advection in the eastern part of the subtropical gyre of the South Pacific Ocean. The advance and retreat of a tongue of cool water stretching from the coast of Chile to the northwest under the southeast trade winds were analyzed and explained as advection. The time history of the development of this cool tongue was described, and its different behavior during two years was related to the 1976 El Nino event. During 1976, advection in the subtropical gyre was much weaker than during the year before. It was concluded that satellite-derived surface temperature maps form an important new tool in the analysis and monitoring of the time changes of large-scale thermal features at the surface of the ocean. (Sims-ISWS)
W78-01137

A HIGH-RESOLUTION ELECTRONIC RAINFALL INTENSITY RECORDER AND TOTALISER,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2B.
W78-01142

USER REQUIREMENTS AND USER ACCEPTANCE OF CURRENT AND NEXT-GENERATION SATELLITE MISSION AND SENSOR COMPLEMENT, ORIENTED TOWARD THE MONITORING OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, MD.
P. A. Castruccio, H. L. Loats, T. R. Fowler, and P. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-15552, Price codes: A05 in paper copy, A01 in microfiche. Report ECC 75: C-3-IV, December 15, 1975. 92 p, 17 fig, 6 tab, 11 ref. NASA NAS5-20567.

Descriptors: *Remote sensing, *Satellites(Artificial), *Surveys, *Water resources, Water users, Watersheds(Basins), Drainage, Vegetation, Reservoirs, Flood plains, Rainfall, Snow cover, Topography, Instrumentation, Equipment, Water resources development.
Identifiers: *LANDSAT, *User surveys, Sensors.

Principal water resources users were surveyed to determine the applicability of remotely sensed data to the user's present and future requirements. Analysis of responses was used to assess the levels of adequacy of Landsat 1 and 2 in fulfilling hydrological functions and to derive systems specifications for future water resources-oriented remote sensing satellite systems. The analysis indicated that water resources applications for all but the very large users require: resolutions of order 15 meters; number of radiometric levels of the same order as currently used in LANDSAT 1 (64); number of spectral bands not in excess of those used in LANDSAT 1 (4); and repetition frequency of order 2 weeks. The users had little feel for the value of new sensors: thermal IR, passive and active microwaves. What is needed in this area is to achieve specific demonstrations of the utility of these sensors and submit the results to the users to evince their judgement. All users indicate that the most significant information requirements are in the area of better knowledge of the characteristics of precipitation. Specifically, the temporal behavior (intensity versus time) of rainfall, its areal distribution, the statistics of succession of rain events as a function of time, and the storm travel characteristics. (Sims-ISWS)
W78-01155

7C. Evaluation, Processing and Publication

QUANTITATIVE MAP INTERPRETATION IN REGIONAL PLANNING SURVEYS (IN AFRIKAANS),
Agricultural Research Station, Bethlehem (South Africa).
J. A. Kruger, and J. S. Swart.
Proceedings of the Grassland Society of Southern Africa, Vol. 11, p 23-27, 1976. (English summary).

Descriptors: *Maps, Regional analysis, *Surveys, Vegetation, Plant groups.
Identifiers: Eragrostis, Elyonurus, Aristida.

A procedure followed for the quantitative interpretation of maps compiled for regional planning purposes of the Upper Orange catchment-basin is presented. The analyses provided useful figures concerning the distribution of dominant vegetation components and their association with relevant habitat factors. (So. African Water Info. Center)
W78-00934

THE IMPACT OF SECOND-HOME DEVELOPMENT ON WATER AVAILABILITY IN NORTH CENTRAL ARIZONA,
Arizona State Univ., Tempe. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 4C.
W78-01052

A PRELIMINARY APPRAISAL OF THE GARBER-WELLINGTON AQUIFER, SOUTHERN LOGAN AND NORTHERN OKLAHOMA COUNTIES, OKLAHOMA,
Geological Survey, Oklahoma City, OK. Water Resources Div.
J. E. Carr, and M. V. Marcher.
Open-file report 77-278, May 1977. 23 p, 11 fig, 2 tab, 11 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Groundwater recharge, *Water quality, Oklahoma, Sandstones, Groundwater availability, Water supply, Hydrogeology, Saline water-freshwater interfaces, Dissolved solids, Maps.

The Garber-Wellington aquifer in parts of Logan and Oklahoma Counties, Oklahoma, averages about 50 percent sandstone and 50 percent shale. Water-table conditions generally exist in the upper 200 ft in the outcrop area and part of the area overlain by the Hennessey Group. Water containing more than 1,000 mg/liter dissloved solids occurs at various depths throughout the area. The thickness of the freshwater zone ranges from less than 150 ft to about 850 ft. The total amount of water stored in the freshwater zone is estimated to be 21 million acre-ft based on a specific yield of 0.20. Minimum recharge in 1975 is estimated to be 190 acre-ft/sq mi or about 10 percent of the annual precipitation. As a result of pumping, the potentiometric surface in 1975 had been lowered 100 to 200 ft locally. Potential well yields range from 225 to 550 gpm depending on the amount of available drawdown. Upconing of saline water is a potential threat to water quality in the freshwater zone of the aquifer if the pressure head is excessively lowered, but the problem can be avoided by steady pumping at low rates from widely spaced wells. (Woodard-USGS)
W78-01075

THICKNESS OF THE POTABLE-WATER ZONE IN THE FLORIDAN AQUIFER,
Geological Survey, Jacksonville, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-01081

NITROGEN LOADS AND CONCENTRATIONS IN FLORIDA STREAMS,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. J. Slack, and D. A. Goolsby.
Florida Bureau of Geology Map Series No 75, 1976. 1 sheet, 3 fig, 3 tab, 16 ref.

Descriptors: *Maps, *Nitrogen, *Load distribution, *Florida, *Streams, Path of pollutants, Water quality, Water analysis, Ammonia, Nitrates, Nitrites.
Identifiers: *Solute concentrations, Organic nitrogen.

The data for this map report are based on approximately 4,000 nitrogen analyses from 204 stations on Florida streams. The concentrations of total nitrogen are generally lowest in northwest Florida streams and highest in central and southern Florida. Streams with the highest total nitrogen concentrations are those that receive industrial waste drainage from heavily fertilized areas, or domestic sewage effluent. Organic nitrogen is the dominant species at practically all stations. The average nitrate-nitrogen concentration is less than 1 milligram per liter at 96 percent of the stations. At only 3 percent of the stations is the average nitrite-nitrogen concentration greater than 0.10 milligram per liter. The average ammonia-nitrogen concentration is less than 0.50 milligram per liter at 95 percent of the stations. Concentration of total nitrogen is generally independent of discharge. Total nitrogen load generally varies directly with drainage area. A reasonable order of magnitude estimate for nitrogen yields is 1 ton of nitrogen per square mile per year. Surface waters with nitrogen yields greatly exceeding 1.0 usually receive industrial, municipal, or agricultural effluents. About 21,000 tons of nitrogen are discharged annually through Florida surface waters to the Atlantic and 52,000 tons to the Gulf of Mexico. (Woodard-USGS)
W78-01082

WATER RESOURCES DATA FOR MISSOURI, WATER YEAR 1976.
Geological Survey, Rolla, MO. Water Resources Div.
Water-Data Report MO-76-1, July 1977. 300 p, 3 fig.

Descriptors: *Missouri, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Missouri consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water quality of ground water. This report contains discharge records for 127 gaging stations; stage records for 3 of these gaging stations; contents for 6 lakes and reservoirs; and water quality for 19 gaging stations, 11 partial-record stations, 1 lake and 3 wells. Also included are data for 99 crest-stage partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Missouri. (Woodard-USGS)
W78-01083

RECONNAISSANCE OF GROUND-WATER RESOURCES IN A PART OF THE YAMPA RIVER BASIN BETWEEN CRAIG AND STEAMBOAT SPRINGS, MOFFAT AND ROUTT COUNTIES, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-01086

MAPS SHOWING GROUND-WATER CONDITIONS IN THE SOUTHERN PART OF THE CHINLE AREA, APACHE COUNTY, ARIZONA--1976,
Geological Survey, Tucson, AZ. Water Resources Div.
G. W. Levings, and C. D. Farrar.
Water-Resources Investigations 77-50 (open-file report), May 1977. 2 sheets, 7 ref.

Descriptors: *Groundwater resources, *Water table, *Water quality, *Maps, Aquifers, Hydrogeology, Arizona.
Identifiers: *Navajo Indian Reservation(Ariz), *Apache County.

The southern part of the Chinle area includes about 2,100 sq mi in northeastern Arizona and is entirely in the Navajo Indian Reservation. The main source of water is the ground water in the several aquifers that are made up of one or more formations. The aquifers are stacked one on the other and generally are not hydraulically connected. Information on the maps includes depth to water, altitude of the water level, and chemical quality of the water. Scale 1:125,000. (Woodard-USGS)
W78-01087

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1975.
Geological Survey, Nashville, TN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 462, Price codes: A20 in paper copy, A01 in microfiche.
Water-Data Report TN-75-1, March 1976. 453 p, 3 fig, 4 tab, 35 ref.

Descriptors: *Tennessee, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Tennessee consist of records of stage, discharge, and water quality of streams and springs; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. Presented are discharge records for 108 gaging stations; stage only records for 1 lake gaging station; elevation and contents for 26 lakes and reservoirs; water quality for 37 gaging stations, 64 partial-record flow stations, and 31 wells; and water levels for 27 observation wells. Also included are 134 crest-stage partial-record stations and 83 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous stream and spring measurements, or as seepage investigations of discharge and water quality. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Tennessee. (Woodard-USGS)
W78-01091

WATER RESOURCES DATA FOR OREGON, WATER YEAR 1976.
Geological Survey, Portland, OR. Water Resources Div.
Water-Data Report OR-76-1, 1977. 592 p, 5 fig, 3 tab.

Descriptors: *Oregon, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Oregon consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 296 gaging stations; stage only records for 8 gaging stations; stage and contents for 42 lakes and reservoirs; water quality for 80 gaging stations, and water levels for 98 observation wells. Also included are 161 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oregon. (Woodard-USGS)
W78-01092

THE UNITED STATES GEOLOGICAL SURVEY IN ALASKA: ACCOMPLISHMENTS DURING 1976.
Geological Survey, Reston, VA. Geology Div.
Circular 751-B, 1977. Blean, K. M., Editor. 112 p, 38 fig, 4 tab, 266 ref.

Descriptors: *Projects, *Alaska, *Hydrology, *Geology, *Publications, Annual, Reviews, Evaluation.
Identifiers: *U.S. Geological Survey projects(Alaska).

United States Geological Survey projects in Alaska include a wide range of topics of economic and scientific interest. Studies in 1976 include economic geology, regional geology, stratigraphy, environmental geology, engineering geology, hydrology, and marine geology. Discussions of the findings or, in some instances, narratives of the course of the investigations are grouped in eight subdivisions corresponding to the six major onshore geographic regions, the offshore projects, and projects that are statewide in scope. Locations of the study areas are shown. In addition, many reports and maps covering various aspects of the geology and mineral and water resources of the State were published. These publications are listed. (Woodard-USGS)
W78-01096

WATER CONSUMPTION BY NUCLEAR POWERPLANTS AND SOME HYDROLOGICAL IMPLICATIONS,
Geological Survey, Reston, VA. Water Resources Div.
E. V. Giusti, and E. L. Meyer.
Circular 745, 1977. 14 p, 6 fig, 1 tab, 9 ref.

Descriptors: *Nuclear powerplants, *Water consumption(Except consumptive use), *United States, *Cooling water, Water demand, Projections, Available water, Economic impact, Hydrologic data, Streamflow, Flow rates, Low flow, Surface-groundwater relationships, Evaluation.

Published data show that estimated water consumption varies with the cooling system adopted, being least in once-through cooling (about 18 cubic feet per second per 1,000 megawatts electrical) and greatest in closed cooling with mechanical draft towers (about 30 cubic feet per second per 1,000 megawatts electrical). When freshwater is used at this magnitude, water-resources economy may be affected in a given region. The critical need for cooling water at all times by the nuclear powerplant industry, coupled with the knowledge that water withdrawal in the basin will generally increase with time and will be at a maximum during low-flow periods, indicates a need for reexamination of the design low flow currently adopted and the methods used to estimate it. The amount of power generated, the name of the cooling water source, and the cooling method adopted for all nuclear powerplants projected to be in operation by 1985 in the United States are tabulated and the estimated annual evaporation at each powerplant site is shown on a map of the conterminous United States. Another map is presented that shows all nuclear powerplants located on river sites as well as stream reaches in the United States where the 7-day, 10-year low flow is at least 300 cubic feet per second or where this amount of flow can be developed with storage. (Woodard-USGS)
W78-01097

8. ENGINEERING WORKS

8A. Structures

WELL REDEVELOPMENT: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 3B.
W78-00952

GASS ON GAS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-00956

OPTIMIZING PENETRATION RATE, PART 1: DETERMINING PARAMETERS THAT AFFECT RATE OF PENETRATION,
Smith International, Inc., Irving. Smoth Tool Div.
J. H. Allen.
Oil and Gas Journal, Vol 75, No 41, p 94-107, October 3, 1977. 5 fig, 2 tab.

Descriptors: *Rotary drilling, *Computer programs, Mathematical models, Bearings, Costs.
Identifiers: Bits.

Outstanding performance can be obtained from present-day journal bearing bits if careful attention is given to the basic factors that affect penetration rate. Contemporary methods for determining the variables that affect rate of penetration should include the use of the latest prediction techniques and programs that provide minimum cost drilling. Moreover, drilling prediction techniques should be modified and updated and new calculation methods developed as new drilling products and new technology are introduced. Despite a considerable technology lag between discovery or development of computer techniques for rotary drilling and field applications of these techniques, many improvements have come about to increase both economy and rate of penetration. Basic factors affecting penetration rate are bit selection, bit weight, bit rotational speed, bit hydraulics, drilling fluid properties, and formation properties. Methods for determining each of these factors are listed in detail with stress on mathematical techniques and computer programs. (See also W78-00960) (Eberle-NWWA)
W78-00959

OPTIMIZING PENETRATION RATE, CONCLUSION: COMPUTER OPTIMIZES OPERATIONS,
Smith International, Inc., Irvine, CA. Smith Tool Div.
J. H. Allen.
Oil and Gas Journal, Vol 75, No 42, p 128-139, October 10, 1977. 4 fig, 35 ref.

Descriptors: *Rotary drilling, *Hydraulics, *Computer programs, Drilling fluids, Mud, Density, Viscosity, Equipment, Geologic formations, Costs.
Identifiers: *Jet bits, Bit weight, Rotary speed, Mud properties, Formation properties, Rate of penetration, Hydraulics programs.

The most significant recent development in improving mud rotary drilling efficiency has been the acceptance and widespread use of jet bits. Research in hydraulics of drilling with these bits

(e.g., studies of bottom-hole cleaning, relationships between bit weight or rotary speed to hydraulic horsepower, etc.), has helped make calculation of mud properties effective. At present, hydraulics programs can be computed using slide rule calculators, tables or charts, and computer programs. Mud properties considered in such analyses include (1) fluid density, (2) solids content, (3) fluid viscosity, and (4) water loss. Various tests of the formation to be drilled are also essential in estimating penetration rate, bit weight, and drilling costs. (See also W78-00959) (Eberle-NWWA)
W78-00960

EFFECTS OF AQUIFER THICKNESS AND SIDE PERFORATION ON DISCHARGE FROM OPEN WELL,
Indian Inst. of Tech., Kharagpur.
For primary bibliographic entry see Field 2F.
W78-00962

NEUTRON LOGGING METHOD FOR LOCATING THE TOP OF CEMENT BEHIND BOREHOLE CASING,
Oil and Natural Gas Commission, Madras (India).
For primary bibliographic entry see Field 7B.
W78-00965

ANCHORING A FORCE MAIN IN SAND.
World Construction, Vol. 25, No. 12, p 15, December, 1972. 2 fig.

Descriptors: *Construction, *Sewers, *Storm drains, Pipes, Water table, Timber piles, Foundations, Construction materials, Concrete technology.
Identifiers: Bronx(NY), Raymet.

Nicholas Di Menna and Sons, Incorporated, the general contractor for sewer and storm line installations at Co-op City, Bronx, New York chose 50-cm-diameter, 0.95-cm-wall 'Raymet' spiral-welded steel pipe and fittings for the force main portion of the sewer network. Due to loose fill and a high water table, croosoted timber piles driven in the trench to an average depth of 13 meters followed by 15 cm of broken stone ballast placed in the trench as a bed for a 28-cm reinforced concrete slab were used in preparing a firm foundation to support the heavy pipe. Before pouring the concrete cradle, the installed pipe was bulkheaded and pressure tested for 30 minutes with water at 8.78 kg/sq cm. (Sandoski-FIRL)
W78-00992

SHIELD-PROTECTED TUNNELING MACHINE DRIVES SEWER UNDER CITY STREETS.
Construction Methods and Equipment, Vol. 55, No. 2, p 99, February, 1973. 2 fig.

Descriptors: *Construction equipment, *Sewers, Tunnels, Tunneling machines, Soils.
Identifiers: Milwaukee(Wisc), Mini-John.

A mixed face excavator burrowing through varying conditions of clay, limestone, and hardpan has advanced beneath the streets of Milwaukee, Wisconsin, opening an average of 28 feet of 12-foot, 1.5-inch-diameter sewer tunnel per day. The Mini-John, a 220-hp elctro-hydraulic tunneler, is designed to dig both earth and rock with shear planes up to an unconfined compressive strength of 16,000 psi. From within the 19-foot-long protective shield, a toothed-bucket mounted on a rotating boom can be extended seven feet to excavate full face from all levels and angles. Controlled by two 150-ton jacks, the bucket can move 90 degrees and applies a tooth load of 119 tons. The bucket has an 85 degree crowd arc and is rotated 360 degrees by a gear drive that develops 150,000 foot-pounds of torque. A 235-ton hydraulic jack positions the boom radially for fullcircle operations. The conveyor, carrying clay and rock upward and back at 200 feet a minute, is powered by a 40-hp electro-hydraulic unit. (Sandoski-FIRL)
W78-00993

THE EFFECT OF LARGE DAMS ON RIVER WATER TEMPERATURE BELOW THE DAMS, WITH SPECIAL REFERENCE TO BILHARZIA AND THE VERWOERD DAM,
Bilharzia Field Research Unit, Nelspruit (South Africa).
For primary bibliographic entry see Field 6G.
W78-00997

1974 ICE BREAKUP ON THE CHENA RIVER,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska. Alaskan Projects Office.
For primary bibliographic entry see Field 2C.
W78-01013

WAIANAE SMALL-BOAT HARBOR, OAHU, HAWAII, DESIGN FOR WAVE PROTECTION, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. R. Bottin, Jr., C. E. Chatham, Jr., and R. D. Carver.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 134, Price codes: A10 in paper copy, A01 in microfiche. Technical Report H-76-8, May 1976. 199 p, 82 photo, 52 plate, 18 tab, 18 ref, 4 append.

Descriptors: *Waves(Water), *Hawaii, *Hydraulic models, *Harbors, Hydraulics, Shores, Shoreline cover, Model studies, Design.
Identifiers: *Oahu(Hawaii), Harbor design, Stub breakwater, Entrance channel, Turning basin, Breaking waves, Wave protection.

A 1:50-scale (undistorted) hydraulic model, reproducing approximately 1.4 miles of shoreline along the proposed Waianae Small-Boat Harbor site (beginning at Kaneilio Point and extending northwesterly), the surrounding reef, and sufficient offshore area to permit generation of the required test waves, was used to investigate the arrangement and design of proposed harbor configurations with respect to wave action. The basic harbor configuration consisted of (1) an outer breakwater, (2) a stub breakwater, (3) an entrace channel, turning basin, and main access channel, and (4) revetted fill areas in the harbor interior. Variations to the basic configuration involved changes in the alignments and lengths of the breakwater structure, the cross section of the breakwaters used, the size and shape of the turning basin, the location of fill areas, and the location of the launching ramp inside the harbor. It was concluded from test results of the three-dimensional model that: (1) Existing conditions, plan 1, are characterized by very rough and turbulent waves in the vicinity of the proposed harbor during periods of severe wave attack. (2) For the improvement plans tested, most wave energy reaching the interior of the harbor was due to diffraction through the entrance rather than from overtopping of, or transmission through, the breakwaters. (3) Although several of the improvement plans tested resulted in wave heights within the criteria established by POD (a maximum of 2.5 ft in the turning basin and 2.0 ft in the berthing area), plans 5A and 5C were determined to be the optimum improvement plans considering cost and wave protection afforded. (4) Breaking waves were observed in the entrance channel for some of the more extreme wave conditions, indicating that there will be periods when this channel is not navigable. (5) The harbor appeared to have no adverse effects on wave-induced currents in the immediate area, and wave-induced circulation should aid in harbor flushing. (6) There was no tendency for sediment to deposit either inside the harbor or in the harbor entrance; however, for certain wave conditions, sediment tended to deposit in the navigation channel. This may or may not indicate a minor potential problem with shoaling of the netrance channel, but shoaling should be no worse than the presently existing at the proposed harbor site. It was concluded from the two-dimensional stability model that, for the range of wave conditions considered, plans 1, 2, and 4 will: (1) Resist significant wave overtopping. (2) Prevent excessive wave energy transmission. (3) Maintain their structural integrity. (Lee-ISWS)
W78-01026

STABILITY OF GOBI BLOCK REVETMENT TO WAVE ATTACK,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8F.
W78-01027

FILLING AND EMPTYING SYSTEM, LITTLE GOOSE LOCK, SNAKE RIVER, WASHINGTON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
L. Z. Perkins, and A. J. Chanda.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 791, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 115-1, September 1975. 84 p, 26 fig, 19 tab, 1 append.

Descriptors: *Navigation, *Locks, *Hydraulic models, *Vortices, *Tailrace, *Washington, Barges, Hydraulics, Withdrawal, Culverts, Design.
Identifiers: *Little Goose Lock(Wash), Snake River(Wash), *Columbia River(Wash), Manifolds.

Little Goose Lock, located on the Snake River 70 miles above its junction with the Columbia River at Pasco, Washington, is 86 ft wide by 675 ft long and is designed for a maximum lift of 101 ft. The split-level hydraulic system in the lock is unique because both intake manifolds and both longitudinal culverts are in the right wall. This design was expected to reduce construction costs. Owing to the high head, the arrangement of longitudinal culverts, and the unknown hydraulic conditions, model studies of the filling and emptying systems were necessary. The following were to be determined in the model: filling and emptying times, culvert discharges, forces on barge tows moored in the lock chamber, movements of free barge tows, pressures at critical points in the culverts, and the possibility of vortex formation at the intakes. Modifications were done in the prototype design based on the hydraulic model tests. The lock chamber can be filled in 11.3 minutes, and it can be emptied in 12.7 minutes under an initial head of 101 ft without causing average forces greater than 5 tons on 8-barge tow. (Singh-ISWS)
W78-01061

COMPARATIVE ASSESSMENT OF WATER USE AND ENVIRONMENTAL IMPLICATIONS OF COAL SLURRY PIPELINES,
Geological Survey, Reston, VA. Water Resources Div.
R. N. Palmer, I. C. James, II, and R. M. Hirsch.
Open-file report 77-698, August 1977. 29 p, 9 fig, 1 tab, 17 ref.

Descriptors: *Coals, *Transportation, *Model studies, *Slurries, *Pipelines, Hydraulic transportation, Available water, Economic feasibility, Comparative costs, Railroads, Electric generators, Evaluation.
Identifiers: *Coal-slurry pipelines, *Western United States, Coal gasification-pipeline transport.

With other studies conducted by the U.S. Geological Survey of water use in the conversion and transportation of the West's coal, an analysis of water use and environmental implications of coal-slurry pipeline transport is presented. Simulations

of a hypothetical slurry pipeline of 1000-mile length transporting 12.5 million tons per year indicate that pipeline costs and energy requirements are quite sensitive to the coal-to-water ratio. For realistic water prices, the optimal ratio will not vary far from the 50/50 ratio by weight. In comparison to other methods of energy conversion and transport, coal-slurry pipeline utilize about 1/3 the amount of water required for coal gasification, and about 1/5 the amount required for on-site electrical generation. An analysis of net energy output from operating alternative energy transportation systems for the assumed conditions indicates that both slurry pipeline and rail shipment require approximately 4.5 percent of the potential electrical energy output of the coal transported, and high-voltage, direct-current transportation requires approximately 6.5 percent. The environmental impacts of the different transports options are so substantially different that a common basis for comparison does not exist. (Woodard-USGS)
W78-01085

DEPRESSED WEIR WITH TWO UNEQUAL SHEETPILES IN ANISOTROPIC SOIL,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-01151

8B. Hydraulics

TRANSITION FROM SUBCRITICAL TO SUPERCRITICAL FLOW,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
V. M. Andersen.
Journal of Hydraulic Research, Vol. 13, No. 3, p 227-238, 1975. 4 fig, 3 ref.

Descriptors: *Transition flow, *Subcritical flow, *Supercritical flow, *Laboratory tests, *Channel flow, Specific head, Flow resistance, Mathematical studies, Flumes, Energy gradient, Slopes, Depth.

A theoretical solution to water surface profile, when there is a sudden change from mild to steep bottom slope, was obtained by neglecting the friction loss in a region about the changing point. The connection of the transition curve to the subcritical curve occurred at a point where the water depth is (rather arbitrarily) a few percent larger than the critical depth, and the connection to the supercritical curve occurred behind the changing point because the total head increases as the water depth is below the critical depth at the point of connection. The slopes of the water surfaces at the connections have to be the same for the two connecting curves. Experimental verification was done using a test flume. The test results were compared with the theoretical results. However, the theoretical expressions did not consider the sidewall effects. The theory and experiments indicated that the critical flow depth occurs on the mild slope side, and the depth at the changing point depends mostly on the value of the steep slope behind the changing point. (Singh-ISWS)
W78-00975

GRAVITY WAVES ON A CURRENT: THE INFLUENCE OF VORTICITY, A SLOPING BED, AND DISSIPATION,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 2E.
W78-01014

ANALYSIS OF A SOLAR COLLECTOR FIELD WATER FLOW NETWORK,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
J. E. Rohde, and R. H. Knoll.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-31671, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum X-3414, August 1976. 27 p, 15 fig, 3 tab, 3 ref, 1 append.

Descriptors: *Fluid mechanics, *Flow, *Model studies, Mathematical models, Flow control, Flow rates, Flow resistance, Networks, Solar radiation, Engineering.
Identifiers: *Incompressible flow, Solar collector panels, Solar collector fields, Solar collectors, Flow networks, Manifolds.

Methods were presented for minimizing the water flow variation in the solar collector field for the Solar Building Test Facility at the Langley Research Center. The solar collector field investigated consisted of collector panels connected in parallel between inlet and exit collector manifolds to form 12 rows. The rows were, in turn, connected in parallel between the main inlet and exit field manifolds to complete the field. The various solutions considered included various size manifolds, manifold area change, different locations for the inlets and exits to the manifolds, and orifices or flow control valves. Calculations showed that flow variations of less than 5% were obtainable both inside a row between solar collector panels and between various rows. (Sims-ISWS)
W78-01032

MARYLAND HIGHWAY DRAINAGE STUDY: VOLUME VIII - A PHYSICAL SIMULATION MODEL OF RUNOFF INTO HIGHWAY CRACKS,
Maryland Univ., College Park. Dept. of Civil Engineering.
J. M. Sinton, and Y. M. Sternberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 458, Price codes: A10 in paper copy, A01 in microfiche. Final Report AW074-073-046-8, July 1974. 220 p, 36 fig, 14 tab, 42 ref, 2 append. DOT AW074-073-046.

Descriptors: *Highways, *Runoff, *Drainage, *Model studies, Hydraulic models, Simulated rainfall, Laboratory tests, Subsurface drainage, Hydraulics, Data processing, Correlation analysis, Subsurface flow, Discharge(Water), Inflow.
Identifiers: *Pavement cracks.

An experimental investigation was conducted concerning the runoff from a simulated highway surface, the interception of runoff by a crack, and flow from a crack into the subbase material of a highway. An artificial rainfall generator supplied flow to the simulated highway surface. Flow into an unrestricted crack (or subbase material) increased for an increased depth of flow, increased crack width, increased rainfall intensity, and roughened crack opening. Flow into an unrestricted crack decreased for increased surface slope and for a smooth crack opening. Statistical evaluation of unrestricted crack data using correlation analysis and factor analysis was presented to show the effect of the rainfall intensity, surface slope, and crack width in the depth of flow and discharge from an unrestricted crack. Prediction equations were obtained for depth of flow and discharge from an unrestricted crack. Flow into a restricted crack (a subbase material restricting flow) was conducted for 3 sample subase materials: 2 permeable and 1 impermeable. Surface flow into the non-draining (sealed) samples decreased as the sub-base model slope increased. Discharge drained and discharge draining from the samples while rainfall continued increased as the model slope increased. The subase results indicated that every effort must be made to detect and to evaluate the presence of porous seams and interface flows because they contributed substantially to the flow of water in the model subbase region. (Sims-ISWS)
W78-01064

THREE-DIMENSIONAL SEEPAGE MODEL STUDY OAKLEY DAM, SANGAMON RIVER, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. L. McAnear, and C. C. Trahan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 148, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper S-72-3, January 1972. 24 p, 14 fig.

Descriptors: *Seepage, *Seepage control, *Model studies, *Simulation analysis, *Dams, Uplift pressure, Damsites, Upstream, Downstream, Rivers, Aquifers, Spillways, Computer models, Systems analysis, Hydraulics, Illinois.
Identifiers: *Sangamon River(Ill), Oakley Dam(Ill), Subsurface conditions, Soil conditions, *Analog models.

Seepage model studies were conducted for the proposed Oakley damsite using a three-dimensional electrical analogy seepage model. Test results indicated that uplift pressures beneath the spillway will vary from 59 percent of the net head at the upstream edge of the structure to 49 percent at the downstream edge. Test results also indicated that piezometric heads at the downstream toe of the dam even with a 1000-ft upstream impervious blanket will be higher than can be safely tolerated. Computed total seepage with the reservoir at flood control pool varied from 2780 gpm (6.2 cfs) to 3290 gpm (7.3 cfs). Seepage control measures such as relief wells and a positive cutoff should be investigated. (Bell-Cornell)
W78-01068

SUMMARY OF GEOLOGIC AND HYDROLOGIC INFORMATION PERTINENT TO TUNNELING IN SELECTED URBAN AREAS,
Geological Survey, Reston, VA. Water Resources Div.
E. M. Cushing, and R. M. Barker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 715, Price codes: A16 in paper copy, A01 in microfiche. Department of Transportation Administrative Report, November 1974. 374 p. DOT-AS-40047.

Descriptors: *Stratigraphy, *Hydrogeology, *Tunneling, *Cities, *United States, Water table, Aquifers, Potentiometric level, Geologic mapping, Bedrock, Earth materials, Reviews, Bibliographies, Information retrieval.
Identifiers: *Urban areas.

Summaries of geologic and ground-water conditions pertinent to tunneling technology and underground construction to depths of at least 200 feet are given, in tabular form, for 34 large U.S. urban areas. Included are information about engineering soils, bedrock, water-table and artesian aquifers, and special features such as active faults, buried bedrock valleys, expansive clays, and land subsidence, with percentage estimates of the area of occurrence of these conditions. A second part of the summaries shows organizations where geologic and ground-water information can be obtained and the types of information available. A list of sources includes reference to published maps and reports, public and private organizations having pertinent unpublished information, and individuals with expertise on specific subjects. A sketch map shows the area of coverage for each urban center. (Woodard-USGS)
W78-01090

OUTFALL DIFFUSER SYSTEMS -- DESIGN AND INSTALLATION,
Simons (H. A.) International Ltd., Vancouver (British Columbia).
F. J. Shumas.
TAPPI Environmental Conference Papers, Chicago, April 25-27, 1977, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 47-65. 8 fig, 2 tab, 9 ref, 3 append.

Descriptors: *Outlets, *Installation, *Design, *Pulp wastes, Hydraulic structures, Outfall sewers, Pulp and paper industry, Waste dilution, Oceans, Rivers, Lakes, Estuaries, Construction materials.

Basic theories are described used in the design of pulp mill outfall and diffuser systems in different receiving environments such as oceans, estuaries, rivers, and lakes. Field test data are given comparing actual dilution with predicted dilution. A review is made of the expected initial dilution of diffuser discharge with respect to the effects of ambient current, trajectory and plume width, discharge density, discharge velocity, discharge port orientation, and depth of discharge below the water surface. Two ocean outfall and diffuser systems are described including materials of construction and methods of installation. (Witt-IPC)
W78-01126

UMPQUA RIVER ENTRANCE, OREGON.
Army Engineer District, Vicksburg, MS. Committee on Tidal Hydraulics.
Report, November 1975. 31 p, 1 plate, 11 exhibits, 2 ref, 1 append.

Descriptors: *Rivers, *Estuaries, *Navigation, *Sediment control, *Oregon, Sedimentation, Shoals, Jetties, Dikes, Groins(Structures), Piers, Sand bars, Sand spits, Sediment transport, Shallow water, Coasts, Harbors, Coastal structures, Coastal engineering, Hydraulics.
Identifiers: *Umpqua River(Ore), Training jetties.

The existing Umpqua River entrance project provides for a north jetty 8000 ft long; a south jetty 4200 ft long, terminating 1800 ft south of the seaward end of the north jetty; a training jetty about 5500 ft long, inside the entrance on the south side of the channel; and dredging to secure and maintain an entrance channel 26 ft deep at mean lower low water and of 'suitable' width. The Committee on Tidal Hydraulics was requested to assist in the evaluation of navigation problems at the entrance to the Umpque River. As a result, the 80th meeting of the Committee was held in Portland on 20-21 May 1975, primarily to discuss and consider these problems. It was clear from the available data that the quantity of littoral drift arriving at the Umpqua entrance from both north and south directions is substantial. The data indicated those annual volumes to be about 500,000 cu yd from the north and 400,000 cu yd from the south. After evaluation of all information and factors available to the Committee at this time, the Committee recommended that the following action be taken if economically justified: (1) The north jetty be rehabilitated to present length. (2) The entrance channel be redredged in a more central location between the jetties and (3) The present training jetty be extended if mitigation of the crosscurrents in the entrance channel area between the jetties is essential to safe vessel operation in that reach of the entrance channel. (Sims-ISWS)
W78-01152

8C. Hydraulic Machinery

MINING PUMPS FOR HEADS IN EXCESS OF 1,500 M,
Sulzer Brothers Ltd. (South Africa).
D. S. Came.
The South African Mechanical Engineer, Vol. 27, No. 4, p 107-111, April 1977. 3 fig.

Descriptors: *Mine water, Hydraulic machinery, Dewatering, *Pumps.

Described is probably the first main dewatering pump to deliver against a head in excess of 1,500m installed in a South African gold mine. The pump development and the reasons for the selection of materials used in the construction are discussed together with a brief report on the condition of the components after 7,000 h operation. A comparison is made between the costs of an installation where pumps deliver 1,800 m in one stage relative to the costs of a relay system where slower speed pumps raise the same quantity of water in two 900 m stages. (So. African Water Info. Center)
W78-00930

CAVITATING BIT JETS PROMISE FASTER DRILLING FOR DEEP-HOLE OPERATIONS,
Hydronautics, Inc., Laurel, MD.
A. F. Conn, and R. P. Radtke.
Oil and Gas Journal, Vol 75, No 45, p 129-146, October 31, 1977. 11 fig, 3 tab, 4 ref.

Descriptors: *Cavitation, *Rotary drilling, *Jets, *Nozzles.
Identifiers: *Bits, Kerfing.

Bits which exploit the destructive energy of cavitation are now being tested and developed. The destructive action of cavitation is well known to designers of pumps and hydraulic components, and the cavitating bit is one of the few useful applications of this phenomenon. In contrast to non-cavitating jets, drilling is achieved by the energy from collapsing cavitation bubbles; in materials such as rocks, which are prone to cracking, the extremely localized pressure amplifications from cavitation cause rapid fracturing which greatly enhances erosion. Two series of rock drilling tests have been run with cavitating nozzles, one in which the ambient fluid pressure was atmospheric and one in which ambient pressure was elevated. Rock type, pressure drop, and distance from nozzle to rock face were among the experimental variables. Results show that cavitating jets were much more efficient than standard jets in eroding rock materials. Effects of drilling mud properties have yet to be studied. Prospects for incorporating cavitating jets into diamond-insert or roller-cone types of bits seem promising for the future. (Eberle-NWWA)
W78-00957

INSTALLATION, OPERATION AND MAINTENANCE OF VERTICAL TURBINE PUMPS,
International Water Supply Ltd., Montreal (Ontario).
B. Hodgins.
Water and Pollution Control, Vol 115, No 8, p 19-20, August, 1977.

Descriptors: *Pumps, *Pump turbines, Electric motors, Bearings, Failures(Mechanics).

The turbine pump was developed to force water out of a relatively small diameter well with water levels beyond the suction capabilities of a horizontal type pump. There are four basic parts to a turbine pump: driver, pump head, discharge column, and bowl assembly. Lubrication of the line shaft bearings in the column is accomplished by either oil or water, depending upon the pumping situation for which the unit is designed. Vertical turbine pumps are available in a wide range of sizes and shapes, to give various head and capacity combinations at particular speeds, and there is an optimum efficiency point for which maximum discharge and total lift is produced for the minimum driving power for each design. Perfect alignment and a thorough initial testing against manufacturer's specifications are essential for a proper pump installation. Once installed, routine checks of quantity of water produced, hours of motor operation, and water level in the well should be made. Depending on water quality, pumps should be pulled every two to five years and inspected for wear and corrosion. Motor failures are more commonplace than failures in the pump mechanism itself; tinkering with line voltage is more usually the cause than motor manufacturing flaws. (Eberle-NWWA)
W78-00961

UNIQUE BIT DESIGN IMPROVES HYDRAULICS AND PERFORMANCE,
Institut Francaise du Petroles (Grenoble). Div. des Techniques de Forage et de Production.
H. Cholet, G. Baron, R. Lazayres, and J. Brisac.
World Oil, Vol 185, No 5, p 63-65, October, 1977. 6 fig.

Descriptors: *Rotary drilling, *Equipment, *Design, Drill holes, Nozzles, Jets.
Identifiers: *Bits.

A new type of bit developed by ARTEP (Association de Recherche sur les Techniques d'Exploration de Petrole) has shown consistent performance increases of at least 15% over standard roller-cone bits in field tests. This radical design change (in which two nozzles of a three-cone bit are extended and the third directed upward) was made in an effort to improve bottom-hole cleaning. Washing at the mud-rock interface, control of crossflow, fast lifting of cuttings from the bit, and prevention of cutting recycling all are facilitated by the new design. As a result of the more efficient cleaning, both drilling rate and bit life show significant increases, with an overall effect of drilling cost reduction. (Eberle-NWWA)
W78-00963

DOWNHOLE DRILLING MOTOR CREATES HIGH TORQUE AT LOW SPEEDS,
Allegheny Ludlum Industries, Inc., Pittsburgh, PA.
W. B. Aufderhaar, and J. F. Melaugh.
Oil and Gas Journal, Vol 75, No 43, p 86-90, October 17, 1977. 6 fig, 13 ref.

Descriptors: *Rotary drilling, Equipment, *Turbines, Deep wells, Bearings.
Identifiers: *Down-hole motors, Garrison Motordrill.

A new positive-displacement down-hole mud motor offers several advantages over conventional turbines. It produces high torque even at the low rotation rates used with conventional rock bits. The new motor also puts horsepower at the bit more efficiently than conventional drilling, and is not at sensitive to undetected stall-out at high loads. Existing, commercially available mud motors have several deficiencies which include excess rotational speed for tri-cone bits and low capacity of bit weight thrust bearings. Generally, positive-displacement motors are more complex than present-day turbines, requiring broader technology in areas of dynamics, materials, and sealing. Motor speed is proportional to flow rate and fairly constant over the entire load range. Power output and efficiency rise rapidly as load is applied and flatten out to provide a very wide, useful range at relatively high values. The features and test history of the Garrison Motordrill, a newly-developed positive-displacement mud motor, are discussed. (Eberle-NWWA)
W78-00964

ELECTRICITY INDEPENDENCE FOR TWO MUNICIPAL SERVICES.
For primary bibliographic entry see Field 5D.
W78-00991

COMPARATIVE ASSESSMENT OF WATER USE AND ENVIRONMENTAL IMPLICATIONS OF COAL SLURRY PIPELINES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 8A.
W78-01085

8D. Soil Mechanics

SOIL SURVEY INTERPRETATIONS FOR EARTH DAMS,
Cedara Agricultural Coll., Pietermaritzburg (South Africa). Research Inst.
D. M. Scotney, P. J. McPhee, and W. B. Russel.
Agricultural Engineering in South Africa, Vol 10, No 1, p 21-29, 1976. 3 fig, 4 tab, 18 ref.

Descriptors: *Soil surveys, Reservoirs, *Earth dams, Embankments, Clay minerals, Dam design, Soil mechanics, Spillways.
Identifiers: South Africa.

There is an urgent need for soil survey interpretations for various purposes in South Africa. Few interpretations for engineering purposes exist and this investigation represents an attempt to interpret soil survey data for earth embankment construction, as well as spillway and basin area suitability for earth dams. Mechanical laboratory soil tests on selected diagnostic materials, defined in terms of the National System of Classification, provided data for an assesment of soil suitability for earth dams. The interpretation is based on soil limitation ratings. Relationships between the clay content of the samples and various engineering properties of soils were established. This interpretation is intended for use by those concerned with the design and construction of small earth dams. (South African Water Info. Center)
W78-00938

8E. Rock Mechanics and Geology

SUMMARY OF GEOLOGIC AND HYDROLOGIC INFORMATION PERTINENT TO TUNNELING IN SELECTED URBAN AREAS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-01090

8F. Concrete

ANCHORING A FORCE MAIN IN SAND.
For primary bibliographic entry see Field 8A.
W78-00992

STABILITY OF GOBI BLOCK REVETMENT TO WAVE ATTACK,
Coastal Engineering Research Center, Fort Belvoir, VA.
B. L. McCartney, and J. P. Ahrens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 514, Price codes: A02 in paper copy, A01 in microfiche. Technical Memorandum No 55, October 1975. 22 p, 16 fig, 2 tab, 8 ref.

Descriptors: *Retaining walls, *Waves(Water), *Stability, *Louisiana, Beaches, Shores, Riprap, Shore protection, Shoreline cover, Precast concrete, Coastal engineering.
Identifiers: *Gobi blocks, *Holly Beach(La).

Tests of Gobi block revetment stability under wave attack were conducted at prototype scale in large wave tank. Wave heights ranging from 1.6 to 3.2 ft and wave periods from 2.8 to 8.5 sec were used. A 1 on 3.5 embankment slope was tested. Stability of the Gobi block revetment compared favorabley with similar weight riprap on the same slope. However, a prototype Gobi block installation at Holly Beach, Louisiana, exhibited greater stability than the wave tank test. This increased stability is attributed to a dry mortar effect of sand and gravel wedged between the blocks. (Sims-ISWS)
W78-01027

8G. Materials

WELL REDEVELOPMENT: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 3B.
W78-00952

CAVITATING BIT JETS PROMISE FASTER DRILLING FOR DEEP-HOLE OPERATIONS,
Hydronautics, Inc., Laurel, MD.
For primary bibliographic entry see Field 8C.
W78-00957

OPTIMIZING PENETRATION RATE, PART 1: DETERMINING PARAMETERS THAT AFFECT RATE OF PENETRATION,
Smith International, Inc., Irving. Smoth Tool Div.
For primary bibliographic entry see Field 8A.
W78-00959

OPTIMIZING PENETRATION RATE, CONCLUSION: COMPUTER OPTIMIZES OPERATIONS,
Smith International, Inc., Irvine, CA. Smith Tool Div.
For primary bibliographic entry see Field 8A.
W78-00960

UNIQUE BIT DESIGN IMPROVES HYDRAULICS AND PERFORMANCE,
Institut Francaise du Petroles (Grenoble). Div. des Techniques de Forage et de Production.
For primary bibliographic entry see Field 8C.
W78-00963

DOWNHOLE DRILLING MOTOR CREATES HIGH TORQUE AT LOW SPEEDS,
Allegheny Ludlum Industries, Inc., Pittsburgh, PA.
For primary bibliographic entry see Field 8C.
W78-00964

THE ACTIVITY OF TRACE METALS IN AQUEOUS SYSTEMS AND THE EFFECT OF CORROSION CONTROL INHIBITORS,
Albuquerque Univ., NM.
R. Urzendowski, and A. H. Guenther.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 611, Price codes: A07 in paper copy, A01 in microfiche. Final Report AFWL-TR-75-203, October 1975. 147 p, 27 fig, 32 tab, 105 ref, 2 append. F29601-73-C-0110.

Descriptors: *Corrosion, *Capacitors, *Inhibitors, *Chemical properties, *Corrosion control, Chemical degradation, Analytical techniques, Inhibition, Oxidation, Electrical equipment, Protective coatings, Trace elements, Water analysis, Water chemistry, Conductivity, Water quality.
Identifiers: *Water capacitors, *Capacitor dielectric systems, Organic additives, Inorganic additives, Electrical characteristics, Dissolved gases in water, Dielectric medium.

The water purification system at Kirtland Air Force Weapons Laboratory was monitored in order to determine the electrical and corrosive characteristics of the water and to investigate its use as a dielectric medium for capacitors. The specific conductance, pH, and the analysis of ionic impurities were used as the basis for evaluating the water purity. From source to use, the water was studied to determine contamination, either ionic or with atmospheric gases such as nitrogen and carbon dioxide. The effect of metallic corrosion in water was studied kinetically in conjunction with equilibrium precipitation of solid phases, chemical implications of impurity removal processes together with various analytical techniques. The principles of metallic corrosion were broadly surveyed with special reference to the controlling factors of immersion and atmospheric corrosion, as well as their application to the prevention of corrosion under service conditions. Extensive measurements were made on various inorganic, polymeric, and organic additives employed in metallic water systems to study their effectiveness in preventing corrosion. For capacitor dielectric systems for which a low conducting dielectric is needed, organic mixtures were the most satisfactory. (Henley-ISWS)
W78-01057

8H. Rapid Excavation

SHIELD-PROTECTED TUNNELING MACHINE DRIVES SEWER UNDER CITY STREETS.
For primary bibliographic entry see Field 8A.
W78-00993

8I. Fisheries Engineering

USE OF SALT (NACL) WATER TO REDUCE MORTALITY OF CHINOOK SALMON SMOLTS, ONCORHYNCHUS TSHAWYTSCHA, DURING HANDLING AND HAULING,
National Marine Fisheries Service, Seattle, WA. Northwest Fisheries Center.
For primary bibliographic entry see Field 5G.
W78-00909

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

THE INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS,
International Crops Research Inst., Hyderabad (India).
For primary bibliographic entry see Field 10D.
W78-01051

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

TOXICITY TO FISH OF CYANIDES AND RELATED COMPOUNDS – A REVIEW,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-00927

SANITARY LANDFILLS, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-01004

10D. Specialized Information Center Services

THE INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS,
International Crops Research Inst., Hyderabad (India).
J. W. Spaven.
Agricultural Administration, Vol 4, No 1, p 49-55, January, 1977. 5 ref.

Descriptors: *Research facilities, *Research and development, *Semiarid climates, *Crop production, Crops, Water, Agriculture, Technology, Governments, Water resources, Land resources, Land, Sorghum, Grains(Crops), Economics, Foods, Diets, Education, Farms.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) was founded in 1972 as one of the nine international agricultural research groups operating under the Consultative Group of International Agricultural Research. The purpose of ICRISAT is to focus research on improving the principal food crops and farming systems of the semi-arid tropics, identify barriers to improvement, and supply findings to forty-eight participating local government agencies which develop recommendations for farmers. Initial efforts concentrated on India and the semi-arid nations of Africa. Crop improvement efforts focused on the following major food items crucial to local diets: sorghum, millet, pigeon pea, chick pea, and groundnut. Farming systems able to be broadly used, yet appropriate for making optimum use of a region's land and water are emphasized in ICRISAT's farming systems program. The organization also emphasizes short-term, in-service training. (Ullery-Arizona)
W78-01051

10F. Preparation Of Reviews

THRESHOLD OF SEDIMENT MOTION UNDER UNDIRECTIONAL CURRENTS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 02J.
W78-01030

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 4
FEBRUARY 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 11, NUMBER 4
FEBRUARY 15, 1978

W78-01184 -- W78-01700

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
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CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

SIMPLIFICATIONS OF WATERSHED GEOMETRY AFFECTING SIMULATION OF SURFACE RUNOFF,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
L. J. Lane, and D. A. Woolhiser.
Journal of Hydrology, Vol. 35, No. 1/2, p 173-190, October 1977. 6 fig, 23 ref.

Descriptors: *Watersheds(Basins), *Hydrographs, *Runoff, *Model studies, Mathematical models, Flow, Channels, Surface runoff, Surface drainage, Surface waters, Precipitation(Atmospheric), Rainfall, Topography, Drainage, Hydrology.
Identifiers: *Watershed geometry, Simplifications.

In formulating the equations describing the flow of water on the surface of a watershed, geometric simplifications must be made. A geometric simplification is the substitution of a simple geometry for a more complex one. The problem is to examine techniques for and consequences of such simplifications, and thereby to develop objective procedures for geometric simplification of complex watersheds. Watershed geometry was represented by a series of planes and channels in cascade. When overland flow and open channel flow in the cascade were described by the kinematic wave equations, the resulting mathematical model was called the kinematic cascade model. Planes were fitted to coordinate data from topographic maps by a least-square procedure. Residuals of the fit formed a geometric goodness-of-fit statistic as the improvement over using the mean elevation. An overall goodness-of-fit statistic was the drainage density ratio, the ratio of drainage density in the cascade of planes and channels to drainage density of the watershed. Given rainfall, runoff, and topographic data for a small watershed, it is possible to define the simplest kinematic cascade geometry which when used in simulation will preserve selected hydrograph characteristics to a given degree of accuracy. (Sims-ISWS)
W78-01290

EVALUATING COMPONENTS OF THE USDAHL HYDROLOGY MODEL APPLIED TO GRASSLAND WATERSHEDS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
F. R. Crow, W. O. Ree, S. B. Loesch, and M. D. Paine.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 692-696, July-August 1977. 5 fig, 4 tab, 5 ref.

Descriptors: *Runoff, *Model studies, *Grasslands, *Oklahoma, Watersheds(Basins), Grazing, Evapotranspiration, Hydrology, Monthly, Surface runoff.
Identifiers: Grassland watersheds, USDAHL model.

The USDAHL-74 Model of Hydrology was applied to a 37 ha watershed in central Oklahoma. During the calibration years of 1970-1972, simulated monthly runoff agreed closely with measured runoff. A single independent test for the years 1956-1959, using watershed parameters tested during the calibration phase, confirmed the good correlation between simulated and measured monthly runoff. A method was presented which shows how the watershed hydrologic cover condition can be used to determine the grazing parameter, Percent Reduction in ET Due to Grazing. (Lee-ISWS)
W78-01297

SIMULATION OF THE TROPICAL CLIMATE OF AN ICE AGE,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
S. Manabe, and D. G. Hahn.
Journal of Geophysical Research, Vol 82, No 27, p 3889-3911, September 20, 1977. 28 fig, 3 tab, 36 ref, 3 append.

Descriptors: *Paleoclimatology, *Tropical regions, *Model studies, Mathematical models, Circulation, Air circulation, Ocean circulation, Precipitation(Atmospheric), Albedo, Evaporation, Runoff, Hydrologic cycle, Deserts, Dunes, Arid lands, Temperature, Water temperature, Climatology, Meteorology.
Identifiers: *Ice age.

Numerical time integrations of general circulation model of the atmosphere were performed with both modern and ice age boundary conditions. It was shown that the climate of continental portions of the tropics in the ice age simulation was much drier than that of the modern climate simulation. According to comparisons of results from the two experiments, tropical continental aridity of the ice age resulted from stronger surface outflow from (or weaker surface inflow into) continents. The intensification of outflow from (or weakening of inflow into) tropical continental regions resulted from the fact that in response to ice age boundary conditions, atmospheric temperature was reduced more over continents than over oceans. With the exception of high latitudes, boundary condition differences between the two experiments consisted mainly of changes of the prescribed values of sea surface temperature and continental albedo. In order to evaluate the relative contributions of these changes in producing continental tropical aridity in the ice age simulation, third numerical experiment was time-integrated in which a hybrid combination of ice age sea surface temperatures and modern continental albedo values were prescribed. From intercomparisons between results from this and the previous two experiments, it was shown that the effect of increased continental albedo was mainly responsible for the weak Asian monsoon in the ice age simulation. (Sims-ISWS)
W78-01304

2B. Precipitation

HEAVY RAINFALL RELATIONS OVER CHICAGO AND NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
J. L. Vogel, and F. A. Huff.
Water Resources Bulletin, Vol. 13, No. 5, p 959-971, October 1977. 5 fig, 2 tab, 17 ref. NSF ENV76-01447.

Descriptors: *Rainfall, *Precipitation excess, *Precipitation intensity, *Illinois, Cities, Weather, Lakes, Effects, Weather modification, Distribution patterns, Precipitation(Atmospheric), Frequency analysis, Analytical techniques, Temporal distribution, Spatial distribution, Storms, Storm runoff, Climatology, Meteorology.
Identifiers: *Chicago(Ill), *Northeast Illinois, Heavy rainstorms.

Detailed studies of rainfall frequency and pattern relations were made over the Chicago urban region and the surrounding six Illinois counties (Cook, DuPage, Kane, Will, Lake, and McHenry). The studies utilized rain gauge records from an urban network of National Weather Service rain gauges in the region, primarily for the period 1949 to 1974. Frequency distributions of point rainfall were obtained for periods from 5 min to 72 h and recurrence intervals of 6 months to 50 years. The results indicated a spatial pattern of short-duration, heavy rainfall frequencies related to urban-lake effects, particularly in the huge industrial region over the southern portion of Chicago. The time distribution within heavy rainstorms over the urban region were similar to a 12-year sample of a dense rain gauge network over a rural area in central Illinois. The characteristics of heavy ranfall over northeast Illinois also were studied through the use of heavy, 1-day storms. A total of 87 storms, capable of producing local flooding, were analyzed to determine: (1) the frequency distribution of storm centers, (2) seasonal and diurnal distribution of storms, and (3) orientation and movement of storms. (Sims-ISWS)
W78-01292

RUNOFF FREQUENCY FROM SMALL STORMS AND IMPLICATIONS FOR WATER QUALITY,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 2E.
W78-01294

SIMULATION OF THE TROPICAL CLIMATE OF AN ICE AGE,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2A.
W78-01304

RAINFALL INFILTRATION INTO BARE SOILS,
Ministry of Agriculture, Tel-Aviv (Israel). Soil Conservation and Drainage Div.
For primary bibliographic entry see Field 2G.
W78-01306

RESPONSE OF THE COASTAL BOUNDARY LAYER ON THE NORTH SHORE OF LAKE ONTARIO TO A FALL STORM,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-01309

PRELIMINARY TESTS OF A CUMULUS CLOUD SEEDING TECHNIQUE,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 3B.
W78-01310

ADJUSTMENT TO QUATERNARY CLIMATIC CHANGE BY THE COLORADO RIVER IN CENTRAL TEXAS,
Texas Univ. at Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W78-01504

AN ANALYSIS OF A POSSIBLE CROP RESPONSE TO HAIL SUPPRESSION SEEDING: THE NELSPRUIT HAIL SUPPRESSION PROJECT,
Cansas International Corporation, Nelspruit (South Africa).
For primary bibliographic entry see Field 3B.
W78-01619

INTERPRETATION OF FOIL IMPACTOR IMPRESSIONS OF WATER AND ICE PARTICLES,
National Center for Atmospheric Research, Boulder, CO.
C. A. Knight, N. C. Knight, W. W. Grotewold, and T. W. Cannon.
Journal of Applied Meteorology, Vol. 16, No. 9, p 997-1002, September 1977. 3 fig, 12 ref.

Descriptors: *Cloud physics, *Instrumentation, *Laboratory tests, Particle size, Particle shape, Ice, Rain, Drops(Fluids), Graupel, Equipment, Precipitation(Atmospheric), Rainfall, Hail, Meteorology.
Identifiers: *Foil impactors.

Impacts of hydrometeors on aluminum foil over a grooved backing, as in standard airborne foil impactors, were produced in the laboratory using a modified crossbow to achieve aircraft speeds. The purpose of the work was to test the ability to distinguish the phase of the hydrometeors from the nature of the imprints at sizes below about 3 mm diameter, solid, spherical ice pellets (frozen drops) and drops of slush leave impressions that are often indistinguishable from those left by liquid drops. (Sims-ISWS)
W78-01620

RADAR-DERIVED STATISTICS ON THE STRUCTURE OF PRECIPITATION PATTERNS,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro Telecomunicazioni Spaziali.
G. Drufuca.
Journal of Applied Meteorology, Vol. 16, No. 10, p 1029-1035, October 1977. 11 fig, 3 tab, 7 ref.

Descriptors: *Precipitation(Atmospheric), *Distribution patterns, *Radar, Rainfall, Statistics, Probability, Weather patterns, Storms, Spatial distributions, Rainfall intensity, Weather, Meteorology.

A large sample of low-elevation weather radar data was analyzed to give information about the spatial structure of precipitation patterns. The quantities considered were rainfall rate distributions as a function of the area mean and maximum rates, joint rainfall rate distributions for pairs of points, and the cellular structure of the patterns. (Sims-ISWS)
W78-01621

THE MICROSTRUCTURE OF CALIFORNIA COASTAL FOG AND STRATUS,
San Jose State Univ., CA. Dept. of Meteorology.
J. Goodman.
Journal of Applied Meteorology, Vol. 16, No. 10, p 1056-1067, October 1977. 11 fig, 3 tab, 24 ref. NSF GA-42464.

Descriptors: *Fog, *Clouds, *California, Coasts, Drizzle, Precipitation(Atmospheric), Cloud physics, Winds, Drops(Fluid), On-site investigations, On-site data collections, Towers, Weather, Meteorology.
Identifiers: *Stratus.

Detailed vertical profiles of the microphysical properties of West Coast advection fog were made over the San Francisco peninsula during the summers of 1974 and 1975. The sampling platform was the 250 m high Mount Sutro tower which, during much of the summer, protrudes through the coastal marine layer into the subsidence inversion. The microphysical structure was found to vary systematically as a function of air parcel trajectory and air mass history. Maritime trajectories had an average droplet concentration of 89/cu cm, contrasting sharply with continental trajectories averaging 265/cu cm. The effect of nuclei depletion due to washout processes as the air parcels travel through stratus decks was found to reduce the number of nuclei available for condensation by as much as 30%. Despite large variations in their initial structure, each sample displayed a remarkable consistency in its microphysical development. Over the peninsula, the mean droplet diameter and liquid water content increased with height in every case. Without exception, broader drop size distributions were observed near the inversion interface; the distribution also broadened throughout the entire layer during the onshore portion of the fog history. In all cases, drizzle drops formed in the uppermost portions of the stratus layer which precipitated downward with time. (Sims-ISWS)
W78-01622

ON THE ACCELERATION OF LARGE WATER DROPS TO TERMINAL VELOCITY,
Illinois Univ. at Urbana-Champaign. Lab. for Atmospheric Research; and Illinois State Water Survey, Urbana.
K. V. Beard.
Journal of Applied Meteorology, Vol. 16, No. 10, p 1068-1071, October 1977. 3 fig, 12 ref, 1 append. NSF ATM75-20066.

Descriptors: *Drops(Fluid), *Velocity, *Model studies, Mathematical models, Drag, Settling velocity, Cloud physics, Rain, Meteorology.
Identifiers: *Terminal velocity, Acceleration, Water drops, Water drop acceleration.

A theory based on the distortion of large water drops was used to calculate the drag and acceleration of drops in the laboratory from rest to terminal velocity. The results showed that the drag coefficient curve for each drop size lies between the curves for a sphere and for water drops at terminal velocity. A comparison with experimental acceleration data at sea level showed an improvement over the more approximate theory of Wang and Pruppacher. The calculations of drops accelerating at reduced air density provided a very good fit to the data of Davies at the reported fall distance of 11 m. The new interpretation of Davies' experiment is consistent with the formula of Beard for the teminal velocity of large drops aloft. (Sims-ISWS)
W78-01623

EFFECTIVE RAINFALL IN IRRIGATED AGRICULTURE,
Indian Agricultural Research Inst., New Delhi.
N. G. Dastane.
Irrigation and Drainage Paper 25, Food and Agriculture Organization of the United Nations, Rome (Italy), 1974. 67 p, 11 fig, 15 tab, 61 ref.

Descriptors: *Effective precipitation, *Irrigation, *Agriculture, Precipitation(Atmospheric), *Rainfall, Evaporation, Evapotranspiration, Soil moisture, Soil water, Infiltration, Groundwater, Drainage, Precipitation excess, Runoff, Storm runoff, Farm management, Crops, Lysimeters, Meteorology, Soil properties.

In view of the vital importance of water in man's life, precise knowledge of not only total rainfall but also of the utilizable or effective part of rainfall is essential for the economic and efficient planning of water resources. This paper presents a number of concepts of effective rainfall currently in use. A distinction was made between effective rainfall and the effectiveness of rainfall, being two different entities. The definition of effective rainfall was examined, and a modified concept of effective rainfall was proposed for use in irrigated agriculture. A brief history as well as the criteria for the assessment and factors influencing effective rainfall were presented. In addition, methods of measuring effective rainfall and its different components, as well as merits and limitations of each of these methods, were discussed. Also, the application of derived data on effective rainfall, together with several calculations and reference, was given for guidance in developing and using the information in planning as well as in practice of water management. Finally, a number of practices to increase effective rainfall were listed. (Sims-ISWS)
W78-01642

A MODEL OF STOCHASTIC STRUCTURE OF DAILY PRECIPITATION OVER AND AN AREA,
Agricultural Research Service, Temple, TX. Blackland Conservation Research Center.
C. . Richardson.
Hydrology Papers No 91, Colorado State University, Fort Collins, July 1977. 54 p, 40 fig, 33 tab, 35 ref.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Mathematical models, Stochastic processes, Daily, Spatial distribution, Probability, Mathematics, Statistics, Fourier analysis, Correlation analysis, Rainfall, Hydrology.

Daily precipitation over an area was studied by modeling the stochastic structure of the time-area daily precipitation process. Daily precipitation at a point was envisioned as a continuous random variable that has been truncated at zero. The zero daily precipitation amounts were considered negative amounts of unknown quantity. The square roots of daily precipitation at a point for a selected study region approximated a sample from a truncated univariate normal distribution. The multivariate normal distribution was used to describe the time-area variation of daily precipitation over an area. The means and standard deviations of the normalized precipitation are periodic within the year. A method was developed for obtaining maximum likelihood estimates of daily means and standard deviations from the truncated samples. The periodic components of the means and standard deviations were described with Fourier series. The Fourier coefficients were related to position within the study region. Sequences of random components were obtained for each station in the study region by removing the periodic means and standard deviations. The sequences of random components were distributed normally with zero means and unity standard deviations and were dependent in time and space. The lag-one autocorrelation coefficients were found to approximate a regional constant. The lag-zero cross-correlation coefficients were found to be a function of interstation distance. Precipitation sequences were generated for 2 areas in the study region using the truncated multivariate normal distribution model. (Sims-ISWS)
W78-01643

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME I, SHORT-DURATION PRECIPITATION FREQUENCY,
California State Dept. of Water Resources, Sacramento.
J. D. Goodridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 000, Price codes: A99 in paper copy, A01 in microfiche. Report FHWA-CA-76-195, October 1976. 678 p, 21 fig, 1 tab, 29 ref.

Descriptors: *Precipitation(Atmospheric), *Frequency analysis, *California, *Rainfall, Snowfall, Runoff, *Drainage, *Depth-area-duration analysis, Data collections, Probable maximum precipitation, Design flood, Precipitation intensity, Weather data, Rain gages, Measurement, Data processing, Spatial distribution, Temporal distribution, Hydrology, Meteorology.
Identifiers: Return periods, Short-duration precipitation.

This report was an analysis of depth-duration-frequency of precipitation in California and contained the annual series extreme values from about 30 rain gage networks in California. A statistical analysis of each record is available, giving 12 return periods ranging from 2 to 10,000 years and durations of 5 min to 60 days, including annual total precipitation. Methods of interstation interpolation were given. Hourly precipitation records of the National Weather Service were reevaluated to develop 5-, 10-, 15-, and 30- min extreme data. This volume reported precipitation, depth-duration-frequency data, and analysis from 600 recording rain gages with durations ranging from 5 min to 24 h. The data contained were intended for use in runoff computation using procedures such as the rational method or the unit hydrograph method. A cooperative compute data bank was developed to

store data on rainfall extremes and to analyzed data periodically, as well as to maintain a continuous file for future use by cooperators. (See also W78-01649 and W78-01650) (Sims-ISWS)
W78-01648

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME II, LONG-DURATION PRECIPITATION DATA,
California State Dept. of Water Resources, Sacramento.
J. D. Goodridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 001, Price codes: A17 in paper copy, A01 in microfiche. Report FHWA-CA-76-195, October 1976. 386 p, 16 fig, 4 tab, 15 ref.

Descriptors: *Precipitation(Atmospheric), *Frequency analysis, *California, *Rainfall, Snowfall, Runoff, *Drainage, *Depth-area-duration analysis, Data collections, Weather data, Probable maximum precipitation, Design flood, *Precipitation intensity, Rain gages, Measurement, Data processing, Spatial distribution, Temporal distribution, Hydrology, Meteorology.
Identifiers: Return periods, Long-duration precipitation.

This report was an analysis of depth-duration-frequency of precipitation in California and contained the annual series extreme values from about 30 rain gage networks in California. A statistical analysis of each record is available, giving 12 return periods ranging from 2 to 10,000 years and durations of 5 min to 60 days, including the annual total precipitation. Methods of interstation interpolation were given. Hourly precipitation records of the National Weather Service were reevaluated to develop 5-, 10-, 15-, and 30- min extreme data. This volume reported depth-duration-frequency analysis of precipitation with durations of one day to 60 days from 900 nonrecording rain gages. The data contained in this report were intended for use in runoff computation using procedures such as the rational method or the unit hydrograph method. A cooperative computer data bank was developed to store data on a rainfall extremes and to analyze data periodically, as well as to maintain a continuous file for future use by cooperators. (See also W78-01648 and W78-01650) (Sims-ISWS)
W78-01649

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME III, INTENSITY-DURATION-FREQUENCY CURVES,
California State Dept. of Water Resources, Sacramento.
J. D. Goodridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 002, Price codes: A14 in paper copy, A01 in microfiche. Report FHWA-CA-76-195, October 1976. 303 p, 7 fig, 1 tab.

Descriptors: *Precipitation(Atmospheric), *Frequency analysis, *California, *Duration curves, *Frequency curves, *Rainfall, Snowfall, Runoff, Drainage, *Depth-area-duration analysis, Weather data, Probable maximum precipitation, Design flood, Precipitation intensity, Data processing, Temporal distribution, Hydrology, Meteorology.
Identifiers: Return periods, Intensity-duration-frequency curves.

This report was an analysis of depth-duration-frequency of precipitation in California and contained the annual series extreme values from about 30 rain gage networks in California. A statistical analysis of each record is available, giving 12 return periods ranging from 2 to 10,000 years and durations of 5 min to 60 days, including the annual total precipitation. Methods of interstation interpolation were given. Hourly precipitation records of the National Weather Service were reevaluated to develop 5-, 10-, 15-, and 30-min extreme data. This volume contained precipitation intensity-duration-frequency curves from 500 recording rain gages, based on maximum annual rainfall depths for 5 to 180 minutes. The information contained in this report was intended for use in runoff computation using procedures such as the rational method or the unit hydrograph method. A cooperative computer data bank was developed to store data on rainfall extremes and to analyze data periodically, as well as to maintain a continuous file for future use by cooperators. (See also W78-01648 and W78-01649) (Sims-ISWS)
W78-01650

A COMPARISON OF OCEANIC PRECIPITATION AS MEASURED BY GAGE AND ASSESSED FROM WEATHER REPORTS,
National Oceanic Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
R. K. Reed, and W. P. Elliott.
Journal of Applied Meteorology, Vol. 16, No. 9, p 983-986, September 1977. 1 tab, 8 ref.

Descriptors: *Precipitation(Atmospheric), *Oceans, Ships, *Rain gages, *Pacific Ocean, *Measurement, Rainfall, Data processing, Weather, Oceanography, Meteorology.
Identifiers: Rainfall estimates, Shipboard rain gages.

The problems of using rain gages on ships were discussed, and methods of estimating rainfall from weather reports at sea were reviewed, with emphasis on discussion of efforts to verify the assessments derived by Tucker. A rain gage was used on cruises of the NOAA ship Oceanographer in the eastern Pacific during 1975 and 1976, and rainfall was estimated from weather reports using Tucker's assessments. In extratropical latitudes (mainly 40-60 deg N), a catch of 35 cm was obtained; estimates from the weather reports gave a value of 31 cm. Thus, Tucker's assessments essentially are in agreement with catches from a small gage in this region. In the tropics, however, the agreement was not good. Almost 3 times as much rain was caught as was estimated; hence, Tucker's coefficients will need to be reevaluated for this area. (Sims-ISWS)
W78-01656

2C. Snow, Ice, and Frost

WORLD DATA CENTER A: GLACIOLOGY.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 10C.
W78-01272

SIMULATION OF THE TROPICAL CLIMATE OF AN ICE AGE,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2A.
W78-01304

INTERPRETATION OF FOIL IMPACTOR IMPRESSIONS OF WATER AND ICE PARTICLES,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W78-01620

ON A DIFFERENTIALLY HEATED SALT-WATER-ICE SYSTEM,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W78-01624

SURGE ACTIVITY ON THE BARNES ICE CAP,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
G. Holdsworth.
Nature, Vol. 269, No. 5629, p 588-590, October 13, 1977. 4 fig, 22 ref.

Descriptors: *Ice, *Canada, *Glaciology, Surges, Geomorphology, Topography, Lakes, Streams, Glacial drift, Movement, On-site investigations, Remote sensing, Satellites(Artificial), Glaciation.
Identifiers: *Baffin Island(Canada), *Barnes Ice Cap, Ice cap.

This report showed that several surges have occurred within the last millennium on the Barnes Ice Cap, a small subpolar ice sheet on Baffin Island, Canada. Surge scars on the ice cap have been identified tentatively, and one surge area subsequently was documented in some detail. Five distinct surge scars of different ages were identified with the help of Landsat imagery. The general features of the surge scars are: (1) The presence of third and occasionally fourth order meltwater channels. (2) Irregular foliation, defined by alternate dark- and light-banded ice, is developed near the margins and indicates the presence of large shear strains. (3) Lakes occur on the ice surface due to trapping of meltwater in local depressions. (4) Major streams, which flow west from the ice cap, can be traced to the major surge areas. (5) Moraines adjacent to the surge lobes tend to be well developed, particularly when the surge is recent, since the moraines initially contain a substantial ice core. (Humphreys-ISWS)
W78-01637

2D. Evaporation and Transpiration

EVAPORATION FROM SOLONCHAKS AND SALTWORT VEGETATION (IN RUSSIAN),
E. N. Minaeva.
Probl Osvo Pustyn' 1. 43-48. 1976.

Descriptors: *Evaporation, *Transpiration, Solonchak soils, *Soil water, Lysimeters, Solar radiation, Turkmen SSR.

Lysimetric and thermal balance studies were conducted on solonchaks in SE Turkmen SSR (USSR). Total evaporation from the soil during April-Oct. was 220 mm, 60% of which was due to transpiration by saltwort vegetation. In solonchaks without vegetation, yearly ground water evaporation was about 100 mm as a result of hydrophysical properties of the soils. Maximum evaporation levels were observed in the winter-spring period, while transpiration levels were highest in June-July. After the vegetation period, total evaporation values sharply decreased. The dense white surface layer of the solonchaks affected the radiation balance. Turbulent heat exchange with the atmosphere comprised 50% of the radiation balance, heat loss on evaporation comprised 30%, and heat exchange with the soil comprised 20%.--Copyright 1977, Biological Abstracts, Inc.
W78-01207

USE OF A MODIFIED BALNEY-CRIDDLE FORMULA TO CALCULATE THE IRRIGATION REQUIREMENTS OF WINTER WHEAT IN THE AREAS BETWEEN 16 DEGREES 30' EAST AND 30 DEGREES E., AND BETWEEN 27 DEGREES SOUTH AND 35 DEGREES S. (IN AFRIKAANS),
Navorsingsinstituut Grond Besproeiing, Pretoria (South Africa).
A. L. Du Pisani.
S Afr Dep Agric Tech Serv Tech Sommun 126: 1-43. 1975 (English summary).

Descriptors: *Irrigation, *Fourier analysis, *Evapotranspiration, Variability, Monthly, Seasonal, Precipitation(Atmospheric), Climatic zones, Temperature, Rainfall.
Identifiers: Balney, Criddle, Irrigation requirements, Orange River, South Africa.

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A comparative study was made of the methods used to calculate the variation, in time, of the ratio of actual to calculated evapotranspiration (BEt) values. The best results were obtained by applying a Fourier series to values, calculated according to the formula of Balney and Criddle using maximum instead of average temperatures. BEt was calculated for the whole growing season for 160 climatological stations in the total area which includes the area to be served by the Orange River irrigation scheme (16 degrees 30' -30 degrees E and 27 degrees -35 degrees S). The irrigation requirement (BB) was calculated by subtracting the effective precipitation (EN) from BEt. EN was taken to be 50% of the total precipitation, except where this value was higher than BEt for the month concerned. In this case EN was then taken as equal to BEt. Maps were drawn for the whole area, depecting monthly and seasonal variation of both BEt and BB for each area. A short description of the various climatic zones found the area was given with the emphasis on monthly average daily maximum temperature and rainfall. The maps show that the seasonal total for BB ranges 400-500 mm for the greatest part of the area. It is <300 mm along certain parts of the coast and some upland, while it is >550 mm along a part of the lower Orange River between Kakamas and Goodhouse. For most inland areas which are to be served by the Orange River scheme, the value of BB is above average (>450 mm). Along the Bushmans and low Fish Rivers which are included in the Orange River Scheme, BB is quite low (approximately 399-350 mm).--Copyright 1977 Biological Abstracts, Inc.
W78-01342

ETHEPHON ADVANCES LOBLOLLY PINE NEEDLE CAST,
Forest Hydrology Lab. Oxford, MS.
C. G. Griffing, and S. J. Ursic.
Forest Science Vol 23 No 3, p 351-354. September 1977, 3 tab, 8 ref.

Descriptors: *Loblolly pine trees, Watershed management, Water balance, Gulf Coastal Plain, *Mississippi.
Identifiers: Pinus taeda L., 2-chloroethanephosphonic acid, *Ethylene, *Abscission, *Needle cast(Pine trees), Auxin.

Potted 1-0 loblolly pine seedlings sprayed with 5,000 ppm acid equivalents of ethephon in water in early July promptly abscised most of their year-old fascicles. Neither survival nor current-year needles were affected. The treatment reduced foliage during the summer-fall period of high potential water use. Quantification of possible reductions in water use under field conditions appears warranted. Application of ethephon in late June to 1-0 loblolly seedlings planted on droughty sandy soils also warrants study, since summer drought is the leading cause of first-year mortality on such sites. (Forest Service)
W78-01347

2E. Streamflow and Runoff

SIMPLIFICATIONS OF WATERSHED GEOMETRY AFFECTING SIMULATION OF SURFACE RUNOFF,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W78-01290

RUNOFF FREQUENCY FROM SMALL STORMS AND IMPLICATIONS FOR WATER QUALITY,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
R. B. Lewis, V. L. Hauser, R. G. Menzel, and J. D. Ross.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 661-665, July-August 1977. 8 fig, 4 tab, 10 ref.

Descriptors: *Runoff, *Nebraska, *Water quality, *Agricultural chemicals, On-site investigations, Watersheds(Basins), Agricultural watersheds, Agricultural runoff, Chemicals, Farm management, Contour farming, Crops, Field crops, Storms, Storm runoff, Precipitation(Atmosphere), Pollutants, Water pollution, Water pollution control.

The concentration of chemicals in surface runoff water is often an important consideration. Water soluble chemicals which are applied to the surface of plants or soil may appear in highest concentration in runoff from small storms. Therefore, some aspects of water quality management require quite different hydrologic information than has been required to solve problems considered in the past. The study of small storms in the central Great Plains near Hastings, Nebraska, revealed much about small storms and their relation to water quality. Compared with straight row cultivation, contouring of corn substantially decreased the number of runoff events resulting from small storms, and thus substantially decreased the probability of pollution from surface applied chemicals. The data showed that wheat on contour produced about 1/3 less annual runoff than wheat grown with straight row tillage; however, no difference was found between contour and straight row wheat in the number of runoff events resulting from small storms. During the months when it is desirable to top-dress nitrogen fertilizer on winter wheat, there is little or no threat of pollution to surface waters. Few runoff events were produced by small storms falling on meadow or pasture; therefore, chemicals may safely be applied to them. During June, the high rainfall month, there were 5 times more small storms producing no runoff than storms which did on all cultivated crops except corn with straight row tillage. Thus, if chemicals are applied only when the soil surface is relatively dry, the probability of surface-water pollution would be small. (Sims-ISWS)
W78-01294

EVALUATING COMPONENTS OF THE USDAHL HYDROLOGY MODEL APPLIED TO GRASSLAND WATERSHEDS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-01297

BOUNDARY LAYER DEVELOPMENT IN OPEN WATER-CHANNEL,
Cambridge Univ. (England). Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-01299

A LEAST SQUARES METHOD FOR COMPUTING STATISTICAL TOLERANCE LIMITS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-01307

PSYCHRORHITHRAL, PAGORHITHRAL AND KRYOKRENE: THREE NEW TYPES OF ALPINE STREAMS AND SPRINGS, (IN GERMAN),
Basel Univ. (Switzerland). Botanisches Inst.
P. Geissler.
Bull Soc Suisse 85(4), p 303-309, 1975.

Descriptors: *Classification, *Alpine streams, Cryptogram, Habitats, *Kryokrene, *Pagorhithral, Phytosociology, *Psychrorhithral, *Springs, *Streams, Zonation.

Phytosociological studies of alpine springs and streams were compared with the zonation of habitats uused in limnology. The following terms were proposed. Psychrorhithral streams include cold, fast running streams, situated above the Epirhithral in which vegetation of cryptograms is often abundantly developed. Pagorhithral streams are very fast running glacier-streams, almost without vegetation, rich in suspended particles. Kryokrene springs are those in block-screes with poor vegetation. Temperature of spring-water is 0 - 3 C, sometimes with periodic desiccation.--Copyright 1977, Biological Abstracts, Inc.
W78-01405

ADJUSTMENT TO QUATERNARY CLIMATIC CHANGE BY THE COLORADO RIVER IN CENTRAL TEXAS,
Texas Univ. at Austin. Dept of Geological Sciences.
V. R. Baker, and M. M. Penteado-Orellana.
Journal of Geology, Vol. 85, No. 4, (July 1977), p 395-422, 12 fig, 3 tab, 96 ref.

Descriptors: *Climates, *Arid climates, *Quaternary period, *Geomorphology, Shores, Alluvial channels, Flood plains, Sediments, Rivers, River basins, Sedimentology, Sedimentation, Meanders, Channels, Channel flow, *Texas, Sediment load, River flow, Humid climates, Degradation(Stream), Erosion, Stream erosion, Mapping.
Identifiers: Climatic change, Geomorphic mapping, Meander wavelength, River terraces, *Colorado River(Tex).

Unlike previous studies of the evoluation of river terraces which emphasize cyclical patterns of aggradation, stability, and degradation, this study emphasizes the morphology and sedimentology of inland paleochannels composing portions of ancient flood plain systems. Ten different channel patterns and sediment assemblages were revealed by geomorphic mapping of flood plain and channel morphology in the Quaternary alluvial valley of the Colorado River. Studies of the modern and ancient patterns indicate cyclic changes in channel width, meander wavelength, sinuosity, and sediment type. However, the amplitudes of the cycles vary. Morphology is sufficiently preserved to use empirical correlations of meander wavelength to discharge in interpreting paleohydrology. The influence of sediment load and flood magnitude-frequency changes preclude quantitative speculation. Studies of fluvial sediments, relict paleosols, and paleobiology support the hypothesis that Quaternary climate in the area alternated between arid and humid intervals. Fine-grained loads and high-sinuosity patterns on flood plains were charcteristic of humid phases. The onset of arid conditions interrupted flood plain development with degradational activity while continued arid conditions promoted aggradation by low-sinuosity stream transport of polygenetic suites of coarse sediments from nearby hillslopes. Transition to humid streams were gradual and probably with more uniform streamflow characteristics. (Ullery-Arizona)
W78-01504

THE GEOLOGIC SETTING OF THE SANDUSKY RIVER BASIN,
Bowling Green State Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W78-01520

CALIBRATION OF ROUGHNESS PARAMETERS FOR MATHEMATICAL MODELS OF RIVERS WITH FLOOD-PLAINS USING DYNAMIC PROGRAMMING, (IN GERMAN),
For primary bibliographic entry see Field 8B.
W78-01540

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY: A USERS'

MANUAL FOR THE TWO DIMENSIONAL HYDRODYNAMIC MODEL,
Alabama Univ., University. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-01544

FORCED PLUME CHARACTERISTICS,
Monash Univ., Clayton (Australia). Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 8B.
W78-01625

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME I, SHORT-DURATION PRECIPITATION FREQUENCY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2B.
W78-01648

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME III, INTENSITY-DURATION-FREQUENCY CURVES,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2B.
W78-01650

2F. Groundwater

RESEARCH ON UNDERGROUND WATERS: 27. STUDY OF AN EPIKARSTIC AQUIFER OF THE CORBIERES (OPOUL, PYRENEES-ORIENTALES) (IN FRENCH),
J. Y. Bertrand.
Ann Speleol 30(3): 513-537. 1975 (English summary).

Descriptors: *Karst hydrology, *Aquifers, Invertebrates, *Aquatic animals, France.

A study of discharge points of an epikarstic aquifer gave some information about its hydrogeological, physical, chemical and biological characteristics. Analysis of the data obtained during the hydrological cycle proved the existence of perennial stocks. High mineralization may be the result of evapotranspiration; seasonal and sometimes daily variations in the temperature of water show that the circulation is closed to the topographic level. The heterogeneity of the aquifer was demonstrated. More than 17,000 aquatic invertebrates were collected. They belong to 17 spp. (Phagocata sp., Haplotaxis corbarensis, a hydroacarian, Pseudocandona sp., Graetiella bertrandi, Ceuthonectes gallicus, Elaphoidella leruthi, Nitocrella sp., Bryocamptus typhlops, Bathynella sp., Faucheria faucheri, Stenasellus buili, Niphargus Kochianus pachypus, an oligochaete, a trichopteran and a dipteran.) of which 10 are hypogean. Quantitative investigations of several floods gave a definite representation of the populations, principally copepods. Epikarstic aquifers are suitable biotopes for the invasion of rich and diversified populations.--Copyright 1977, Biological Abstracts, Inc.
W78-01192

STUDIES ON SALINIZATION OF GROUNDWATER, 1. THEORETICAL CONSIDERATION ON THE THREE-DIMENSIONAL MOVEMENT OF THE SALT WATER INTERFACE CAUSED BY THE PUMPAGE OF CONFINED GROUNDWATER IN FAN-SHAPED ALLUVIUM,
Ehime Univ., Matsuyama (Japan). Dept. of Applied Physics.
Y. Kishi, and Y. Fukuo.
Journal of Hydrology, Vol. 35, No. 1/2, p 1-29, October 1977. 8 fig, 8 ref, 2 append.

Descriptors: *Groundwater flow, *Sea water, *Saline water intrusion, *Saline water-freshwater interfaces, *Alluvial fans, Mathematical models, Confined water, Pumping, Equations, Numerical analysis, Hydraulic conductivity, Density, Darcys law, Boundaries(Surfaces).
Identifiers: Three-dimensional flow, Ghyben-Herzberg relation, Green's functions, Image method.

A theoretical model was presented on the phenomenon of seawater intrusion into confined groundwater to make clear the relationship between the amount of pumping of freshwater and the corresponding three-dimensional spatial distribution of salt water. First, differential equations were derived for the fresh and salinized regions, respectively, from the fundamental equation of confined water. The equation in the salinized region, which is a quasilinear differential equation, can be transformed to a linear one and then is continued to the equation in the fresh region, resulting in the two-dimensional Poisson's equation which is applicable to the entire region. The equation in steady-state was solved in integral form by using the method of Green's functions and was expressed simply in the case of idealized field conditions analogous to a fan-shaped alluvium by the usual method of images. Finally, some numerical examples were shown for the case of uniform pumpage in a circular region. (Visocky-ISWS)
W78-01287

DIFFUSE FLOW AND CONDUIT FLOW IN LIMESTONE TERRAIN IN THE MENDIP HILLS, SOMERSET (GREAT BRITAIN),
University of East Anglia, Norwich (England). School of Environmental Sciences.
T. C. Atkinson.
Journal of Hydrology, Vol. 35, No. 1/2, p 93-110, October 1977. 7 fig, 2 tab, 31 ref.

Descriptors: *Groundwater movement, *Karst hydrology, *Springs, *Flow, Karst, Limestones, Recharge, Caves, Aquifers, Conduits, Percolation, Tracers, Dye releases, Discharge(Water), Baseflow, Hydrogeology.
Identifiers: *Diffuse flow, *Conduit flow, *Mendip Hills(England), England.

The hydrogeology of the karstic Carboniferous Limestone was described. Water tracing established recharge areas for 15 major springs, and water budgets confirm the size of the areas found. Groundwater flow occurs in 2 modes: turbulent conduit flow and diffuse Darcian flow in fine fractures. Recharge is 50% quickflow via caves and closed depressions and 50% slower percolation. Active storage in the diffuse component (S = 0.92%) is 30 times greater than in phreatic conduits. Diffuse hydraulic conductivity is 0.89 m/day, and an average of 60-80% of groundwater is transmitted by conduits in this maturely karsted and steeply dipping aquifer. (Sims-ISWS)
W78-01288

CARBON DIOXIDE IN THE ATMOSPHERE OF THE UNSATURATED ZONE: AN IMPORTANT CONTROL OF GROUNDWATER HARDNESS IN LIMESTONES,
University of East Anglia, Norwich (England). School of Environmental Sciences.
T. C. Atkinson.
Journal of Hydrology, Vol. 35, No. 1/2, p 111-123, October 1977. 6 fig, 4 tab, 30 ref.

Descriptors: *Carbon dioxide, *Hardness(Water), *Groundwater, *Limestones, Caves, Springs, Spring water, Calcium, Calcite, Alkalinity, Water chemistry, Organic material, Groundwater movement, Atmosphere, Unsaturated flow, Chemistry, Hydrogeology, Hydrology.
Identifiers: *Ground-air carbon dioxide, *Mendip Hills(England), England.

Weekly analyses of springwaters in the Mendip Hills, England, showed constant partial pressure of CO2. Soil air partial pressure of CO2 (measured directly and calculated from soil water analyses) fluctuates seasonally and is almost always less than the partial pressure of CO2 of springs. A source of CO2 in the unsaturated zone was proposed to account for the discrepancy, supported by direct measurements of CO2 in fractures in cave walls and analyses of drip waters. The partial pressure of CO2 increases with depth, and values at the bottom of caves are similar to spring waters. A possible source is decay of downwashed soil organic matter. (Sims-ISWS)
W78-01289

EFFECTS OF A RECREATIONAL IMPOUNDMENT ON NEARBY NATURAL LAKES: A CASE STUDY,
Wisconsin Univ.-Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-01291

THE ROLE OF DRAINAGE SYSTEMS IN SOIL RECLAMATION OF THE MUGAN-SALYANY STEPPE (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W78-01344

WATER SUPPLY AT LOS ALAMOS DURING 1976,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 4B.
W78-01547

EXPERIENCE IN THE USE OF THE METHOD OF MICROELECTRICAL VERTICAL SOUNDINGS IN STUDYING IRRIGATED SOIL EVOLUTION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
E. M. Anikanova, and T. A. Pavlova.
Vestn Mosk Univ Biol Pochvoved 31(2), p 87-91, 1976.

Descriptors: *Groundwater, *Mineralogy, *Water levels, Salts, Rocks, Moisture content, *Soil moisture, *Sounding, Irrigated land.

Joint geophysical and soil research was undertaken in the Bagaebsko-Sadkov-sky ameliorative system in the Rostov region (Russian, SFSR USSR), to study the possibility of using the microelectrical soundings method to solve such amelioration problems as determination of the depth of ground-water levels and their mineralization, evaluation of the volume of water soluble salts, and the moisture of rocks over the groundwater level.--Copyright 1977, Biological Abstracts, Inc.
W78-01559

LEAKAGE OF GROUNDWATER THROUGH A SLOT IN A SHEET PILE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-01632

2G. Water In Soils

ANALYSIS OF HYDROLOGICAL FEATURES OF PORTIONS OF THE LAKE ONTARIO BASIN USING SKYLAB AND AIRCRAFT DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01186

EVAPORATION FROM SOLONCHAKS AND SALTWORT VEGETATION (IN RUSSIAN),
For primary bibliographic entry see Field 2D.
W78-01207

WATER AND PHYSICAL PROPERTIES OF SOIL AND COTTON YIELDS DEPENDING ON DIFFERENT METHODS OF BASIC TILLAGE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Khlopkovodstva. Leningrad (USSR).
S. N. Ryzhov, and L. N. Slesareva.
Pochvovedenie 11. 57-70. 1976. English summary.

Descriptors: *Soil physical properties, *Moisture content, *Cultivation, Loam, Cotton, Crop production, Soil structure, Soil density.
Identifiers: Serozem, USSR.

Different depth and methods of basal tillage of an irrigated typical serozem with a heavy loam texture changed its structural composition, density, hardness and porosity controlling the direction of the main soil regimes and affecting the yields of cotton. The highest effect was obtained from 2-storeyed plowing and rototilling to the depth of 30 cm with autumn ridging and 2-storeyed plowing to the depth of 30 cm.--Copyright 1977, Biological Abstracts, Inc.
W78-01227

MOVEMENT OF SALTS WITH PELLICULAR WATER IN SOILS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidrotekhniki i Melioratsii, Moscow (USSR).
S. M. Pakshina, and V. R. Petukhov.
Pochvovedenie 6. 59-65. English summary.

Descriptors: *Salts, *Soils, *Ion transport, Boundaries(Surfaces), Chlorine, Sulfates, Thin films, Ionization.
Identifiers: Pellicular water, USSR.

Possible types of film-water in soils and calculations of ion flows in each case are considered. Thin layers have both equal and different potentials but signs are similar on both boundaries. Asymmetric films have both positive and negative potentials on the liquid-air boundary, depending on quantity and kind of anions in the soil solution. Calculations using the modern double-layer theory showed that a local increase of Cl-concentration (when film-water and a source of salt are present in soil) takes place during the movement of thin layers and asymmetric films which have a negative potential on the liquid-air boundary. The increase of sulfate concentration occurs only with the movement of symmetric films.--Copyright 1977 Biological Abstracts, Inc.
W78-01228

ERODIBILITY OF COARSE SAND-CLAYEY SILT MIXTURES,
Lehigh Univ., Bethlehem, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-01285

CHANGES IN BIOCHEMICAL AND WATER-PHYSICAL PROPERTIES OF SOILS IRRIGATED WITH MINERALIZED WATER (IN RUSSIAN),
Ukrainian Research Inst. of Agrochemistry and Soil Science, Kharkov (USSR).
N. P. Rus'ko, and M. P. Shkirya.
Pochvovedenie 10. 94-99. 1976. (Engl summ).

Descriptors: *Soil chemical properties, *Soil physical properties, *Irrigation effects, *Bromegrass, Vegetation effects, Plant growth, Grasses, Mineral water, Soil compaction, Germination, Turf.
Identifiers: U.S.S.R.

The effect of prolonged growth of smooth brome grass as 1 site was studied with and without irrigation. The prolonged growth of smooth brome grass and the use of irrigation led to overcrowding, compaction, turfness of crops and to a sharp decrease in seed productivity.--Copyright 1977, Biological Abstracts, Inc.
W78-01293

PREPARATIVE-SCALE SIZE FRACTIONATION OF SOILS AND SEDIMENTS AND AN APPLICATION TO STUDIES OF PLUTONIUM GEOCHEMISTRY,
Argonne National Lab., IL. Radiological and Environmental Research DiV.
For primary bibliographic entry see Field 2J.
W78-01301

PRECISION WITH WHICH SELECTED SOIL PHYSICAL PARAMETERS CAN BE ESTIMATED,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
T. C. Keisling, J. M. Davidson, D. L. Weeks, and R. D. Morrison.
Soil Science, Vol 124, No 4, p 241-248, October 1977. 3 fig, 5 tab, 16 ref.

Descriptors: *Soil physical properties, *Soil water movement, *Measurement, *Estimating, Depth, Sampling, Reliability, Hydraulic conductivity, On-site laboratories, Mathematical studies, Forecasting.
Identifiers: Solute movement.

Under field conditions, the validity of many predictions concerning the movement of soil water and solute depends on the inherent variability of the soil parameters used in making the predictions. Data concerning the natural variability of many physical parameters of soils are lacking. A single soil series was studied over a land area 7.3 km in radius. Estimates were made of how some physical properties of soil vary with depth and with large and small land areas. Estimates of the number of samples required to achieve a given precision for each soil parameter also were made. The variability arising from location to location was found to be the major influence on the variation of soil water conductivity. Restricting sampling to a radius of 5.6 km or sampling within morphological horizons reduced the variance of the soil water conductivity. A range of 1 to 56 locations was required to achieve a standard deviation equal to 10% of the mean for the different physical properties of soil measured. (Visocky-ISWS)
W78-01302

RAINFALL INFILTRATION INTO BARE SOILS,
Ministry of Agriculture, Tel-Aviv (Israel). Soil Conservation and Drainage Div.
J. Morin, and Y. Benyamini.
Water Resources Research, Vol 13, No 5, p 813-817, October 1977. 5 fig, 3 tab, 6 ref, 1 append.

Descriptors: *Infiltration, *Model studies, *On-site investigations, Mathematical models, Soils, Soil properties, Precipitation(Atmospheric), Rainfall, Rainfall intensity, Mulching, Impact(Rainfall), Infiltration rates, Agriculture.
Identifiers: *Bare soils, Crust formation.

Raindrop impact destroys the surface aggregates of soils and gradually forms a continuous crust. Infiltration rates of bare soils are determined by the mentioned process. A theoretical model presented previously was tested under field conditions with a sandy loam soil. The effect of the crust's structure was tested under a 3 rainfall intensities and in wetting and drying cycles. The results of the tests confirmed the theoretical model. The study demonstrated quantitatively that the major factor determining the reduction of infiltration rates is crust formation and not moisture regime. (Sims-ISWS)
W78-01306

EFFECT OF HOLE SIZE ON PERCOLOATION RATE IN A FIELD PERCOLATION TEST,
Ontario Ministry of the Environment, Toronto. Pollution Control Branch.
H. T. Chan.
Publication No 560, August 1976. 65 p, 10 fig, 15 tab, 10 ref, 1 append.

Descriptors: *Infiltration, *Percolation, *Effects, Soil disposal fields, Soil physics, Permeability, Infiltrometers, Soil moisture meters, Soil water movement, On-site investigations, Mathematical studies.
Identifiers: *Percolation pits, Septic systems, Holes, Percolation rates, Soil disposal systems.

The influence of the hole size in a field percolation test was investigated at the Whitby Experimental Station of Ontario ministry of the Environment. It was found that the inverse percolation rate (I.P.R.), which is defined as the time taken by the water level in the hole to drop one unit distance, increases with the diameter of the test hole provided that the sum effect of other factors on the I.P.R. is approximately equal. However, under field testing conditions, a number of factors can affect simultaneously the I.P.R. in the test, and the effect of hole size can be overshadowed. Consequently, there is no apparent trend between the hole size and the I.P.R. Generally the variability in the I.P.R. obtained in different sized holes is less than the variability of data due to soil and climatic conditions. Hence, it can be concluded that in practice the effect of the hole size on the I.P.R. is not significant. Other aspects of the field percolation testing also have been studied. Conclusions were obtained regarding the degree of saturation of the soil adjacent to the test hole and the significant influence of the depth of the water column in the hole. (Adams-ISWS)
W78-01312

THE ROLE OF DRAINAGE SYSTEMS IN SOIL RECLAMATION OF THE MUGAN-SALYANY STEPPE (IN RUSSIAN),
A. P. Akhmedov.
Pochvovedenie 6. 93-98. 1976. English summary.

Descriptors: *Land reclamation, *Drainage practices, *Saline soils, Groundwater, Mineral water, Surface-groundwater relationships, Cotton.
Identifiers: Azerbaijan-SSR, Mugan-Salyany, USSR.

A collector-drainage system was used to wash 125,000 ha of salinized lands (Planted in cotton) in Mugan-Salyansk steppe, Azerbaijan, SSR, USSR. A deep horizontal drainage efficiently controlled soil salinization with a high occurrence of strongly mineralized ground water without natural withdrawal.--Copyright 1977, Biological Abstracts, Inc.
W78-01344

WATER REGIME OF A TYPICAL THICK CHERNOZEM OF THE (DNIEPER RIVER) LEFT-BAND FOREST-STEPPE ZONE OF THE UKRAINIAN SSR (IN RUSSIAN),
Ukrainian Research Inst. of Agrochemistry and Soil Science, Kharkov (USSR).
G. Ya. Chesnyak.
Pochvovedenie 6. 37-45. 1976. English summary.

Descriptors: *Chernozems, *Water balance, *Soil water movement, *Cultivation, Soil moisture, Forests, Seasonal, Moisture availability, Soil-water-plant relationships.
Identifiers: Dnieper, Ukrainian-SSR, USSR, Agricultural practices.

The water regime in virgin and plowed chernozems of the left-bank forest steppe of the Dnieper River, Ukraine (USSR), is similar; in

plowed soils moisture circulation occurs in a thicker layer (2.5 m) than in virgin soils (1.5-1.8 m). In Plowed chernozems the thickness of seasonal moisture dynamics and the intensity of moisture circulation is determined by biology and agrotechniques of cultivated crops. The average moisture expenditure during the growing season is higher under tilled-crop than under crops of continuous sowing.--Copyright 1977, Biological Abstracts, Inc.
W78-01346

CONVERSION OF SLUDGES INTO 'TOPSOILS' BY EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5E.
W78-01469

PHYSICAL PROPERTIES AND MOISTURE CONDITIONS IN CLAYEY GLEY SOILS OF THE KOLKHIDA LOWLAND, (IN RUSSIAN),
All Union Research Inst. of Tea and Subtropical Plants.
For primary bibliographic entry see Field 3F.
W78-01472

MANAGING SALINE WATER FOR IRRIGATION.
International Center for Arid and Semi-Arid Land Studies, Lubbock, TX.
For primary bibliographic entry see Field 3C.
W78-01492

MODELS FOR PREDICTING THE IMPACT OF IRRIGATION ON SOIL SALINITY,
Hebrew Univ., Jerusalem (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 3C.
W78-01495

COMPOSITION OF SALINE DRAINAGE WATER IN IRAQ AND ITS USE,
State Organization of Soils and Land Reclamation, Baghdad (Iraq).
For primary bibliographic entry see Field 3C.
W78-01497

RESISTANCE TO SODA SALINIZATION OF SOME IRAQI SOILS,
Baghdad Univ. (Iraq). Dept. of Soil.
For primary bibliographic entry see Field 3C.
W78-01498

UTILIZATION OF HIGHLY SALINE WATERS FOR WHEAT PRODUCTION: A CASE STUDY IN THE ARID ZONE OF INDIA,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3C.
W78-01507

SOIL SALINIZATION IN THE DELTA OF THE RIVER NILE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.
For primary bibliographic entry see Field 3C.
W78-01542

STUDIES ON THE SOIL-WATER SYSTEM IN THE FIELD: III. DESORPTION CURVE EQUATION, (IN JAPANESE),
Utsunomiya Univ. (Japan). Coll. of Agriculture.
K. Soma.
Bull Coll Agric Utsunomiya Univ. 9(3), p 57-74, 1976.

Descriptors: *Adsorption, *Desorption, *Soil moisture, Distribution, Energy, Equations, Isotherms, Movement, Soils.

The desorption curve represents the relation between soil moisture stress and soil moisture content and is used for studying the behavior of water movement in the unsaturated zone. Applying the mathematical expression of sigmoidal shape which relates the probability distribution of particles to their energy status for the desorption curve as well as the adsorption isotherm curve, the desorption curve equation pF - A + B . (v/vo -c-1) is obtained; (where pF = water holding index, v = amount of water, vo = amount of saturation, and A, B, C are constants). Some practical applications and results of this desorption curve equation are given. (See also W73-13091) --Copyright 1977 Biological Abstracts, Inc.
W78-01575

SOME METHODS FOR DETERMINING HYDROLOGICAL PROPERTIES OF THE SOIL AND THEIR DEPENDENCE ON OTHER PHYSICAL PROPERTIES, (IN SERBO-CROATIAN),
Zagreb Univ. (Yugoslavia). Inst. of Pedology and Technology of Soil.
M. Zic.
Poljopr Znan Smotra 37(47), p 107-114, 1976.

Descriptors: *Clays, *Soil physical properties, *Soil analysis, Sampling, Measurement, *Porosity, Soil moisture, Humus, Soil water, Wilting.
Identifiers: *Yugoslavia.

Sixty soil samples of various mechanical composition and humus content were analyzed. Colluvial soils, Organic Calcomelanosis, Rendzinas, Calcocambisols and Luvic Calcocambisols on limestones and dolomites, Terra rossa, Luvisols on loess and Rigosols of intensive orchards and vineyards on loess and pleistocene loams were represented. A strong and positive correlation was determined between the soil water capacity after Novak and porosity (r = correlation coefficient = 0.57xx). A very strong, but negative correlation (r = - 0.84xx) existed between water retention at 2 pressure of 0.33 bars and porosity. Due to different correlations to porosity, the use of soil samples in natural condition is recommended. For determining the balanced state of soil and water, roughly corresponding to the wilting point, both applied methods render positive results and are intercorrelated (r = 0.90xx). The results obtained by calculation (from the values for loss due to drying at 105 C) were slightly lower. The methods of Richards is preferred. Between the values for the physiologically inert water and the percent clay content, a very strong correlation was determined and the correlation coefficient was highly significant (r = 0.77xx, 0.75xx). The effect of the mechanical soil composition was dominant, primarily that of the proportion, and probably quality, of clay.--Copyright 1977 Biological Abstracts, Inc.
W78-01629

EFFECTIVENESS OF AGRICULTURAL IMPROVEMENTS FOR THE CULTIVATION OF TEA SHRUBS IN THE KOLKHIDA LOWLAND, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W78-01689

SOIL WATER SYSTEM AND YIELD OF FIELD CROPS WITH DIFFERENT TILLAGE SYSTEMS, (IN RUSSIAN),
Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Agriculture Experiment Methods.
For primary bibliographic entry see Field 3F.
W78-01691

2H. Lakes

ANALYSIS OF HYDROLOGICAL FEATURES OF PORTIONS OF THE LAKE ONTARIO BASIN USING SKYLAB AND AIRCRAFT DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01186

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, MD.
IFYGL Bulletin No. 19, February 1977. 93 p, 5 fig, 4 tab, 11 ref.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Projects, Publications, Bibliographies, Water circulation, Currents(Water), Lakes.
Identifiers: *International Field Year for the Great Lakes.

Listed were the official International Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U.S. publications, and additions to the IFYGL bibliography. Two brief papers dealing with water circulation were included. Brief reports on both Canadian and U.S. scientific projects were given. Canadian and U.S. summaries of data available from IFYGL archives were tabulated. (Sims-ISWS)
W78-01187

ALGOLOGIC AND CHEMICAL-BACTERIOLOGIC STUDY OF THE WATER OF THE RESERVOIR OF THE PUBLIC PROMENADE OF CURITIBA, STATE OF PARANA, BRAZIL: I. GENERA OF MICROSCOPIC ALGAE (IN PORTUGUESE),
Universidade Federal de Pernambuco, Recife (Brazil). Inst. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-01198

HYGIENIC PROBLEMS OF PROTECTING WATER RESERVOIRS FROM POLLUTION WITH THERMAL ELECTRIC POWER PLANTS (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-01200

SAMPLING AND ANALYSIS OF MINNESOTA TRIBUTARIES AND MUNICIPAL POINT SOURCES TO LAKE SUPERIOR.
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5B.
W78-01229

EFFECTS OF A RECREATIONAL IMPOUNDMENT ON NEARBY NATURAL LAKES: A CASE STUDY,
Wisconsin Univ.-Oshkosh. Dept. of Geology.
J. I. Hoffman.
Water Resources Bulletin, Vol. 13, No. 5, p 941-952, October 1977. 5 fig, 1 tab, 18 ref.

Descriptors: *Impoundments, *Lakes, *Seepage, *Water quality, *Wisconsin, Recreation, Environmental effects, Groundwater, Groundwater movement, Water table, Nutrients, Pollutants, Chemicals, Hydrogeology, Hydrology.
Identifiers: *Legend Lake(Wis), *Menominee County(Wis).

Completion of a 1,270 acre recreational impoundment (Legend Lake) in the glacial sands of Menominee County, Wisconsin, produced geochemical and hydrologic alterations in some

nearby natural lakes. The impoundment was produced by the construction of three dams, one of which proved to be temporary, connecting 9 natural lakes and ponds of 383 acres with 951 acres of flooded lands. Water levels were raised 3-15 feet within the impounded area. Much of the flooded area was peat rich wetland associated with the prior drainage. Water depths are less than 15 feet in 70% of the impoundment. Three seepage lakes, located less than 1/2 mile from the impoundment, experienced shoreline flooding, shoreline and soil erosion, some tree kills, and increased turbidity. These lakes also experienced concentration increases in several chemical constituents which indicate an influx of impoundment water through a regional alteration in the groundwater flow paths. The three lakes were connected by canals, and a 2.3 cfs gravity drain with an auxiliary pumping station was built to return excess water to the outflow of the impoundment. Future projects of this type would benefit from a more extensive hydrologic and geochemical analysis prior to initiation. Had environmental assessments been required at the time of this development, as they now are in Wisconsin for similar projects, some of the problems encountered might have been alleviated. (Sims-ISWS)
W78-01291

RESPONSE OF THE COASTAL BOUNDARY LAYER ON THE NORTH SHORE OF LAKE ONTARIO TO A FALL STORM,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce.
Journal of Physical Oceanography, Vol 7, No 5, p 719-732, September 1977. 8 fig, 21 ref.

Descriptors: *Water temperature, *Lake Ontario, *Storms, *Great Lakes, On-site investigations, Upwelling, Winds, Temperature, Thermocline, Ships, Current meters, Measurement, Coasts, Circulation, Water circulation, Lakes, Limnology.

Water temperature measurements were made from a ship steaming continuously around a 10 km square on the north shore of Lake Ontario during a vigorous upwelling and downwelling cycle generated by a fall storm. The measurements revealed the existence of horizontal eddies and meanders within the coastal boundary layer having scales between 1 and 10 km. Active internal waves and a rich vertical microstructure also were observed. The above features are considered to be indicative of horizontal and vertical mixing processes generated by large-scale (10 km) adjustments of the coastal boundary layer. The wealth and diversity of the small-scale features suggest that the usual methods of parameterizing geophysical turbulence in terms of large-scale motion will be of little use in the coastal zone and consequently, the outlook for deterministic modeling of the coastal flow regimes is not bright. It was concluded that very simple dynamical models of the large-scale motions allow one to divide the shorelines of a large lake into a relatively small number of dynamically homogeneous zones. Details of the behavior within each zone must be supplied by field observations of winds, currents, and temperatures in the form of a regional coastal climatology. (Sims-ISWS)
W78-01309

DETERMINATION OF TRACE ELEMENT CONTAMINATION OF SEDIMENTS BY MULTIELEMENT ANALYSIS OF CLAY-SIZE FRACTION,
Wisconsin Univ., Madison. Dept. of Soil Science.
P. A. Helmke, R. D. Koons, P. J. Schomberg, and I. K. Iskandar.
Environmental Science and Technology, Vol 11, No 10, p 984-989, October 1977. 4 fig, 2 tab, 22 ref. DACW37-74-C-0013.

Descriptors: *Trace elements, *Bottom sediments, *Dredging, *Lake Superior, *Pollutants, *Geochemistry, Chemical properties, Analytical techniques, Water pollution sources, Sampling, Water quality, Bottom sampling, Heavy metals, Sediments, Water pollution.
Identifiers: Clay-size fractions.

Samples of total sediments and the clay-size fraction were analyzed for more than 20 elements to evaluate the use of trace element concentrations in the fine fraction to determine if the sediments have received anthropogenic inputs of elements. The samples were from Lake Superior and the harbor of Duluth, Minn., and Superior, Wis. The concentrations of trace elements in the samples of total sediments vary by more than a factor of 2 over the study area, and they are not related in a simple fashion to sample location. The ability to detect contaminated sediments is not improved when the values of concentrations are corrected for the effects of dilution by quartz. In contrast, the concentrations of trace elements in the clay-size fraction vary less than 15% from their mean values from site to site except for some areas that have high concentrations of Cr, Cu, Zn, Hg, and As. The high concentrations of these elements result from anthropogenic inputs. (Henley-ISWS)
W78-01311

EUTROPHICATION: A THREAT TO NEW HAMPSHIRE'S LAKES AND PONDS - WHAT LEGAL TOOLS ARE AVAILABLE FOR PROTECTION,
Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5G.
W78-01359

PROCEEDINGS OF SANDUSKY RIVER BASIN SYMPOSIUM, HELD AT TIFFIN, OHIO ON MAY 2-3, 1975.
International Reference Group on Great Lakes Pollution from Land Use Activities.
For primary bibliographic entry see Field 5B.
W78-01518

BENTHIC MICROINVERTEBRATE POPULATIONS OF SANDUSKY BAY,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-01531

ABUNDANCE AND POPULATION TRENDS OF SANDUSKY BAY FISHES,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-01532

USE OF HEAVY METAL POLLUTION IN SANDUSKY BAY SEDIMENTS TO DETERMINE SEDIMENTATION RATES,
Bowling Green State Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-01533

THE USE OF UNDERWATER EQUIPMENT IN FRESHWATER RESEARCH.
Virginia Polytechnic Inst. and State Univ. Blacksburg.
For primary bibliographic entry see Field 7B.
W78-01537

COMPARISON OF COMPUTER SIMULATION MODELS WITH FIELD DATA FROM NEARSHORE ENVIRONMENTS,
Williams Coll. Williamstown, MA.
W. T. Fox, and R. A. Davis, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 682, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No. 15, Office of Naval Research, Arlington, Va., April 1976. 54 p, 20 fig, 21 ref, 2 append.

Descriptors: *Computer models, *Simulation analysis, *Coasts, *Storms, *Beaches, *Waves(Water), *Fourier analysis, *Computer programs, Beach erosion, Maps, Winds, Meteorological data, Systems analysis, Lake Michigan, Forecasting.
Identifiers: *Longshore currents, *Nearshore environment, Field data, Bar erosion.

Computer simulation models of coastal processes provide an accurate means of predicting wave and current conditions in the nearshore environment. A 7-year study was undertaken to develop and test a series of computer simulation models based on time-series data from field studies. The field studies include Stevensville, Michigan (1969); Sheboygan, Wisconsin (1972); Mustand Island, Texas (1971-72); Cedar Island, Virginia (1973); South Beach, Oregon (1973-74); Zion, Illinois and South Haven, Michigan (1974) and Plum Island, Massachusetts (1975). A series of computer programs were developed for analysis and plotting of the field data. A Fourier analysis program was used to plot smoothed curves for weather, waves and current variables. Topographic maps and maps of erosion and deposition were plotted based on daily beach and nearshore profiles. An 'Area-time Prism' model was formulated to graphically portray changes in beach and nearshore bar configuration through time. A 'Coastal Process Simulation Model' was developed to predict wave and longshore current conditions, and beach and bar erosion on the eastern shore of Lake Michigan. A 'Coastal Storm Model' based on the size, shape and intensity of a coastal storm predicts wind, waves and currents for any coastal orientation. The coastal storm model can hindcast conditions of past storm or produce short-term forecasts in developing storms. The model is based on an inverted normal curve which is rotated around the center of a storm system. (Bell-Cornell)
W78-01543

EFFECT OF PULP MILL EFFLUENT ON SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-01554

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
For primary bibliographic entry see Field 5B.
W78-01558

DENSITY, DISTRIBUTION, AND MOVEMENT OF NIPIGON BAY FISHES IN RELATION TO A PULP AND PAPER MILL EFFLUENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-01563

CONTRIBUTIONS TO THE ECOLOGY OF BENTHIC ALGAE IN THE ALPINE ZONE OF THE PYRENEES: II. CYANOPHYCEANS AND OTHER ALGAL GROUPS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (West Germany). Inst. of Wasserund Abfallwirtschaft.
D. Backhaus.
Int Rev Gesamten Hydrobiol 61(4) p 471-516, 1976.

Descriptors: *Calcium, *Algae, Lakes, *Benthic flora, *Systematics, *Cyanophyta, Aquatic

vegetation, Chantransia-Chalybea-var-profunda, Cyanostylon-microcystoides, Desmosiphon-maculans, Gloeocapsa-tornensis, Homeothrix-sinensis, Hydrococcus-cesatii, Lyngbya-lachneri, Nitella-flexilis, Nostoc-zetter-stedtii, Onkonema-sp, Pleurocapsa-minor, Schizothrix spp.

An investigation was made of the benthic and littoral microphytic vegetation of Esteragne Brook, and Porth-Bielh Lake in the High Pyrenees. Both waters combine a low Ca content with a consistently basic pH. A comparison of their flora with that of other lakes may help to deal with the problem of whether the algal flora is determined by the Ca content or the pH. The algal flora of Esteragne Brook differs little from that of low-Ca streams of the central European highlands. In Porth-Bielh Lake there is a distinct depth-zonation among the dominant algae. The dominant taxa at a depth of 0-0.5 m are: Schizothrix lacustris f. lutescens, S. calcicola, Gloecapsa tornensis, Pleurocapsa minor with Cyanostylon microcystoides and Hydrococcus cesatii praticularly on the underside of the stones; from 0.5-1.5 m: a massive growth of Nostoc zetter-stedtii; from 2.5-4.5 m: S. funalis; from 7 m: Nitella flexilis. The lake also includes a number of rare and little known forms such as Onkonema sp., cf. Desmosiphon maculans, Lyngbya lachneri, Homeothrix sinensis, Chantransia chalybea var. profunda, Siphonenma polonicum chamaesiphonoides. Green algae were almost completely absent from the upper zones, in contrast to the usual findings. The littoral flora has a distinctive character, and is not directly comparable with that usually found in lakes with either high or low calcium content. A certain resemblance to lakes with a high Ca content can be found only if all the forms present particularly with lower abundances are considered. The strong development of lithophytes should be emphasized in contrast to their usually low density in lakes with low Ca content. The systematic section deals with systematic and taxonomic problems in a number of difficult forms.--Copyright 1977, Biological Abstracts, Inc.
W78-01583

ANALYSIS OF A PULP AND PAPER MILL EFFLUENT PLUME,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-01584

BENTHIC FAUNA OF BODIES OF WATER OF THE LOWER TUNGUSKA BASIN, (IN RUSSIAN),
Siberian Research Inst. of the Fish Industry, Krasnoyarsk (USSR). Krasnoyarsk Div.
N. V. Vershinin.
Gidrobiol Zh 12(4), p 43-48, 1976.

Descriptors: *Benthic fauna, Surface waters, *Invertebrates, Flood plains, Lakes, Tributaries, River basins.
Identifiers: Zoobenthos, *Tunguska Basin(USSR), Biocenoses.

The qualitative and quantitative composition of invertebrate zoobenthos of the lower Tunguska, its tributaries and flood plain lakes were analyzed depending on the flow rate, depth and temperature of water and the soil character. Biocenoses are determined and their role in the formation of zoobenthos is shown. Zoobenthos from the lower Tunguska basin is compared with zoobenthos from other high-latitude water bodies.--Copyright 1977 Biological Abstracts, Inc.
W78-01586

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-01587

SURFACE CIRCULATION IN THE GREAT LAKES AS OBSERVED BY LANDSAT-1 AUGUST 1972 TO DECEMBER 1973: SOUTHERN LAKE MICHIGAN,
National Environmental Satellite Service, Washington, DC.
H. G. Stumpf, and A. E. Strong.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1973-1988, September 1975. 10 fig, 1 tab, 8 ref. NASA S-70246-AG.

Descriptors: *Lake Michigan, *Water circulation, *Remote sensing, *Tracers, Lakes, Surfaces, Currents(Water), Suspended solids, Pollutants, Algae, Limnology, Analysis, Analytical techniques, Winds, Wind velocity, Satellites(Artificial).
Identifiers: LANDSAT.

The surface current circulation patterns of southern Lake Michigan were charted for all cardinal and subcardinal wind directions, employing LANDSAT-1 observations of the distribution of natural tracing material borne in the surface waters. The colorants consisted chiefly of river discharges composed of suspended sediments, pollutants, and algae; extensive chemical precipitations proved valuable for areas farther from shore. Comparison of the satellite-derived surface current charts with previous theoretical and empirical studies showed good agreement. (See also W78-01589) (Humphreys-ISWS)
W78-01609

THE RESULTS ARE USEFUL FOR HELPING TO DETERMINE AN OPTIMUM SPECTRAL BANDWIDTH FOR FUTURE SPACE SENSORS WHERE A BOTTOM REFLECTION IS DETECTABLE. (SEE ALSO W78-01589) (HUMPHREYS-ISWS)
eatures because of water transparency in the blue/green portion of the spectrum. Depth to 20 meters were measured with the S-192 in the Puerto Rico test site. The S-190B photography, with its improved spatial resolution, clearly delineates the triple sand bar topography in the Lake Michigan test site. Several processing techniques were employed to test for maximum depth measurement with least erro
For primary bibliographic entry see Field 7C.
he Skylab S-192 MSS for measurement of nearshore

ON THE FOOD OF BROWN TROUT (SALMO TRUTTA M. FARIO) IN THE OPATOVICE WATER SUPPLY RESERVOIR (CZECHOSLOVAKIA), (IN GERMAN),
Brno Univ. (Czechoslovakia). Naturwiss. Fak.
B. Losos.
Zool Listy 25(3), p 275-288, 1976.

Descriptors: *Brown trout, *Trout, *Reservoirs, *Fish diets, *Fish food organisms, Seasonal, Diptera, Mayflies, Stoneflies, Benthic fauna, Daphnia, Littoral, Tributaries, Anisus-leucostomus, Chironomidae, Cladocera, Cloeon-dipterum, Cyclops-strenuus, Czechoslovakia, Daphnia-longispina, Migration, Opatovice, Plecoptera, Radix-peregra, Remnants, Rivulogammarus-fossarum, Salmo-trutta-m-fario, Freshwater shrimps.

In the 2 yr following the filling of the water supply reservoir of Opatovice (Czechoslovakia) (1974-1974), the food was examined in 56 specimens of brown trout. The composition of food showed seasonal changes in connection with the food supply in the environment. The main share fell to the zoobenthos (ranging from 43.5-100%; average, 93.0%), the most frequently occurring component being larvae and pupae of Chironomidae (ranging from 29.2-94.0%; average, 50.6%). Of the above 2 stages of development, the more frequent, except in March 1974, were the pugae which were 5 times as numerous as the larvae throughout the investigation. They became an easy prey of trout, particularly during emergence when they swam towards the water level. From among more benthic forms there occurred Radix peregra (0-65.6%; average, 12.2%), larvae and partly subimagines of the mayfly, Cloeon dipterum (0-67.3%; average, 11.4%), less frequently larvae of stoneflies (Plecoptera: 5.4%), fresh water shrimps, Rivulogammarus fossarum (5.3%), Anisus leucostomus (3.4%) and various species of the genus Sigara (1.7%). The other benthic forms were represented by less than 1% on the average. A large share of torrential forms was found in the food of brown trout. The presence of a great number of littoral forms of zoobenthos in the food confirms the fact that a large part of the brown trout population was distributed in the littoral zone where the trout have many hiding places and abundant suitable and available food.
W78-01631

MAJOR, MINOR, AND TRACE ELEMENTS OF BOTTOM SEDIMENTS IN LAKE DU QUOIN, JOHNSTON CITY LAKE, AND LITTLE GRASSY LAKE IN SOUTHERN ILLINOIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-01655

INFLUENCE OF VINANSKY LAKE UPON THE FORMATION OF CRUSTACEOPLANKTON IN THE NEW ZEMPLINSKA SIRAVA DAM, (IN GERMAN),
Komenskeho Univ., Bratislava (Czechoslovakia). Katedra Syst. Ekol. Zool.
F. Vilchek.
Acta Fac Rerum Nat Univ Comenianae Zool 21, p 111-118, 1976.

Descriptors: *Zooplankton, *Crustaceans, *Lakes, Copepods, Inflow, Aquatic populations, Dams, Vinansky Lake, Zemplinska-Sirava Dam, Czechoslovakia.

Research on crustaceoplankton in the 1965-1968 revealed that its present state evolved from the initial zoocoenosis being influenced by the inflow of the water from Vinansky Lake and the migration of aquatic birds. The specific composition of Cladocera and Copepods as well as their abundance are more profuse in the dam than in the lake or in the tributary stream.--Copyright 1977 Biological Abstracts, Inc.
W78-01687

2I. Water In Plants

CHANGES IN BIOCHEMICAL AND WATER-PHYSICAL PROPERTIES OF SOILS IRRIGATED WITH MINERALIZED WATER (IN RUSSIAN),
Ukrainian Research Inst. of Agrochemistry and Soil Science, Kharkov (USSR).
For primary bibliographic entry see Field 2G.
W78-01293

EFFECT OF AIR TEMPERATURE AND SOIL HUMIDITY ON THE WATER CONTENT IN GENERATIVE BUDS OF CHERRY AND CULTIVARS WITH DIFFERENT LEVELS OF FROST RESISTANCE (IN RUSSIAN),
Nikita State Botanical Garden, Yalta (USSR).
E. A. Yablonskii.
Fiziol Rast (MOSC) 23(4): 823-828. 1976. English summary.

Descriptors: *Moisture content, *Air temperature, *Soil moisture, *Crop response, Seasonal varia-

bility, Weather patterns, Soil-water-plant relationships.
Identifiers: Cherry, Cultivars, Mazzard, USSR, Crimea.

The total water content was determined in generative buds of cherry and mazzard cherry growing in the South Crimea (USSR) during 1968-1973 from Sept.-Jan. The content did not depend on frost resistance of different cultivars. The effect of air temperature and soil moisture was specific in different cultivars during various years, with a cold or warm winter or with a humid or dry autumn. Resistant cultivars were characterized by a lower response to changes in the hydrothermic regime of the medium as compared to less resistant cultivars.
W78-01343

SPONTANEOUS CHANGES OF TRANSPIRATION UNDER CONSTANT ENVIRONMENTAL CONDITIONS, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
U. Brunner, and M. Eller Benno.
Bull Soc Bot Suisse 85(4), p 289-297, 1975.

Descriptors: *Water vapor, Measurement, Leaves.
Identifiers: *Absorption, Environmental effects, Photometers, *Pipe betle, Roots, Stomata, Temperature, *Transpiration.

Water vapor exchange and absorption of water by the roots of intact single leaf plants of Pipe betle L. were measured simultaneously. Measurements were carried out with a weighable high-sensitivity potometer under controlled environmental conditions. The reliability of the results was secured by 2 independent measurements of the ambient factors during each experiment. The observed values of transpiration and absorption were generally equal. If the roots were not aerated for a long period of time and the whole plant was exposed to higher temperatures, absorption became insufficient and there was a tendency for short noncyclic interruptions of transpiration under unchanging environmental conditions. Truly cyclic variations of transpiration and absorption appeared after a less severe treatment. During these cycles absorption remained sufficient, and a conspicuous phase-shift between loss and uptake of water was observed. The observed phenomena are explained as changes of the stomatal resistance. A connection between the stomatal action and the root resistance is suggested.--Copyright 1977, Biological Abstracts, Inc.
W78-01412

PSYCHROMETRIC ANALYSIS OF TURGOR PRESSURE RESPONSE: A POSSIBLE TECHNIQUE FOR EVALUATING PLANT WATER STRESS RESISTANCE,
Agricultural Research Service, Logan, UT. Crops Research Lab.
D. A. Johnson, and R. W. Brown.
Crop Science, Vol 17, No 4, July-August, 1977, p 507-510, 3 fig, 1 tab, 20 ref.

Descriptors: *Plant tissues, *Drought tolerance, *Drought resistance, *Hygrometry, *Turgidity, *Plant physiology, Arid lands, Semiarid climates, Land reclamation, Soil-water plant relationships, Desert plants, Metabolism, Viability, Water requirements, Plant growth, Growth stages, Soil moisture, Moisture stress.
Identifiers: *Turgor pressure, Psychrometric analysis.

Evaluating plants under water stress is important to programs such as rangeland and mineland rehabilitation, especially in the arid and semiarid west where rehabilitation efforts can be limited if plants with superior drought performance are not selected. Techniques for selecting appropriate plant material should be capable of the following: (1) assessing plant performance at different developmental stages; (2) completion in a short period of time; (3) requiring relatively small quantities of plant materials; (4) examining plant characteristics that integrate a wide array of water stress avoidance and tolerance mechanisms. Psychometric analysis of plant turgor may be one such technique. To determine if differences in turgor pressure response could be correlated with performance during water stress, a study was undertaken of five plant species and hybrids under a range of soil moisture regimes. Water potential components of leaf sample were measured by a psychrometric technique. Predictions of resistance to water stress based on ability to maintain positive turgor closely agreed with field observation. The results suggest that the technique may be useful. (Ullery-Arizona)
W78-01500

DAILY POTENTIAL INTERCEPTION OF RAINFALL BY DIFFERENT FOREST POPULATIONS, (IN FRENCH),
Institut Royal Meteorologique de Belgique, Brussels.
F. Bultot, G. L. Dupriez, and A. Bodeux.
J Hydrol (Amst) 31(3/4), p 381-392, 1976.

Descriptors: *Rainfall intensity, *Evaporation, *Forests, *Interception, Rainfall, *Spruce, *Beech.

On basis of complementary observations, the relationships previously established to estimate potential interception by a spruce forest (Picea abies) and a beech forest (Fagus silvatica) in relation to rainfall, rain intensity and evaporating power of the air were checked. A comparison was then made between the values of the potential interception by spruce forests with different ages.--Copyright 1977, Biological Abstracts, Inc.
W78-01555

ALGAE OF BENTHIC OVERGROWTH IN THE TRANSBAIKALIAN RIVER OF INGODA, (IN RUSSIAN),
Chitinskii Gosudarstvennyi Pedagogichskii Inst. (USSR).
M. I. Kachaeva.
Gidrobiol Zh 12(5), p 68-72, 1976.

Descriptors: *Algae, *Benthic flora, Rivers, Biomass, *Diatoms, *Ingoda River(Russian-SFSR), Seasonal, USSR.

The hydrological indices of the Ingoda River (Russian SFSR, USSR) are characteristic of small mountain rivers in the USSR. A 1969-70 study of its algoflora revealed a rich composition of 241 spp., varieties and forms. A definite regularity in its seasonal dynamics was noted: overgrowth appears in the middle of May and disappears during the prolonged summer high water and during its freezing over period. The most favorable periods for algae development are the 1st half of summer and the 2nd half of fall. The most significant elements of the biomass are green filamentous algae; diatoms comprise an average of 2-3 g/m2 and maximum of 8 m/g2. The highest concentraion of algae is observed in the zone from 0.2-0.5 m deep; with increase of depth and rate of flow the concentration sharply falls.
W78-01557

EFFECT OF WATER DEPTH IN NET CAGES ON THE GROWTH AND BODY SHAPE OF TILAPIA MOSSAMBICA, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
T. Maruyama, and R. Ishida.
Bull Freshw Fish Res Lab (TOKYO) 16 (1), p 11-19, 1976.

Descriptors: *Depth, *Fish, *Growth rates, Nets, Spawning, Deep water, Shallow water, Statistical methods, On-site investigations, Aquatic environment, *Tilapia, Tilapia-Mossambica.

To investigate the adequate water depth to culture T. mossambica 5 groups of fish were reared in net cages of water depth, 50, 75, 100 and 150 cm., and the growth, form and number of spawnings of the caged fish were compared. The fish cultured in deep water showed greater body length and body depth than those of the fish in shallow water. As body depth increases accompanied by growth of body length, significance of the differences between each pair of groups were tested. Variant analysis indicated significant differences among the monthly body lengths and body depths of the groups. The test of the average body length showed a difference between the 150 cm group and the other 4 groups, but no difference among these 4 groups. The test of the corrected average body depth detected a difference among the 5 groups even after the correction for the effects of body length. More frequent spawning was observed in the groups deeper than 75 cm. The 150 cm depth was more suitable for the growth of body length than the shallow depths. Water depths greater than the limit of about 75 cm favored the growth of body length, while shallow water of 25 cm was unsuitable.--Copyright 1977, Biological Abstracts, Inc.
W78-01571

ON CERTAIN THEORETICAL AND PRACTICAL PROBLEMS IN RAISING FISH OF THE MUGILIDAE FAMILY, (IN SERBO-CROATIAN),
Institut za Oceanografiju i Ribarstvo, Split (Yugoslavia).
D. Morovic.
Poljopr Znan Smotr 37(47), p 47-56, 1976.

Descriptors: *Fish diets, *Nutrient requirement, *Aquatic habitats, Environment, Ponds, Fish management, Lagoons, Fish farming.
Identifiers: Liza aurata, Liza ramada, Mugil cephalus, Mugilidae, Yugoslavia.

To study the influence of fish meal on the growth of fishes of the Mugilidae family, raised in fish ponds, nutritional experiments were performed in the juvenile stage of 3 spp. Mugil cephalus, Liza ramada and L. aurata. The results proved unsatisfactory from an economic standpoint. To speed the growth of the young fishes, one must keep them in a natural environment of lagoon canals and add fish meal to the food naturally present.--Copyright 1977 Biological Abstracts, Inc.
W78-01588

2J. Erosion and Sedimentation

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1973.
Federal Highway Administration, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 376, Price codes: A14 in paper copy, A01 in microfiche. Report to Water Resources Council, Washington, D.C. 1973. 308 p, 3 tab, 2 append.

Descriptors: *Sedimentation, *Research and development, *Projects, Research facilities, Federal government, Sediment transport, Suspended solids, Erosion, Sedimentation rates, Sediments, Sedimentology.

A digest was presented of information furnished by all Federal agencies conducting sedimentation investigations on work in progress or planned, on important findings, on new methods, on new publications, on laboratory and other research activities, and on other pertinent information. The material was organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and Foreign. Other major headings included Laboratory and Other Research Activities. An excerpt from the Catalog of Infor-

mation on Water Data, Index to Water Quality Stations, 1973 edition, compiled by the Geological Survey, Office of Water Data Coordination, was included as Appendix A. The excerpt is a list, as of January 1973, of long-term (3 years or more) water quality sites at which sediment data have been collected. Appendix B was a listing of agency addresses by departments where additional information on agency activities can be obtained. (Sims-ISWS)
W78-01185

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, BUREAU OF RECLAMATION, DENVER, COLORADO, MAY 6-8, 1947.
For primary bibliographic entry see Field 4D.
W78-01188

EROSION BY IMPINGING CIRCULAR TURBULENT JETS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and S. Beltaos.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY10, Proceedings Paper 13287, p 1191-1205, October 1977. 13 fig, 1 tab, 16 ref, 2 append.

Descriptors: *Jets, *Turbulence, *Erosion, Hydraulic models, Hydraulics, Model studies, Flow, Equations, Mathematical studies, Sands, Froude number.
Identifiers: *Impingement, Turbulent jets, Similarities, Submerged jets, Impingement height, Polystyrene.

Described was an experimental study of the erosion of loose beds of sand and polystyrene by impinging (submerged) jets of air and water. The maximum depth of erosion increases linearly with the logarithm of time up to a characteristic time value beyond which the variation becomes non-linear and eventually approaches an asymptotic state. For large impingement heights, the asymptotic values of the maximum depth and radius of erosion in terms of the impingement height were found to be mainly functions of the densimetric Froude number divided by the impingement height in terms of the diameter of the jet at the nozzle. Some correlations also were found for small impingement heights. The geometric form of the eroded bed profile, in the unsteady as well as in the asymptotic state, was found to be similar. (Lee-ISWS)
W78-01284

ERODIBILITY OF COARSE SAND-CLAYEY SILT MIXTURES,
Lehigh Univ., Bethlehem, PA. Dept. of Civil Engineering.
W. A. Murray.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY10, p 1222-1227, October 1977. 3 fig, 1 tab, 7 ref, 1 append. NSF OIP74-20724.

Descriptors: *Laboratory tests, *Erosion, *Cohesive soils, Sediments, Stream beds, Sand, Silts, Clays, Stream erosion, Sediment transport, Analytical techniques, Measurement.
Identifiers: Soil mixtures.

This paper presented results of a laboratory study concerning the erosion characteristics of soil mixtures composed of a uniform coarse sand mixed with various percentages of a silty soil. Tests were conducted in a flume constructed of plexiglass, 152 cm long, 11 cm wide, and 11 cm deep, with a headbox and a tailbox. The sediment bed was observed closely during any given test series to ensure that excessive erosion that would appreciably change the average bed elevation of the test section did not occur. From the experimental study results of the erodibility of coarse sand-clayey silt mixtures, the following conclusions may be drawn: (1) The sediment transport rate for all sediment samples increased as the 16th power of the bed shear stress. (2) The bed shear stress necessary to attain a given rate of sediment transport increased as the percentage of fine material increased in the soil sample. However, the rate of increase with percentage fines was less than previously reported. (3) It appears that pursuing this type of experimental analysis will shed light on the overall problem of predicting the erodibility of cohesive soils. (Humphreys-ISWS)
W78-01285

AN EROSION EQUATION DERIVED FROM BASIC EROSION PRINCIPLES,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
G. R. Foster, L. D. Meyer, and C. A. Onstad.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 678-682, July-August 1977. 28 ref.

Descriptors: *Soil erosion, *Watersheds(Basins), *Theoretical analysis, *Mathematical models, Rill erosion, Sediment transport, Sediment yield, Sheet erosion, Erosion, Equations, Overland flow, Runoff, Rainfall, Erosion control, Land management, Shear stress.
Identifiers: Interrill erosion.

An erosion equation was derived from the continuity equation for sediment transport and other basic equations describing rill and interrill erosion. The resulting equation is a useful model for explaining the behavior of the erosion process. The equation might serve as the basis for an operational equation for estimating soil loss for specific storms. (Humphreys-ISWS)
W78-01295

A RUNOFF EROSIVITY FACTOR AND VARIABLE SLOPE LENGTH EXPONENTS FOR SOIL LOSS ESTIMATES,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
G. R. Foster, L. D. Meyer, and C. A. Onstad.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 683-687, July-August 1977. 1 tab, 15 ref.

Descriptors: *Soil erosion, *Sediment yield, *Watersheds(Basins), *Mathematical models, Equations, Erosion, Sheet erosion, Rill erosion, Runoff, Estimating, On-site tests, Slopes, Analysis.
Identifiers: Erosivity, Runoff erosivity, Rainfall erosivity, Interrill erosion, Universal Soil Loss Equation.

A runoff erosivity term was developed for the Universal Soil Loss Equation (USLE) from analysis of an erosion equation derived from basic erosion principles. The accuracy of erosion estimates for individual storms can be improved significantly by using a soil loss equation having separate terms for rill and interrill erosion. Also, such an equation can be used to estimate the amount of sediment from different slope segments and also the amount from the soil surface and from deeper within the soil profile. The analyses showed the potential of estimating soil loss using separate rill erosion and interrill erosion terms in an erosion equation. Research is needed to define precisely the relationship between rill erosion and runoff erosivity and that between interrill erosion and rainfall erosivity. The separate effects of cover, management, and supporting practices on rill and interrill erosion need to be estblished. The achievement of the mentioned goals promises to provide a flexible, useful, and accurate erosion equation based on sound erosion principles. In the meantime, basic erosion principles can be used as guidelines to adjust parameters in the USLE for more accurate soil loss estimates for specific time periods and situations. (Humphreys-ISWS)
W78-01296

RUNOFF AND EROSION CHARACTERISTICS OF SURFACE-MINED SITES IN WESTERN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
J. E. Gilley, G. W. Gee, W. O. Willis, and R. A. Young.
Transaction of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 697-700, 704, July-August 1977. 1 fig, 3 tab, 9 ref.

Descriptors: *Runoff, *Erosion, *North Dakota, Soil erosion, Sedimentation, Hydrology, Strip mines, Grasslands, Mulching, Rainfall simulators, Agriculture.
Identifiers: Universal Soil Loss Equation, Straw mulch.

A rainfall simulator was used to measure runoff and erosion from rangeland, spoil, and topsoil sites. Measured soil losses were greatest on bare topsoil plots and least on the non-cultivated rangeland site. Application of a straw mulch reduced erosion on topsoil by over 90%. However, the measured erosion and runoff values from the mulched topsoil sites were still over 50% higher than from the rangeland site. (Lee-ISWS)
W78-01298

LOCAL SCOUR AROUND CYLINDRICAL PIERS,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 8B.
W78-01300

PREPARATIVE-SCALE SIZE FRACTIONATION OF SOILS AND SEDIMENTS AND AN APPLICATION TO STUDIES OF PLUTONIUM GEOCHEMISTRY,
Argonne National Lab., IL. Radiological and Environmental Research DiV.
R. N. Muller, and G. T. Tisue.
Soil Science, Vol 124, No 4, p 191-198, October 1977. 8 fig, 5 tab, 19 ref.

Descriptors: *Separation techniques, *Soils, *Sediments, *Geochemistry, Particle size, Sediment transport, Laboratory equipment, Setting velocity, Histograms, Erosion.
Identifiers: *Physical fractionation, Elutriation, *Plutonium.

A modified elutriation procedure for the physical separation of soils and sediments based on particle size was described. The size distribution of fractions obtained by the described method was verified directly and indicated that acceptable separation of silts and clays may be obtained. Studies of plutonium distribution with particle size indicated that the greatest concentrations are in the smaller size classes, which are most subject to erosional transport. (Visocky-ISWS)
W78-01301

TIME SCALES AND DYNAMIC MODELS OF DEEP-SEA SEDIMENTATION,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Marine Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W78-01303

DETERMINATION OF TRACE ELEMENT CONTAMINATION OF SEDIMENTS BY MULTIELEMENT ANALYSIS OF CLAY-SIZE FRACTION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W78-01311

EVALUATION OF SEDIMENT CONTROL DAMS,
Pennsylvania Dept. of Transportation, Harrisburg. Bureau of Materials, Testing and Research.

For primary bibliographic entry see Field 4D.
W78-01313

ACOP PUMPING SAMPLER. ALLUVIAL RIVER MECHANICS PROJECT,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 4D.
W78-01314

CONTROL OF EROSION AND SEDIMENT DEPOSITION FROM CONSTRUCTION OF HIGHWAYS AND LAND DEVELOPMENT,
Environmental Protection Agency, Washington, DC. Office of Water Programs.
For primary bibliographic entry see Field 4D.
W78-01315

POLLUTION STUDIES OF TRACE ELEMENTS IN SEDIMENTS FROM THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chem. Dept.
For primary bibliographic entry see Field 5B.
W78-01474

ADJUSTMENT TO QUATERNARY CLIMATIC CHANGE BY THE COLORADO RIVER IN CENTRAL TEXAS,
Texas Univ. at Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W78-01504

USE OF HEAVY METAL POLLUTION IN SANDUSKY BAY SEDIMENTS TO DETERMINE SEDIMENTATION RATES,
Bowling Green State Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-01533

HYDRAULIC SENSOR INSTRUMENTATION OF A SHORE FACE IN A TIDAL CURRENT CONVERGENCE ZONE--CAPE HENRY, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W78-01536

GROIN LENGTH AND THE GENERATION OF EDGE WAVES,
Oregon State Univ. Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W78-01538

CHANGES DUE TO JETTIES AT TILLAMOOK BAY, OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W78-01539

STUDIES ON THE FIXATION OF DRIFTING SAND: 3. RELATION BETWEEN SAND SURFACE MOISTURE CONTENT AND DRIFTING SAND, (IN JAPANESE),
Tottori Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 2L.
W78-01585

EROSION BY CIRCULAR TURBULENT WALL JETS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-01634

HELLEY-SMITH BED LOAD SAMPLERS,
Agricultural Research Service, Boise, ID.
C. W. Johnson, R. L. Engleman, J. P. Smith, and C. L. Hanson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY10, p 1217-1221, October 1977. 2 fig, 1 tab, 9 ref, 1 append.

Descriptors: *Bed load samplers, *Sampling, *Idaho, *On-site investigations, Instrumentation, Demonstration watersheds, Equipment, Sediment transport, Sediments, *Sediment load, On-site tests, Testing, Testing procedures, Measurement.
Identifiers: *Reynolds Creek Experimental Watershed(Idaho), Helley-Smith samplers.

This paper reported recent findings and experiences in using Helley-Smith bed load samplers in streams on the Reynolds Creek Experimental Watershed in southwest Idaho. Equipment and procedures developed in sampling during peak streamflow events were described. The 90-sq mile sagebrush rangeland watershed, with a main stream length of 16 miles (25.7 km), an elevation difference of 3,700 ft (1,130 m), and average streamflow rate of 21.5 cfs, is characterized by steep gravel-boulder streambeds with many outcrops of basalt and granite. The streams transport large quantities of sediment during rainfall and snowmelt events. Users of Helley-Smith bed load samplers, under conditions of high organic and sediment transport, should recognize the possible sampling error caused by clogging of standard sampler bags and instead use either larger bags or bags with a mesh larger than 0.2 mm. The samplers with standard small 0.2-mm mesh bags clogged very easily and drastically affected the sediment catch. The large sampler bags with 930 sq in of bag area, instead of 340 sq in caused no sampler operation problems and allowed sampling for longer periods to obtain larger samples. Large 0.2-mm mesh bags are recommended for most uses. (Humphreys-ISWS)
W78-01641

MAJOR, MINOR, AND TRACE ELEMENTS OF BOTTOM SEDIMENTS IN LAKE DU QUOIN, JOHNSTON CITY LAKE, AND LITTLE GRASSY LAKE IN SOUTHERN ILLINOIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5A.
W78-01655

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS. PART IV: FINAL REPORT-FIELD TESTING PROGRAM,
Arizona Transportation and Traffic Inst., Tucson.
For primary bibliographic entry see Field 4D.
W78-01658

2K. Chemical Processes

RESEARCH ON UNDERGROUND WATERS: 27. STUDY OF AN EPIKARSTIC AQUIFER OF THE CORBIERES (OPOUL, PYRENEES-ORIENTALES) (IN FRENCH),
For primary bibliographic entry see Field 2F.
W78-01192

CARBON DIOXIDE IN THE ATMOSPHERE OF THE UNSATURATED ZONE: AN IMPORTANT CONTROL OF GROUNDWATER HARDNESS IN LIMESTONES,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2F.
W78-01289

PREPARATIVE-SCALE SIZE FRACTIONATION OF SOILS AND SEDIMENTS AND AN APPLICATION TO STUDIES OF PLUTONIUM GEOCHEMISTRY,
Argonne National Lab., IL. Radiological and Environmental Research DiV.
For primary bibliographic entry see Field 2J.
W78-01301

ANNUAL BOOK OF ASTM STANDARDS. PART 31. WATER.
American Society for Testing and Materials, Philadelphia, PA.
For primary bibliographic entry see Field 5A.
W78-01576

2L. Estuaries

SOME ASPECTS OF PUGET SOUND'S CIRCULATION AND WATER PROPERTIES,
Washington Univ., Seattle. Dept. of Oceanography.
C. A. Barnes, and C. C. Ebbesmeyer.
Report M76-36 to NOAA Environmental Research Laboratories, 1976. 44 p, 9 fig, 1 tab, 51 ref.

Descriptors: *Estuaries, *Circulation, *Tidal effects, Washington, Sounds, Stratification, Water circulation.
Identifiers: *Puget Sound(Wash).

Using Puget Sound, this study illustrates that estuarine circulation may be quite vigorous at all depths where tides provide sufficiently deep tidal mixing and pumping. Puget Sound is a complex system of interconnected estuarine types. Its two main arms are fjords: in the first (Whidbey Basin) mixing is insufficient to break down the near surface stratification zone except in a shallow secondary channel in which the net flow is seaward at all depths; in the second (Puget Sound Main Basin) flood tides 'pump' deep water upwards and mix it with surface water through a 44m depth constriction located in a sill zone leading to a smaller terminal basin. On ebb, mixed water returns rapidly to mid-basin via a secondary channel. Blocking either the terminal or secondary channel in a tidal model greatly slowed the circulation in the Main Basin, demonstrating the marked effect of geometry and bathymetry on transport. Although most of Puget Sound's runoff empties into Whidbey Basin, its transport is about an order of magnitude less than in the Main Basin. Analysis of current records and water properties suggests that water depth travels from mouth to head of the Main Basin in approximately two weeks contrasted to a few months in Whidbey Basin. (NOAA)
W78-01273

RECOMMENDATIONS FOR MICROBIOLOGICAL STUDIES IN THE CONTINENTAL SHELF AREAS. RESULTS FROM TWO WORKSHOPS CONVENED 10-11 AUGUST 1976 AND 19-20 OCTOBER 1976 IN BOULDER, COLORADO. OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5C.
W78-01274

FIELD STUDIES ON BENTHIC COMMUNITIES IN THE NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (NOMES),
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 5C.
W78-01275

REVIEW OF EXISTING INFORMATION ON FISHES IN THE DEEP OCEAN MINING EN-

VIRONMENTAL STUDY (DOMES) AREA OF THE TROPICAL PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01276

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY STUDIES; PRELIMINARY REPORT,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-01278

DISTRIBUTION AND COMPOSITION OF THE SUSPENDED PARTICULATE MATTER IN THE WATERS OF THE DOMES REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-01279

STUDIES ON SALINIZATION OF GROUNDWATER, 1. THEORETICAL CONSIDERATION ON THE THREE-DIMENSIONAL MOVEMENT OF THE SALT WATER INTERFACE CAUSED BY THE PUMPAGE OF CONFINED GROUNDWATER IN FAN-SHAPED ALLUVIUM,
Ehime Univ., Matsuyama (Japan). Dept. of Applied Physics.
For primary bibliographic entry see Field 2F.
W78-01287

TIME SCALES AND DYNAMIC MODELS OF DEEP-SEA SEDIMENTATION,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Marine Geology and Geophysics.
J. R. Southam, and W. W. Hay.
Journal of Geophysical Research, Vol 82, No 27, p 3825-3842, September 20, 1977. 12 fig, 7 tab, 29 ref. NSF DES74-02825 A0Y.

Descriptors: *Sedimentation, *Oceans, *Model studies, Mathematical models, Sediments, Chemicals, Geochemistry, Geology, Biological properties, Oceanography.

Models of very long-term geochemical cycling of material include oceanic sediments as a part of the much larger system of mantle differentiation, production of sea floor, subduction, and continental growth. Mass balance considerations show that the system cannot be in steady-state if pelagic sediment has always had its present composition. An approximate steady-state system is possible if pelagic sediments were exclusively red clay and siliceous ooze. The origin of the calcareous plankton 100 millions of years ago apparently initiated a process interior to the system which is driving the system toward a new steady-state. On a time scale of tens of millions of years, sea level fluctuations associated with changes in the length of oceanic ridges and the rate of spreading cause differential partitioning of sediments between shelf areas and the oceanic realm. This process may alter the inputs to the ocean system and may affect both the volume and the composition of oceanic sediment. for shorter time scales, the sedimentary record reflects variations in internal processes of the ocean system. (Sims-ISWS)
W78-01303

BOTTOM NEPHELOID LAYERS AND BOTTOM MIXED LAYERS OBSERVED ON THE CONTINENTAL SHELF OFF OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
H. Pak, and J. R. V. Zaneveld.
Journal of Geophysical Research, Vol 82, No 27, p 3921-3931, September 20, 1977. 10 fig, 3 tab, 21 ref. ONR N00014-57-0369-0007.

Descriptors: *Continental shelf, *Profiles, *On-site investigations, *Pacific Ocean, *Oregon, Temperature, Water temperature, Conductivity, Salinity, Depth, Transmissivity, Light, Frequency analysis, Upwelling, Sediment transport, Oceans, Oceanography.
Identifiers: *Bottom mixed layers, *Bottom nepheloid layers.

One hundred and seventy pairs of temperature and light transmissiion profiles were obtained by simultaneous conductivity-temperature-depth (CTD) and light transmissometer casts in three cruises on the R/V Yaquina over the continental shelf off Oregon. The data were analyzed for bottom nepheloid layers (BNL) and bottom mixed layers (BML). Supplementing the data were 1,177 CTD profiles taken during the Coastal Upwelling Ecosystems Analysis (Cuea) program and time series current data obtained under the Winter-Spring Transition Experiment on the Oregon Continental Shelf program. Frequencies of BML occurrences obtained from Cuea data taken during July and August 1972 and July and August 1973 were 52.9 and 53.3% for the respective years. Frequency of BNL occurrences for each of the three Yaquina cruises was consistently higher than that of BML. Large temporal variations in bottom layers are attributed to advection of different water types there. Frequency of BNL and NML clearly is associated with coastal upwelling intensities; under intense coastal upwelling, BNL and BML tend to be dissipated, and under weak coastal upwelling, they tend to be thick. (Sims-ISWS)
W78-01305

WIND STRESS AND ROUGHNESS LENGTH OVER BREAKING WAVES,
New South Wales Univ., Kensington (Australia). Dept. of Theoretical and Applied Mechanics.
W. K. Melville.
Journal of Physical Oceanography, Vol 7, No 5, p 702-710, September 1977. 5 fig, 32 ref. NSF OCE74-23791.

Descriptors: *Waves(Water), *Winds, *Model studies, Mathematical models, Roughness(Hydraulic), Stress, Turbulence, Friction, Fluid friction, Drag, Air-water interfaces, Oceans, Oceanography.
Identifiers: Breaking waves, Roughness length.

The effects of surface wave breaking on the adjacent atmospheric boundary layer were examined. It was argued that the transition from aerodynamically smooth to rough flow in a neutral atmosphere corresponds to the onset of extensive small-scale wave breaking. The association of wave breaking with the generation of turbulence in the boundary layer above leads to the result that the friction velocity is approximately equal to the phase velocity of the breaking waves. It was argued that this approximate relationship holds even when the small-scale breaking waves are riding on a swell. The existence of a minimum phase velocity for surface waves then requires that there be a minimum friction velocity, in the neighborhood of 23 cm/s, below which rough flow cannot occur. A result of Phillips and Banner which described the limiting amplitude of small gravity waves under the action of wind drift and swell was used to derive a relationship between the roughness length and friction velocity which is a generalization of Charnock's equation. The published field measurements of a number of workers were shown to support these results. (Sims-ISWS)
W78-01308

STATE HAS TITLE TO FORESHORES OF GEORGIA'S NAVIGABLE WATERS,
For primary bibliographic entry see Field 6E.
W78-01348

COASTAL RESOURCE USE - DECISIONS ON PUGET SOUND,
Washington Univ., Seattle. Sea Grant Program.
For primary bibliographic entry see Field 6G.
W78-01355

COASTAL ZONE MANAGEMENT IN HAWAII,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6E.
W78-01367

POLLUTION STUDIES OF TRACE ELEMENTS IN SEDIMENTS FROM THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chem. Dept.
For primary bibliographic entry see Field 5B.
W78-01474

HYDRAULIC SENSOR INSTRUMENTATION OF A SHORE FACE IN A TIDAL CURRENT CONVERGENCE ZONE--CAPE HENRY, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Inst. of Oceanography.
J. C. Ludwick, and P. B. Johnson.
Technical Report No. 25, June 1977, 179 p. NOAA Grant-04-4-022-17.

Descriptors: *Erosion, *Instrumentation, *Sediment transport, *Bottom sediments, *Sedimentation, Virginia, Tidal effects, Coasts.
Identifiers: Virginia Beach(VA), Convergence zone, Tidal currents.

This study deals with whether coastal currents are competent to erode unconsolidated and semiconsolidated sediments of sand size on the inner continental shelf. The basic data gathering technique employs a rigid instrument platform installed on the sea floor. An armored cable is used to transmit sampled data to recording instruments on shore. The advantages and disadvantages of this system are compared with conventional techniques of using surface vessels, radio-link buoys, and self-contained recording and storage within the sensor housing for periodic retrieval. The design, operation, and installation of the measurement system are discussed in detail. The second part of this report presents results of a study of jet-like coastal currents and bottom sediment transport off Virginia Beach, Virginia. (NOAA)
W78-01536

THE USE OF UNDERWATER EQUIPMENT IN FRESHWATER RESEARCH.
Virginia Polytechnic Inst. and State Univ. Blacksburg.
For primary bibliographic entry see Field 7B.
W78-01537

GROIN LENGTH AND THE GENERATION OF EDGE WAVES,
Oregon State Univ. Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W78-01538

CHANGES DUE TO JETTIES AT TILLAMOOK BAY, OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 8B.
W78-01539

COMPARISON OF COMPUTER SIMULATION MODELS WITH FIELD DATA FROM NEARSHORE ENVIRONMENTS,
Williams Coll. Williamstown, MA.
For primary bibliographic entry see Field 2H.
W78-01543

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY: A USERS' MANUAL FOR THE TWO DIMENSIONAL HYDRODYNAMIC MODEL,
Alabama Univ., University. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-01544

CHEMICAL COMPOSITION OF SEAWEED IN THE COASTAL WATERS OF THE BLACK SEA (UKRAINIAN SSR), (IN RUSSIAN),
Odessa Technological Inst. (USSR).
M. S. Dudkin, I. V. Areshidze, and G. D. Lukina.
Rastit Resur 12(1), p 133-137, 1976.

Descriptors: Coasts, Mineralogy, *Nitrogen, Copper, Trace elements, *Black Sea, *Carbohydrates, Chemical properties, *Potamogeton-pectinatus, *Protein, *Ruppia-spriralis, Ukrainian-SSR, USSR, Vitamin, *Sosteria-marina, *Sea weed.

Zosteria marina, Ruppia spiralis, and Potamogeton pectinatus growing in the coastal waters of the Black Sea (USSR) were found to be rich in carbohydrates (46-51.6%), N compounds (52.20-56.54%), and raw protein (11.31-14%), as well as several trace elements, mainly Mn (0.5%) and Cu (0.05%), macroelements. The sugar content was 2.3%. The vitamin B1 level was 1.13-1.26 micro-g/g of raw material. Based on their chemical composition and availability, consideration of these seaweeds as prospective raw material for industrial use was indicated.--Copyright 1977, Biological Abstracts, Inc.
W78-01560

THE EFFECT OF ANAEROBIOSIS ON MEASUREMENT OF SULFITE PULP MILL EFFLUENT CONCENTRATION IN ESTUARINE WATER BY U.V. SPECTROPHOTOMETRY,
Fisheries and Marine Service, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5A.
W78-01577

STUDIES ON THE FIXATION OF DRIFTING SAND: 3. RELATION BETWEEN SAND SURFACE MOISTURE CONTENT AND DRIFTING SAND, (IN JAPANESE),
Tottori Univ. (Japan). Faculty of Agriculture.
M. Nishikawa, K. Tanaka, and S. Ikeda.
Bull Tottori Univ For 8, p 63-82, 1975.

Descriptors: *Sands, *Moisture content, Sand dunes, Wind velocity, Erosion.
Identifiers: Ammophilia-breviligulata, *Wet sands, *Drifting sands.

Drifting wet sand disasters on the coastal sand-dunes by the Japan sea occur with the rain and snow fall of a hard monsoon. The drifting sand on the wet sandy surface soil was studied to determine a method for the fixation of drifting sand on the coastal sand-dune. The relation between sand surface moisture content and the threshold wind velocity of drifting sand was studied using a wind tunnel. Sand surface moisture content, wind velocity and the quantity of drifting sand at Fushino in the Koyama Sand-dune from Dec. 1973 to April 1974 were investigated. There was a rectilineal relation between the sand surface moisture content and the threshold wind velocity of drifting sand. Sand surface moisture content indicated an air-dried condition below 1% and a possibility of drifting sand after several hours if a hard wind blew, even in the case of rainfall. Drifting sand originated at a mean speed of 6-8 m/s at a height of 1 m above ground, with a below sand surface moisture content of below 1%; toward 0.3% the quantity of drifting sand increased abruptly in proportion as the wind speed increased. Drifting sand originated at a mean speed of 15.8 m/s, a height of 1 m above ground and with a below sand surface moisture content of about 6% during rainfall. Its quantity grew nearly to the same volume as in the case of the air-dried sand. The quantity of drifting sand at a place covered with American beachgrass (Ammophila brevigulata Fern.) was about 1/800 of that on bare land. This planting place showed the remarkable effect of fixation of drifting sand.--Copyright 1977 Biological Abstracts, Inc.
W78-01585

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, LAND USE-MARINE RESOURCES, VOLUME I-C.
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-01589

THE SIGNIFICANCE OF THE SKYLAB ALTIMETER EXPERIMENT-RESULTS AND POTENTIAL RESULTS,
Battelle Columbus Labds., OH.
For primary bibliographic entry see Field 7B.
W78-01605

A COMPARISON OF SKYLAB S-193 AND AIRCRAFT VIEWS OF SURFACE ROUGHNESS AND A LOOK TOWARD SEASAT,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.; National Oceanic and Atmospheric Administration, Miami, FL. Sea-Air Interaction Lab.
D. Ross.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1911-1936, September 1975. 16 fig, 18 ref.

Descriptors: *Remote sensing, *Waves(Water), *Oceans, Analytical techniques, Analysis, Surveys, Instrumentation, Measurement, Electronic equipment, Winds, Wind velocity, Satellites(Artificial), Aircraft, Rainfall, Hurricanes.
Identifiers: Skylab, Seasat.

An extensive aircraft underflight program was conducted along the Skylab groundpath for the purpose of documenting wind, wave, and atmospheric conditions affecting the amplitude of the active and passive microwave signatures. The S-193 microwave system senses a roughness parameter at the ocean surface that is proportional to the surface windspeed. The exact relationship between the wind and the roughness parameter is the subject of continuing investigations. The Skylab S-193 experiment has proved that active and passive microwave sensors can be used to infer surface winds but are subject to scatter and a decreasing sensitivity with increasing windspeed in the case of the active radar, and bias due to rainfall with little sensitivity to lower windspeeds in the case of passive microwave signatures. These results, therefore, suggest that combined active and passive systems with a weighted averaging process (employing polarization dependencies) being used to infer the local wind reduce some of the scatter due to random errors and should be tested with Skylab data. The results further suggest that a parameterization of the wave spectrum may be necessary in order to further reduce the scatter in radar backscattering cross sections. The Skylab data set contains most of the data needed to test these hypotheses and could lead to satellite determination of both the windspeed and surface wave spectrum by judicious use of active and multifrequency passive microwave systems. (See also W78-01589) (Humphreys-ISWS)
W78-01606

SKYLAB S-193 RADSCAT MICROWAVE MEASUREMENTS OF SEA SURFACE WINDS,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
R. K. Moore, A. K. Fung, J. Young, J. Claassen, and H. Chan.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1937-1952, September 1975. 11 fig, 7 ref.

Descriptors: *Wind velocity, *Remote sensing, *Oceans, Microwaves, Measurement, Dispersion, Frequency, Analysis, Satellites(Artificial), Temperature, Rain, Monitoring, Winds, Surfaces.
Identifiers: Skylab.

The small-scale roughness of the sea surface is known to be in equilibrium with the local winds near the surface. Because radar backscatter and microwave emissions are sensitive to surface roughness, they are highly correlated with sea surface winds. The radiometric measurements are more sensitive to variations in the atmosphere than are the backscatter measurements. The simultaneous collection of the two measurements permits most atmospheric effects to be removed from the data. The S-193 Radscat made extensive measurements of many sea conditions. The equivalent 20 meter-elevation wind speeds range from calm to over 30 meters/sec. Measurements were taken in a tropical hurricane (Ava), a tropical storm (Christine), and in portions of extratropical cyclones. Other surface parameters investigated for correlation with the measurements included sea temperature, air/sea temperature difference, and gravity-wave spectrum. The gravity-wave spectrum was estimated from numerical wave specification theories. Regression analysis was used to determine empirically the relation between surface parameters and the microwave measurements, after correction for atmospheric effects. Results indicate a relationship approaching square-law at 50 deg between differential scattering coefficient and wind speed with horizontally polarized scattering data showing slightly more sensitivity to wind speed than vertically polarized data. These results agree well with theory and show that sea surface winds can be measured accurately from space. (See also W78-01589) (Humphreys-ISWS)
W78-01607

A PROCEDURE FOR ESTIMATION OF SEA-SURFACE TEMPERATURE FROM REMOTE MEASUREMENTS IN THE 10-13 MICROMETER SPECTRAL REGION,
Science Applications, Inc., La Jolla, CA.
D. C. Anding.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1953-1972. September 1975. 8 fig, 12 ref.

Descriptors: *Water temperature, *Oceans, *Remote sensing, *Oceanography, Surfaces, Temperature, Satellites(Artificial), Instrumentation, Measurement, Infrared radiation, Analytical techniques, Theoretical analysis, Radiation.
Identifiers: Skylab.

This paper demonstrated the feasibility of procedure for the remote measurement of sea surface temperature which inherently corrects for the effect of the intervening atmosphere without recourse to climatological data. The procedure relies upon the near-linear differential absorption properties of the infrared window region between 10 and 13 micrometers and requires radiometric measurements in a minimum of two spectral intervals within the infrared window which have a significant difference in absorption coefficient. The procedure was applied to Nimbus 4 infrared inter-

ferometer spectrometer data and to Skylab EREP S191 spectrometer data, and it was demonstrated that atmospheric effects on the observed brightness temperature can be reduced to less than 1.0 Kelvin. The technique is likely to produce a significant benefit for unusual conditions, such as warm moist atmospheres over cool waters, or vice versa, when climatological data would yield a particularly poor result. (See also W78-01589) (Humphreys-ISWS)
W78-01608

OCEAN COLOR IMAGERY- COASTAL ZONE COLOR SCANNER,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-01610

SKYLAB INVESTIGATION OF THE UPWELLING OFF THE NORTHWEST COAST OF AFRICA,
Delaware Univ., Newark. Coll. of Marine Studies.
K. H. Szekielda, D. J. Suszkowski, and P. S. Tabor.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentatio·s, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2005-2021, September 1975. 11 fig, 12 ref. NASA NAS9-13344.

Descriptors: *Remote sensing, *Upwelling, *Oceans, *Africa, Coasts, Water temperature, Water properties, Plankton, Distribution, Chlorophyll, Color, Spectroscopy, Sediment distribution, Suspended solids, Monitoring, Instrumentation.
Identifiers: *Cape Blanc(Africa), Skylab.

The upwelling off the NW coast of Africa in the vicinity of Cape Blanc was studied in February - March 1974 from aircraft and in September 1973 from Skylab. The aircraft study was designed to determine the effectiveness of a differential radiometer in quantifying surface chlorophyll concentrations. Results of the aircraft study indicated that the two-channel, ratio approach is ineffective in determining surface chlorophyll concentrations and should not be used in future studies. Photographic images of the S190A Multispectral Camera and the S190B Earth Terrain Camera from Skylab were used to study distributional patterns of suspended material and to locate ocean color boundaries. The thermal channel of the S192 Multispectral Scanner was used to map sea-surface temperature distributions offshore of Cape Blanc. Correlating ocean color changes with temperature gradients is an effective method of qualitatively estimating biological productivity in the upwelling region off Africa. (See also W78-01589) (Humphreys-ISWS)
W78-01611

THE FEASIBILITY OF UTILIZING REMOTELY SENSED DATA TO ASSESS AND MONITOR OCEANIC GAMEFISH,
For primary bibliographic entry see Field 7B.
W78-01612

LANDSAT DIGITAL DATA PROCESSING - A NEAR REAL-TIME APPLICATION,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-01613

NEARSHORE COASTAL MAPPING,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01614

QUANTITATIVE SUSPENDED SEDIMENT MAPPING USING AIRCRAFT REMOTELY SENSED MULTISPECTRAL DATA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 7B.
W78-01615

REMOTE SENSING OF SALINITY,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
G. C. Thomann.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2099-2126, September 1975. 16 fig, 6 ref.

Descriptors: *Salinity, *Remote sensing, *Sea water, *Mississippi, *Coasts, Measurement, On-site investigations, On-site data collections, Water temperature, Evaluation, Surveys.
Identifiers: *Mississippi Sound.

The complex dielectric constant of seawarer is a function of salinity at 21 cm wavelength, and seawater salinity can be determined by a measurement of emissivity at 21 cm along with a measurement of thermodynamic temperature. Three aircraft and one helicopter experiments using two different 21 cm radiometers were conducted under different salinity and temperature conditions. Single or multiple ground truth measurements were used to calibrate the data in each experiments. RMS deviations of between 2 and 3% were found between remote and ground truth boat measurements. Part of this deviation is attributed to position mislocation between the aircraft and boats. It is inferred from these experiments that accuracies of 1 to 2% are possible with a single surface calibration point necessary only every two hours if the following conditions are met: water temperatures above 20C , salinities above 10%, and level plane flight. More frequent calibration, and two point calibration (at a high and low salinity level) rather than single point calibration may give better accuracies in some instances. (See also W78-01589) (Humphreys-ISWS)
W78-01616

AUTOMATIC INTERFACE MEASUREMENT AND ANALYSIS,
National Aeronautic and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 7B.
W78-01617

THE MAPPING OF MARSH VEGETATION USING AIRCRAFT MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 7C.
W78-01618

THE MICROSTRUCTURE OF CALIFORNIA COASTAL FOG AND STRATUS,
San Jose State Univ., CA. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W78-01622

ON A DIFFERENTIALLY HEATED SALT-WATER-ICE SYSTEM,
Washington Univ., Seattle. Dept. of Oceanography.
P. Welander, and J. Bauer.
Tellus, Vol. 29, No. 5, p 462-469, October 1977. 6 fig, 2 ref, 1 append. NSF OCE-13339.

Descriptors: *Ice, *Salinity, *Heat flow, *Saline water, *Temperature, Hydrodynamics, Hydraulics, Equations, Model studies, Mathematical studies.
Identifiers: Freshwater-ice oscillator, Ice-cover regime, Ice-free regime.

A previous theoretical study by Welander on a freshwater-ice oscillator was extended to the salt-water case. The system comprises a deep, high-salinity, warm water reservoir (fixed temperature and salinity) and a shallow constant-depth mixed layer with temperature, salinity, and ice thickness varying in time. This layer is cooled by contact with overlaying air kept at a fixed, subzero temperature. The main new feature is the variation of the heat flux through the water interface with stratification. This variation causes two new phenomena of interest: (1) 'false' thermal adjustments to existing ice-covered steady states, and (2) multiperiodic self-sustained oscillations including both ice-covered and ice-free regimes. The usefulness of basic model studies of this type in connection with climate research was pointed out. (Lee-ISWS)
W78-01624

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-01627

SHORT-TERM WATER COLUMN PERTURBATIONS CAUSED BY WASTEWATER SLUDGE DUMPING IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-01628

RADON 222 DISTRIBUTION AND TRANSPORT ACROSS THE SEDIMENT-WATER INTERFACE IN THE HUDSON RIVER ESTUARY,
Lamont-Doherty Geological Observatory Palisades, NY.
For primary bibliographic entry see Field 5B.
W78-01635

WINTER INTRUSIONS OF THE LOOP CURRENT,
National Oceanic Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
R. L. Molinari, S. Baig, D. W. Behringer, G. A. Maul, and R. Legeckis.
Science, Vol. 198, No. 4316, p 505-507, November 4, 1977. 2 fig, 6 ref. BLM 085 50-IA5-26.

Descriptors: *Water circulation, *Water temperature, *Gulf of Mexico, Remote sensing, On-site data collections, Circulation, Temperature, Gulfs, Currents(Water), Winter, Oceanography.
Identifiers: *Loop current(Gulf of Mexico).

The circulation in the eastern Gulf of Mexico is dominated by the so-called Loop Current, which enters the Gulf through the Yucatan Straits and exits through the Straits of Florida. The path in the interior of the Gulf varies considerably with time, sometimes following a nearly direct route between the two straits, while at other times extending far to the north, forming an anticyclonic (clockwise) loop which gives the current its name. Sea-surface temperature data obtained from satellite and subsurface temperature data obtained from ships were used to determine the intrusion of the Loop Current during the winter months. The Loop Current extended considerably farther to the north during the last three winters than has been observed previously. (Sims-ISWS)
W78-01636

A NOTE ON HORIZONTAL GRADIENTS IN FJORDS,
Oslo Univ. (Norway). Inst. of Geophysics.

F. E. Dahl.
Journal of Physical Oceanography, Vol. 7, No. 5, p 753-758, September 1977. 12 fig, 9 ref.

Descriptors: *Fjords, *On-site tests, *Water circulation, Thermocline, Water temperature, Currents(Water), Measurement, Surveys, Dissolved oxygen, Density, Salinity, Distribution, Spatial distribution, Foreign countries.
Identifiers: *Norway, *Oslofjord(Norway), Geostrophic velocity.

Observations from the Oslofjord show that the transverse gradients of temperature and density are of the same order of magnitude as those in the longitudinal direction of the fjord. A comparison between current measurements and computed geostrophic current shows good agreement which indicates that the transverse gradients in fjords should not be neglected. (Humphreys-ISWS)
W78-01638

SIMULATION MODEL OF EROSION AND DEPOSITION ON A BARCHAN DUNE,
Virginia Univ., Charlottesville.
A. D. Howard, J. B. Morton, M. Gal-el-Hak, and D. B. Pierce.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA CR-2838, Price codes: A05 in paper copy, A01 in microfiche. NASA CR-2838, April 1977. 77 p, 15 fig, 3 tab, 41 ref. NGR 47-005-172.

Descriptors: *Dunes, *Wind erosion, *Wind velocity, *Saltation, *Model studies, Velocity, Sediment transport, Systems analysis, Particle size, Oceans, Equilibrium, Hydraulics.
Identifiers: *Salton Sea, *Barchan dune, Erosion patterns, Unidirectional wind.

Erosion and deposition over a barchan dune near the Salton Sea, California, was modeled. Field observations of near-surface wind velocity and direction plus supplemental measurements of the velocity distribution over a scale model of the dune were combined as input to Bagnold-type sand-transport formulas corrected for slope effects. A unidirectional wind was assumed. The resulting patterns of erosion and deposition compare closely with those observed in the field and those predicted by the assumption of equilibrium. Discrepancies between the simulated results and the observed or predicted erosional patterns appear to be due to natural fluctuations in the wind direction. The shape of barchan dunes is a function of grain size, velocity, degree of saturation of the oncoming flow, and the variability in the direction of the oncoming wind. The upwind roughness can be controlled by fixed elements or by sand in the saltation. In the latter case, dune scale is determined by grain size and wind velocity. (Singh-ISWS)
W78-01645

SURVEY OF COASTAL REVETMENT TYPES,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-01646

ALTERATION AND DESTRUCTION OF ESTUARIES AFFECTING FISHERY RESOURCES OF THE GULF OF MEXICO,
National Marine Fisheries Service, St. Petersburg, FL. Southeast Regional.
For primary bibliographic entry see Field 5C.
W78-01663

THE SPECIES DIVERSITY INDEX OF SOME IN-SHORE DIATOM COMMUNITIES AND ITS USE IN ASSESSING THE DEGREE OF POLLUTION ON PARTS OF THE NORTH COAST OF COMWALL,
For primary bibliographic entry see Field 5B.
W78-01678

SHORT-TERM THERMAL RESISTANCE OF ZOEAE OF 10 SPECIES OF CRABS FROM PUGET SOUND, WASHINGTON,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-01679

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

METHOD FOR RECLAIMING VARIEGATED WASTES,
For primary bibliographic entry see Field 5D.
W78-01203

SILICATE SCALE CONTROL IN GEOTHERMAL BRINES,
Occidental Research Corp., La Verne, CA.
E. F. Wahl, I. K. Yen, and W. J. Bartel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 951, Price codes: A07 in paper copy, A01 in microfiche. Final Report G R and D 74-048, September 1, 1974. 122 p, 49 fig, 27 tab, 30 ref. OWRT 14-30-3041.

Descriptors: *Desalination, *Scaling, *Brines, Geothermal studies, Water wells, Silica, Silicates, Mathematical models, Calcite, Iron, Chemistry, Thermal water, Sea water, California.
Identifiers: *Geothermal brines, *Scaling control, East Meas Test Site(Calif).

The scaling characteristics of synthetic and East Mesa Well 6-1 geothermal brines were studied using a specially constructed test unit. The test unit was capable of simulating a variety of process conditions including flashing of the brine and separation of the vapors from the liquid prior to the scaling test section. Heated, cooled and zero heat flux probes were used. A summary of silica chemistry as related to deposition from geothermal brines is given. A mathematical model was derived and used to correlate the data for the synthetic brines experiments. The scaling rate determined from this analysis was used to show the effect of Reynolds number, bicarbonate concentration, and addition of silica sand on scaling. Experiments at the East Mesa Test Site using brine from Well 6-1 showed that the predominant scale was calcite. A mixture of iron and silica scale was the next most significant scale. No scale formed until the brine was allowed to flash. The location of scaling could be controlled by the separator operation. Relative to flashing, scaling was independent of heat flux.
W78-01316

DESALTING PLANTS INVENTORY REPORT NO. 6,
Hawaii Univ., Honolulu. Coll. of Business Administration.
N. A. El-Ramly, and C. F. Congdon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 896, Price codes: A06 in paper copy, A01 in microfiche. --OWRT/S--77/6, October, 1977. 113 p, 4 tab. OWRT 14-34-0001-7526.

Descriptors: *Desalination plants, *Surveys, Census, Treatment facilities, Desalination processes, Distillation, Membrane processes, Water supply, Waste water treatment.

This is the sixth in a series of reports continuing an inventory of world-wide land-based desalting plants with capabilities of at least 25,000 (U.S.) gallons per day. It is based largely on data supplied by the world's desalting plant manufacturers. The report provides detail on plant location or operator, size, type of process, the year construction began or of plant commissioning, name of the manufacturer, type of water feed, product water use, type of fuel used, and whether or not a desalting plant operates in conjunction with an electric power generating plant (single or dual purpose). (See also W75-09852)
W78-01491

3B. Water Yield Improvement

THE NEGEV - A DESERT RECLAIMED.
United Nations Conference on Desertification, August 29-September 9, 1977, Nairobi, A/Conf. 74/16, 110 p. 14 tab, 15 ref.

Descriptors: *Deserts, *Land reclamation, *Water supply development, *Crop production, *Water utilization, Land management, Runoff, Desalination, Cloud seeding, Brackish water, Irrigation systems, Crop production, Livestock, Greenhouses, Water policy, Water transfer.
Identifiers: *Israel, *Negev, Trickle irrigation.

The climate, geomorphology, flora, and fauna of Israel's arid and semi-arid southern regions are described, and policies and technologies used in the development of the area discussed, stressing recovery in the Negev desert. Past overgrazing and overuse of vegetation for fuel and building materials denuded hillsides, exposing soil to erosion. Neglect of fragile terracing and dams furthered the desertification process. Recovery involved soil conservation measures, bringing water to the south from major water resources in the north, developing irrigation techniques, utilizing local brackish water resources, and organizing agricultural management systems adapted to desert conditions. Many agricultural settlements have been established with the aid of an incentive program including drought compensation and water subsides for irrigation. The continuing sedentarization of the Bedouin and potential industrial development of the area are also discussed. (Mills-Arizona)
W78-01184

PRELIMINARY TESTS OF A CUMULUS CLOUD SEEDING TECHNIQUE,
Atmospheric Environment Service, Downsview (Ontario).
G. A. Isaac, R. S. Schemenauer, C. L. Crozier, A. J. Chisholm, and J. I. MacPherson.
Journal of Applied Meteorology, Vol 16, No 9, p 949-958, September 1977. 9 fig, 3 tab, 20 ref.

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Canada, Aircraft, Instrumentation, Silver iodide, Clouds, Cloud physics, Forests, Forest fires, Rainfall, Ice, Crystals, Particle size, Meteorology.
Identifiers: *Seeding tests, Ice crystals.

A cloud seeding technique was proposed which has the objective of stimulating rainfall from cumulus clouds drifting over forest fires. Preliminary tests of the ice crystal production capability of the cloud seeding technique were conducted on 5 cumulus clouds near Yellowknife, N.W.T., Canada, during July 1975. The clouds were over forest but not near forest fires. A T-33 turbulence research aircraft performed the seeding by burning wing-mounted TB1 AgI flares while flying through the clouds at the -5 to -10C level. The T-33 turbulence measurements enabled estimates to be made of the rate of dispersion of the AgI. Microphysical measurements were made before and after seeding by an instrumented DHC-6 Twin Otter aircraft flying at the seeding level, and these measurements were compared with measurements in 6 untreated cumulus clouds. High concentrations of ice crystals appeared after seeding in 4 of the 5 seeded cumulus clouds, and on 2 occasions precipitation-sized particles appeared at the seeding level. The evidence indicated that the AgI aerosol large quantities of ice crystals. (Sims-ISWS)

W78-01310

THE PROBLEM OF WEATHER MODIFICATION IN DRY FARMING IN THE SOUTHERN PART OF WESTERN SIBERIA AND NORTHERN KAZAKH SSR, (IN RUSSIAN),
Akademiya Nauk, SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
O. S. Gulyaev.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk 2, p 3-10, 1976.

Descriptors: *Weather modification, Land reclamation.
Identifiers: *Crops, *Dry farming, Grain, *Kazakh-SSR, *Siberia, Spring, USSR, Wheat.

The use of moisture resources in grain husbandry is evaluated. Heat and water regimes of spring wheat fields are influenced by agrotechnical method and the geographical features. The need for working out the theory and practice reclamation in dry farming is indicated. A spatial evaluation is given for the possible changes in heat and moisture supply of spring crops as influenced by agronomical practice in weather modification.--Copyright 1977, Biological Abstracts, Inc.
W78-01464

WATER SUPPLY AT LOS ALAMOS DURING 1976,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 4B.
W78-01547

3C. Use Of Water Of Impaired Quality

AN ANALYSIS OF A POSSIBLE CROP RESPONSE TO HAIL SUPPRESSION SEEDING: THE NELSPRUIT HAIL SUPPRESSION PROJECT,
Cansas International Corporation, Nelspruit (South Africa).
For primary bibliographic entry see Field 5D.
W78-01619

MANAGING SALINE WATER FOR IRRIGATION.
International Center for Arid and Semi-Arid Land Studies, Lubbock, TX.
Proceedings, International Salinity Conference, Texas Tech University, Lubbock, January 1977, 618 p. Dregne, H.E., ed.

Descriptors: *Salinity, *Saline water, *Irrigation water, *Water quality, Irrigation, Irrigation operation and maintenance, Irrigation effects, Irrigation efficiency, Arid lands, Semiarid climates, Deserts, Desalination, Salts, Saline doils, Irrigation practices, Brackish water, Saline water conversion, Texas, New Mexico.
Identifiers: Iraq, Pakistan.

Irrigation water salinity is becoming an increasingly serious problem as water of less and less desirable quality is exploited for irrigation and as greater intensity of water use leads to degradation. An international conference was held at Texas Tech University in Lubbock, Texas, in 1976 to assess the current state of knowledge in managing saline water for irrigation and to present new information on how to cope with salinity. Plant scientists, soil scientists, and engineers representing 20 countries participated in the sessions. Their findings are presented in this volume. Forty-seven articles are included. The tone of the papers is one of optimism that moderately saline water can be used successfully for irrigation if what is known already and what is being learned now is used effectively. Mixed with the optimism is the realization that careless management of saline irrigation water can be disastrous to the land, and more important, to the people living on that land. (See W78-01493 thru W78-01498) (Jamail-Arizona)
W78-01492

IRRIGATION WITH SALINE WATER UNDER DESERT CONDITIONS,
Higher Agricultural Council, Baghdad (Iraq).
A. Hardan.
In: Managing Saline Water for Irrigation, Proceedings of the International Salinity Conference, Texas Tech University, Lubbock, Texas, August 16-20, 1976. p 165-169, 2 tab, 6 ref.

Descriptors: *Saline water, *Irrigation effects, *Saline water systems, *Irrigation water, Salinity, Deserts, Arid lands, Groundwater, Irrigation, Wheat, Potatoes, Crop production, Fruit crops.
Identifiers: *Iraq.

The results of irrigating pear trees, wheat, and potatoes with saline water are presented. Experiments were conducted in the Western Desert of Iraq near the town of Haditha where the general climatic feature is a dry, hot summer followed by a mild winter with low precipitation. The overall objective of the desert development program is to provide for an improved way of life for the desert dwellers without abrupt changes in their life style. The results showed no significant reduction in the growth of newly planted pear trees as a result of irrigation with saline water for three years. The analysis of variance for the effect of irrigation with saline water on the yield of wheat for the three seasons showed no statistical significance. There was a significant reduction in the yield of potatoes when irrigated with water of high salinity. A typical soil profile of the area is also presented. (See also W78-01492) (Jamail-Arizona)
W78-01493

PREDICTED AND ACTUAL YIELD DECLINE FROM FIFTY PERCENT INCREASE IN SALINITY OF THE COLORADO RIVER,
California Univ., Davis. Div. of Agricultural Sciences.
F. E. Robinson.
In: Managing Saline Water for Irrigation, Proceedings, International Salinity Conference, Texas Tech University, August 1976, p 170-174, 1 tab, 1 ref.

Descriptors: *Salinity, *Colorado River, *Colorado River Basin, *Irrigation water, *Irrigation effects, *Crop production, Salt tolerance, Saline water, Irrigation, Salts, Mathematical models, Onions, Carrots, Alfalfa, Wheat, Beans, Crop response, Water quality.

A study was conducted to determine the yields of several major crops of the lower Colorado River Basin when sprinkler irrigated with different amounts of water and to compare the actual field declination to the yield declination predicted by the criteria presently utilized by the University of California Committee of Consultants. Yield predictions of onion, cabbage, carrot, alfalfa, wheat, and beans were determined from linear correlations derived from crop tolerance and leaching requirement tables of the Committee of Consultants. Six plots were irrigated with different amounts of water. The water was salinized by the addition of a saline solution to the irrigation water. The results are presented. It is concluded that in using the Committee of Consultants data to predict yield declination due to an increase in the amount of irrigation water, only the yield declinations of 10% or greater could be demonstrated significantly. Values of yield declination obtained from the Committee of Consultants gave results in an acceptable order of magnitude in waters of the Colorado River for carrots, onions, beans, alfalfa, and cabbage. (See also W78-01492) (Jamail-Arizona)
W78-01494

MODELS FOR PREDICTING THE IMPACT OF IRRIGATION ON SOIL SALINITY,
Hebrew Univ., Jerusalem (Israel). Div. of Soil Physics.
E. Bresler.
In: Managing Saline Water for Irrigation, Proceedings, International Salinity Conference, Texas Tech University, Lubbock, 1977, p 299-315, 7 fig, 13 ref.

Descriptors: *Salinity, *Saline soils, *Irrigation water, *Irrigation effects, Saline water, Water quality, Irrigation, Irrigation systems, Arid lands, Semiarid climates, Salts, Crop production, Irrigation practices, Mathematical models, Salt tolerance.
Identifiers: Drip irrigation, Trickle irrigation.

Soil salinity is an important factor of the environment in which plants grow. Salinity problems are known to exist in many soils throughout the world, particularly in arid and semiarid regions, where irrigation is necessary for successful agriculture. Prediction of salinization and sodication of irrigated soils is important in establishing management practices directed toward reclamation of saline soils already affected by improper management and maintenance or improvement of nonsaline or reclaimed irrigated soils. A summary of several original research studies on this subject is presented. A mathematical model is used to explain the relationship between soil and saline water. The problems caused by using saline water for irrigation are of both a short and long range nature. It was found that if short range effects can be predicted, it is also possible to predict long term effects. The use of trickle-drip irrigation is discussed. (See also W78-01492) (Jamail-Arizona)
W78-01495

MINIMIZING THE SALT BURDEN OF PECOS RIVER IRRIGATION DRAINAGE WATER,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
G. A. O'Connor, and C. Cull.
In: Managing Saline Water for Irrigation, Proceedings, International Salinity Conference, Texas Tech University, Lubbock, 1977, p 494-505, 2 tab, 9 fig, 5 ref.

Descriptors: *Irrigation effects, *Leaching, *Saline soils, *Salinity, *New Mexico, Salts, Irrigation, Drainage, Saline water, Agriculture, Drainage water, Lysimeters, Soil moisture, Irrigation practices, Irrigation efficiency, Soil management.
Identifiers: Minimized leaching, *Pecos River(NMex).

The success of irrigated agriculture is dependent upon the control of soil salinity. Applying as little leaching water as possible without allowing salts to accumulate in the soil to levels detrimental to the crop is known as the minimum leaching concept. Tests have shown a tremendous potential for this concept as a water and money saving device. A study was conducted to evaluate the potential using Pecos River water applied to an agricultural soil in the Pecos Valley. Overall verification of the minimized leaching concept under New Mexico conditions will consist of a laboratory study, a greenhouse study, and a field plot experiment to be conducted in the Pecos River Valley. The data reported here are for the laboratory study. Experiments were conducted on soils from the Roswell-Artesia Basin of the Pecos River Valley. The results are presented. Minimized leaching has been shown to reduce both the volume and salt load of irrigation drainage water from New Mexico soils, although several more months of irrigation are apparently needed to verify the expected results. Thus, it is suggested that minimized leaching, with its associated water savings, would offer tremendous potential to the farmers of the Pecos Valley. (See also W78-01492) (Jamail-Arizona)
W78-01496

COMPOSITION OF SALINE DRAINAGE WATER IN IRAQ AND ITS USE,
State Organization of Soils and Land Reclamation, Baghdad (Iraq).
A. B. Hanna.
In: Managing Saline Water for Irrigation, Proceedings, International Salinity Conference, Texas Tech University, Lubbock, August, 1976, p 590-597. 5 tab, 4 ref.

Descriptors: *Leaching, *Saline soils, *Saline water, *Drainage water, *Irrigation water, Drainage, Salts, Salinity, Water quality, Irrigation effects, Calcium, Ions, Electrical conductance, Alkaline soils, Alkalinity.
Identifiers: *Iraq.

A study was conducted to determine the composition of dissolved salts in main drains and collectors in Iraq, and to study seasonal fluctuations of the salt concentration and its composition, and also the possibility of using these waters for the first stages of leaching saline and saline-alkali soils. Monthly water samples were collected between January 1973 and June, 1975 from fifty sites where the most important drains and collectors were located. Leaching experiments on surface soil samples from the Abu-Ghraib area were conducted with irrigation water from the same vicinity in order to compare it with the drainage water. The results are presented and show that leaching with drain water having an electrical conductivity of 10 mmhos/cm, followed by leaching with irrigation water, was as effective as leaching with irrigation water only. It is apparent that drain water can be used in the first stage of leaching saline soils. Final leaching to reduce soil salinity can then be done with good quality irrigation water. (See also W78-01492) (Jamail-Arizona)
W78-01497

RESISTANCE TO SODA SALINIZATION OF SOME IRAQI SOILS,
Baghdad Univ. (Iraq). Dept. of Soil.
A. H. Alzubaidi.
In: Managing Saline Water for Irrigation, Proceedings, International Salinity Conference, Texas Tech University, Lubbock, August, 1976, p 333-338, 2 tab, 10 ref.

Descriptors: *Saline soils, *Irrigation water, *Soil physical properties, Arid lands, Semiarid climates, Salinity, Saline water, Sodium compounds, Irrigation, Cations, Water reuse, Soil profiles, Salt tolerance, Water quality, Land reclamation.
Identifiers: *Iraq.

The resistance of some soils in Iraq to soda salinization was investigated. It is important to have this information in managing saline water for irrigation and reclamation of different types of soils. Nine soil samples collected from various depths of different soil profiles representing different locations of Iraq were used in the study. These were tested for soil salinity. The results are presented. Due to the presence of a high quantity of soluble and exchangeable calcium and magnesium in most of the saline soils of Iraq, CO3-containing water could be used (to some limit depending on the c-value of these soils) for irrigation and during the first stages of reclamation. (See also W78-01492) (Jamail-Arizona)
W78-01498

SALINE WATERS-THEIR POTENTIALITY AS A SOURCE OF IRRIGATION,
R. P. Dhir.
In: Desertification and its Control; Indian Council of Agricultural Research, New Delhi, 1977. p 130-148, 5 fig, 14 tab, 48 ref.

Descriptors: *Salinity, *Irrigation water, *Saline water, *Water quality, Irrigation, Arid lands, Semiarid climates, Irrigation effects, Deserts, Saline soils, Irrigation practices, Brackish water, Salts, Groundwater, Soil properties, Crop production, Boron, Leaching.
Identifiers: *India(Rajasthan).

Saline waters are a common feature of the arid and semiarid regions of India, and it is often necessary to use this water for irrigation. Work done there on several aspects of the use of saline water for irrigation is discussed and the results of tests are presented. The State of Rajasthan contains large areas of arid land. It is also one of the few states in India that have been subject to thorough investigation. The problem of irrigation water salinity in Rajasthan is discussed in detail. The effect of saline water on soil properties is examined. A concluding section discusses the potential use of saline waters for irrigation. In some areas there is little choice as the saline waters may be the only water source. It was also found that the salinity resulting from the use of sodium-chloride dominated water is not permanent, but is easily leached with rainfall. (Jamail-Arizona)
W78-01506

UTILIZATION OF HIGHLY SALINE WATERS FOR WHEAT PRODUCTION: A CASE STUDY IN THE ARID ZONE OF INDIA,
Central Arid Zone Research Inst., Jodhpur (India).
R. P. Dhir.
In: Problems in the Development and Conservation of Desert and Semidesert Lands. Twenty Third International Geographical Congress, Working Group on Desertification in and Around Arid Lands, Pre-Congress Symposium, Ashkhabad, U.S.S.R., July 20-26, 1976. 1 fig, 5 ref, p 111-114.

Descriptors: *Irrigation water, *Wheat, *Crop response, *Crop production, *Salinity, Soil-water-plant relationships, Arid lands, Leaching, Rainfall, Nitrates, Nutrients, Monsoons, Sodium chloride, Irrigation, Salts, Magnesium, Crop yield, Irrigation efficiency, Adsorption.
Identifiers: *India, Kharchia.

From a study of the use of highly saline waters for growing wheat in India, it was concluded that highly saline waters can be used for irrigating wheat crops. A study of thirty-seven wheat fields was conducted in India's Pali district utilizing irrigation waters with salinity ranging from five to twenty m mho (3200-13,000 ppm). The details of site and soil characteristics, the salinity of the irrigation water, and wheat yields were recorded. Salinity values of the soils were recorded at the beginning of the irrigation season and again after six to eight irrigations. Salinity build-up was found to be dependent upon soil texture and water salinity. Salinity build-up was not permanent due to leaching during the monsoon season. Two years of normal rainfall was generally required for complete soil desalinization. An alkali hazard persisted after leaching, but did not interfere with reuse of the land for cropping wheat. It was further found that the normal mineral nutrition of a salt-resistant variety of wheat (Kharchia) was not impaired by the presence of sodium - chloride, and naturally occurring nitrates had a beneficial effect. (Ullery-Arizona)
W78-01507

SOIL SALINIZATION IN THE DELTA OF THE RIVER NILE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.
V. V. Egorov, and N. G. Minashina.
Pochvovedenie 7, p 75-83, 1976.

Descriptors: *Saline soils, Salinity, Salts, *Salt tolerance.
Identifiers: Deltas, Irrigation, Rivers, *Nile River(Egypt).

Soil salinization is found mainly on the periphery of the delta. The upper and middle portions of the delta are completely under irrigation and have almost no salt affected soils. Low salt accumulation is due to the specific genesis of the delta, which occupies a lacustrine depression partly fed by running water and partitioned by a barrier from the influence of sea waters, the existence of a long lasting basin irrigation system, and the specific properties of Nile deposits which are fine and aggregated.--Copyright 1977, Biological Abstracts, Inc.
W78-01542

3D. Conservation In Domestic and Municipal Use

WATER PROBLEMS IN SOUTHWEST ASIA,
Durham Univ. (England).
For primary bibliographic entry see Field 6B.
W78-01508

WATER CONSERVATION PROBLEMS IN NORTHERN ITALY,
Bologna Environmental Agency, (Italy).
For primary bibliographic entry see Field 5D.
W78-01630

3E. Conservation In Industry

POLYMERS FOR USE IN WATER TREATMENT,
Betz Labs., Inc., Trevose, PA. (Assignee).
For primary bibliographic entry see Field 5F.
W78-01190

SYSTEM FOR SOFTENING WATER,
Goodyear Tire and Rubber Co., Akron, OH. (Assignee).
For primary bibliographic entry see Field 5F.
W78-01191

TREATMENT OF WATER CONTAINING CYANIDE,
Thiokol Corp., Newtown, PA. (Assignee).
For primary bibliographic entry see Field 5D.
W78-01194

METHOD FOR THE RECYCLE TREATMENT OF WASTE WATER FROM CHROMIUM PLATING,
Kayabakoyo-Kabushiki-Kaisha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W78-01201

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Metcalf and Eddy, Inc., Des Plaines, IL.
For primary bibliographic entry see Field 5D.
W78-01238

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Water Pollution Control Directorate, Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W78-01249

BREWSTER'S NEW PHOSPHATE WASHER PLANT.
For primary bibliographic entry see Field 5D.
W78-01261

RECOVERY OF ORGANIC POLLUTANTS VIA SOLVENT EXTRACTION,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-01263

UTILIZATION OF PULP AND PAPER INDUSTRY WASTES (UTILIZATSIYA OTKHODOV TSELLYULOZNO-BUMAZHNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelskii Inst. Bumagi, Moscow USSR.
For primary bibliographic entry see Field 5D.
W78-01271

EXTRACTIVES AS A RENEWABLE RESOURCE FOR INDUSTRIAL MATERIALS.
National Research Council, Washington, DC. Committee on Renewable Resources for Industrial Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 357, Price codes: A13 in paper copy, A01 in microfiche. Panel report 1976. 72 p, 3 fig, 14 tab, 36 ref. NSF STP-75-01069.

Descriptors: *Resources development, *Bark, *Oil, *Lipids, *Resins, Materials, Industrial production, Vegetable crops, *Extractives, Turpentine.

An analysis of extractives as renewable industrial materials was performed to identify their optimum use, and means of overcoming barriers to their use. Extractives studied were bark, naval stores, vegetable oils, tallow and fats, and oils from aquatic sources. Information on current use and flow of industrial materials of these extractives and estimates of their production and use in 1985 and 2000 shows that total amounts may increase to 5 times present levels, with major increases indicated in naval stores and tallow markets if demands and economic incentives are adequate. The analysis relates the availability and cost of extractives to the supply situation of respective main products and to availability and cost of competing nonrenewable materials, predicting that the supply situation will be stable for the next 25 years. A review of current and potential technology and applications that would extend the use of extractives indicates a necessity to increase their production and availability and to demonstrate their potential in industrial applications. Increased production of unsaturated fatty acids, increased availability and utilization of oleoresin chemicals, and demonstration of the potential of bark as a chemical raw material in a pilot plant are recommended. (Wares-IPA)
W78-01549

NEW ASPECTS OF CLOSED PROCESSING CIRCUITS IN THE PAPER AND PAPERBOARD INDUSTRY,
Sulzer Bros. Ltd., Winterthur (Switzerland).
For primary bibliographic entry see Field 5D.
W78-01565

STEAM ENERGY UTILIZATION,
Bowater Technical Services Ltd., Northfleet (England).
A. B. Webzell.
Paper Technology and Industry, Vol 17, No 4, p 161-166, August, 1976. 2 appendices, 2 fig, 4 ref.

Descriptors: *Pulp and paper industry, *Heat balance, *Steam, Energy, Thermal properties, Water, Liquids, Water vapor, Water types, Heat exchangers, Boiler feed water, Piping systems(Mechanical).
Identifiers: Paper machine, *Heat recovery, Condensates.

A brief discussion of the potential and kinetic energies of water in the solid, liquid, and vapor states is presented. A schematic diagram of heat balance in a paper machine is included to indicate the importance of a heat recovery system. Over 26,000 of the 30,000 kw/hr of heat energy supplied to the paper machine are normally lost as moisture-laden air exhausted to the atmosphere. Air-to-water heat exchangers, and heat pipes are discussed. A steam and condensate system allowing up to 30% blow-through steam is presented as an effective means of heat transfer from the drying cylinder to the paper web. Mill experiences are presented where an increased power demand was not accompanied by an increase in process demand for steam, and where feed water to the boilers was limited by a low level of condensate returns, and solutions are provided. (Swichtenberg-IPC)
W78-01567

WATER CONSERVATION PROBLEMS IN NORTHERN ITALY,
Bologna Environmental Agency, (Italy).
For primary bibliographic entry see Field 5D.
W78-01630

PAPER AND ALLIED PRODUCT, (LITERATURE REVIEW),
National Council of the Paper Industry for Air and Stream Improvement Inc., New York.
For primary bibliographic entry see Field 5D.
W78-01660

3F. Conservation In Agriculture

THE NEGEV - A DESERT RECLAIMED.
For primary bibliographic entry see Field 3B.
W78-01184

CENTER PIVOT IRRIGATION SYSTEM,
Lindsay Manufacturing Co., NB. (Assignee).
C. H. Meis, D. A. Siekmeier, and A. L. Zimmerer.
U.S. Patent No. 4,011,990, 9 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 956, No 3, p 852, March 15, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Distribution systems, *Irrigation efficiency, Irrigation practices, Application equipment.

A center pivot irrigation system is specifically constructed to water the corners of a square field. The system has an extension for a center pivot irrigation system which may either trail or lead the main pipeline. The main pipeline is stationary and inoperative while the extension is pivoting and watering a corner and when the main pipeline is moving and irrigating, the extension is folded in and is inoperative. The extension has indexable wheels, which are in a trailing position when the main pipeline is stationary and are indexed 90 degrees and rotated through the corner when the main pipeline is stationary opposite a corner. (Sinha - OEIS)
W78-01204

IRRIGATION METHOD AND APPARATUS,
D. M. Williams.
U.S. Patent No. 4,010,898, 7 p, 6 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 487, March 8, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Water distribution(Applied), Application equipment, Irrigation practices.

The method is carried out by application of water to cover an outward directed area away from each tree trunk of plant covering a consistent area during each application. The apparatus includes a semi-permanent, semi-looped elastic distributing conduit having a closed end and an open end with spray nozzles in the upper surface for distributing liquid outward from the plant in fan-like overlapping patterns. The apparatus becomes a semi-permanent installation. The object is to provide an irrigation method and apparatus utilizing the high-frequency pressure application that is effective to prevent the accumulation of dangerous levels of salt above the root zone of plants and to prevent wetting of the plant. (Sinha-OEIS)
W78-01213

UNDERGROUND IRRIGATION DEVICES AND METHODS OF MAKING AND USING THE SAME,
W. M. Angle.
U.S. Patent No. 4,010,298, 5 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 956, No 1, p 262, March 1, 1977.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, Distribution systems, Irrigation efficiency, Irrigation practices, Application equipment.

The invention consists primarily of a main reservoir or source of fluid and primary distribution lines coupled to the source and intended to carry fluid to secondary distribution lines. Each of the secondary distribution lines is provided with anti-clog apertures to allow flow of fluid to the soil. The primary and secondary lines are placed below the surface of the ground. A device is provided which will also act as a drainage device; fertilizers and other materials may be fed into the soil by it. A perforated pipe suitable for subsurface irrigation laterals is formed with indentations and perforations in sheet material that is then rolled into a tube or pipe. (Sinha-OEIS)
W78-01214

HYDRANT CONSTRUCTION FOR A SOIL IRRIGATION SYSTEM,
Academy of Agricultural Sciences, Sofia (Bulgaria). Central Lab. for Agro-physical Investigations.
I. S. Varlev.
U.S. Patent No. 4,009,830, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 956, No 1, p 127, March 1, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Water delivery.
Identifiers: Submerged hydrants.

A submersible hydrant for soil irrigation systems is adapted to receive a movable cap member which cooperates with the hydrant housing for selective blocking during submergence of the hydrant. An aperture in the side wall of the hydrant housing distributes the irrigation fluid. The cap member and the surrounding housing are suitably threaded to permit adjustable positioning of the cap in the upper housing portion at a desired position between upper and lower limits at which the distribution aperture is completely open and closed, respectively. The capturing means may include a limit pin which projects inward from the side wall of the upper housing above the distributing aperture which serves to inhibit further upward movement of the cap after the distributing aperture is completely exposed. In order to provide an effective fluid-tight, contamination-proof seal between the cap and the interior of the hydrant housing when the hydrant is in its submerged position, the housing is provided with an inwardly tapering shoulder that cooperates with a seal of complementary shape carried on the lower end of the cap. The cap may be provided with a bore extending longitudinally and terminating at its upper end in a nozzle to propel a jet-type spray upward from the hydrant thereby wetting and softening the surrounding soil. This facilitates the upward movement of the hydrant out of the ground. (Sinha-OEIS)
W78-01215

IRRIGATION MEANS FOR THE UNIFORM DISTRIBUTION OF LIQUID,
U. Tiedt.
U.S. Patent No. 4,009,832, 7 p, 19 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 1, p 128, March 1, 1977.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, *Irrigation efficiency, Irrigation practices, Flow control, Water delivery, Application equipment.

The object is to improve known irrigation systems so that a substantially uniform distribution of liquid is achieved without the need for separate valves in the outlet apertures and with a tube wall thickness governed only by the internal liquid pressure to be withstood. Any impurities in the region of the outlet apertures can be flushed out by a self-cleaning effect which is controlled by the liquid pressure. The irrigation tube is provided with an internal flap underlying the outlet apertures and by means of which the outflow resistance offered to the liquid is variable in response to the liquid pressure in the tube. At least one longitudinal portion of the flap lies against the inner surface of the tube wall under liquid pressure and the contacting faces of the tube and flap throttle the flow of liquid by reasons of the surface structure. (Sinha-OEIS)
W78-01216

GENERAL IRRIGATION PROJECT REGULATIONS (OPERATION AND MAINTENANCE).
Bureau of Indian Affairs, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-01362

THE PROBLEM OF WEATHER MODIFICATION IN DRY FARMING IN THE SOUTHERN PART OF WESTERN SIBERIA AND NORTHERN KAZAKH SSR, (IN RUSSIAN),
Akademiya Nauk, SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
For primary bibliographic entry see Field 3B.
W78-01464

PHYSICAL PROPERTIES AND MOISTURE CONDITIONS IN CLAYEY GLEY SOILS OF THE KOLKHIDA LOWLAND, (IN RUSSIAN),
All Union Research Inst. of Tea and Subtropical Plants.
N. I. Gudzhabidze, and I. A. Motsereliya.
Pochvovedenie 7, p 110-114, 1976.

Descriptors: *Soil physical properties, *Soil moisture, *Clays, Corn(Field), Humidity, Soil profiles, Agriculture.
Identifiers: Drainage, Gley, *Kolkhida, Lowlands(Georgian SSR), Soils, USSR.

Soils in the Kolkhida Lowland (Georgian SSR, USSR) are drained by means of a system of canals supplemented by agricultural improvement measures such as profile strips, surface planning according to natural slopes and frequent ridges. A study of the effects of these measures on the moisture conditions and physical properties of swelling soils planted with corn indicated that the mechanism operates in practically water impermeable subsoil at a depth not more than 30-40 cm from the surface. On drained fields a relatively high air content was noted only in the cultivated soil layers. Mechanical loosening of the soil does not allow an increase in air content because soil fragments tend toward maximum dense packing after moistening. Significant reduction of moisture and the optimal water-air soil condition can only be acheived by dehumidification as much as possible while simulataneously improving its physical properties toward increased aeration of the soil mass. --Copyright 1977, Biological Abstracts, Inc.
W78-01472

MANAGING SALINE WATER FOR IRRIGATION.
International Center for Arid and Semi-Arid Land Studies, Lubbock, TX.
For primary bibliographic entry see Field 3C.
W78-01492

MINIMIZING THE SALT BURDEN OF PECOS RIVER IRRIGATION DRAINAGE WATER,
New Mexico State Univ., Las Cruces. Dept. of Agronomy.
For primary bibliographic entry see Field 3C.
W78-01496

THE RAJASTHAN CANAL PROJECT,
A. S. Kapoor, and B. S. Rajvanshi.
In: Desertification and its Control: Indian Council of Agricultural Research, New Delhi, 1977. p 121-129, 2 tab.

Descriptors: *Canals, *Canal design, *Canal construction, *Irrigation canals, Water resources, Water resources development, Water supply, Arid lands, Deserts, Irrigation, Irrigation water, Social aspects.
Identifiers: India, Rajasthan.

A canal is being constructed in the Thar Desert in the northwestern part of the Rajasthan, India, and efforts are being made to colonize the area. The Thar is described and the hazards, methods of execution, and the progress achieved on the canal project are discussed. With irrigation waters from the canal it is hoped that the now barren lands will be converted into extensive agricultural lands. The actual construction of the canal, which is divided into two stages, is discussed in detail. The amount of land to be irrigated and the costs of the project are given. The problems in the construction of the project are described. Conclusions are presented and are basically concerned with the benefits to the region when the project is completed. (Jamail-Arizona)
W78-01505

AN ANALYSIS OF A POSSIBLE CROP RESPONSE TO HAIL SUPPRESSION SEEDING: THE NELSPRUIT HAIL SUPPRESSION PROJECT,
Cansas International Corporation, Nelspruit (South Africa).
For primary bibliographic entry see Field 3B.
W78-01619

EFFECTIVE RAINFALL IN IRRIGATED AGRICULTURE,
Indian Agricultural Research Inst., New Delhi.
For primary bibliographic entry see Field 2B.
W78-01642

EFFECTIVENESS OF AGRICULTURAL IMPROVEMENTS FOR THE CULTIVATION OF TEA SHRUBS IN THE KOLKHIDA LOWLAND, (IN RUSSIAN),
R. I. Papisov.
Pochvovedenie 7, p 84-93, 1976.

Descriptors: *Cultivation, *Crop response, *Soil properties, *Drainage effects, *Drainage practices, Subsurface drainage, Soil moisture, Water table, Runoff, Kolkhida, *Tea shrubs, U.S.S.R.

Changes in soil properties and processes due to improvements of water regime (drainage) were studied. Observations on the soil moisture regime and the fluctuations of the ground water table, the estimation of inner and surface runoff, the determination of physical, chemical and biological soil properties, as well as the tea shrub development and yields indicate the necessity of applying profiling ridges in combination with subsurface drainage, placed at 10 m intervals, on soils of Kolkhida, USSR, lowland.--Copyright 1977, Biological Abstracts, Inc.
W78-01689

SOIL WATER SYSTEM AND YIELD OF FIELD CROPS WITH DIFFERENT TILLAGE SYSTEMS, (IN RUSSIAN),
Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Agriculture Experiment Methods.
B. A. Dospekhov, A. Ya. Rassadin, and A. E. Alekseeva.
Izv Timiryazev S-Kh Akad 4, p 54-62, 1976.

Descriptors: *Soil moisture, *Moisture content, *Soil treatment, *Cultivation, *Crop response, On-site investigations, Soil types, Loam, Podzols, Alkaline soils, Mechanical control, Field crops, Evaporation, Water requirements, U.S.S.R.

In complex field experiments conducted on medium loamy, weakly-cultivated, soddy-weakly-polzolized soil, the effects of providing field crops with moisture under different systems of soil tillage were investigated. Making the depth smaller and decreasing the number of mechanical cultivations from 4-5 to 1 using rotary type implements did not produce a negative effect upon plants with moisture or themoisture content in the 1 m soil layer when the moisture content was equal to field water capacity. Under such conditions the total amount of water for desuction and evaporation from the 1 m soil layer under potatoes and barley was higher by 9.7 and 12.5%, respectively, then under conventional tillage conditions. Under conditions of insufficient soil moisture in the treatments with milling tillage and combination of 3-stage and deep presowing milling tillage, water needed per ton of crop was 16 and 10% lower in growing barley and 25 and 22% in growing vetch-oats mixture (hay).--Copyright 1977 Biological Abstracts, Inc.
W78-01691

AUTOMATIC ANTI-SIPHON VALVE,
C. C. Rodieck.
U.S. Patent No 4,014,361, 6 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1661, March 29, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Application equipment, Flow control, *Valves.

Irrigation systems in general tend to place large amounts of water in areas where they are not needed and may not provide enough water to other plants which are located near the top of a hill. This is caused by a siphoning effect which draws water from higher positions when the water is turned off. This invention directs itself toward the solution of this siphoning problem. A hollow valve body with a cylindrical side has a first outlet through its top end. An inlet is formed through the side of the valve body for receiving water under pressure. A second outlet is provided near the bottom of the valve body. A cylindrical valve gate is positioned concentric within the hollow of the cylindrical valve body. A valve seat is attached at the top end and is adapted for receiving the top end of the valve gate so as to block water flow through the first outlet. A float is connected to the top end of the valve gate by a rod. The float is capable of urging the valve gate against the valve seat whenever the water level outside of the valve body is above or at a pre-selected level. (Sinha-OEIS)
W78-01694

FLUID-FLOW CONTROL DEVICES PARTICULARLY USEFUL AS DRIPPER NOZZLES IN TRICKLE IRRIGATION,
P. Rosenberg.
U.S. Patent No 4,014,473, 5 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1698, March 29, 1977.

Descriptors: *Patents, *Irrigation, *Flow control, Irrigation efficiency, Irrigation practices, Application equipment.
Identifiers: *Drip irrigation.

A fluid-flow control device particularly useful as a dripper nozzle in trickle irrigation comprises a conduit having an enlarged convex head attached to a cap defining a housing within which is enclosed a double-concave regulating member. The convex head has an axial passageway engageable by one face of the concave member. The inner face of the cap has a depending boss engaging the other face of the concave member. The arrangement being such that during the flow of fluid through the passageway, the regulating member is set into rapid oscillating movement to rapidly open and close its outlet and thereby to control the flow of the fluid. (Sinha-OEIS)
W78-01697

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE NEGEV - A DESERT RECLAIMED.
For primary bibliographic entry see Field 3B.
W78-01184

A LEAST SQUARES METHOD FOR COMPUTING STATISTICAL TOLERANCE LIMITS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 7C.
W78-01307

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1976.
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01317

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1975.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01318

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1976.
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01319

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1975.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01320

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1975.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01321

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1975.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01322

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1976.
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01323

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1975.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01324

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1976.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01326

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01328

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01329

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01330

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01331

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01332

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01333

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01334

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01335

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1975.
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01336

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1975.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01338

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1976.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01339

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01340

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01341

DESIGNATION OF NEW RIVER SEGMENT AS A COMPONENT OF THE WILD AND SCENIC RIVERS SYSTEM.
For primary bibliographic entry see Field 6E.
W78-01365

THE INFLUENCE OF FORESTS ON THE WATER REGIME OF SMALL RIVERS IN THE BELORUSSIAN POLESYE, (IN RUSSIAN),
Akademiya Navuk BSSR, Minsk. Inst. of Experimental Botany.
I. D. Yurkevich, N. F. Lovchii, and E. P. Yaroshevich.
Lesovedenie 5, p 3-11, 1976.

Descriptors: *Floods, *Belorussian Polesye(USSR), Flooding, *Forests, Rivers, *Seasonal, Spring.

Investigations of small river regimes in the Belorussian Polesye (USSR) are discussed with relation to afforestation of their basins. With increased afforestation the total annual outflow of rivers changes little, but the duration of spring floods increases and their intensity decreases; summer floods become more even. Duration of the floods increases, on an average, by 4 days/10% of afforestation, and the greatest average daily modulus of flow decreases by 10 1/s from 1 km2;

the greatest summer flood average daily modulus of the outflow is 1.8 l/s smaller.--Copyright 1977, Biological Abstracts, Inc.
W78-01453

INTRODUCTION TO THE SANDUSKY RIVER BASIN.
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 5B.
W78-01519

THE GEOLOGIC SETTING OF THE SANDUSKY RIVER BASIN,
Bowling Green State Univ., OH. Dept. of Geology.
J. L. Forsyth.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 13-60. 3 fig, 67 ref.

Descriptors: *Geology, *Geologic history, *Glaciers, *River basins, Till, Stratigraphy, Glacial drift, Rivers, Watersheds(Basins), Lake Erie, Ohio.
Identifiers: *Sandusky River Basin(Ohio).

The underlying bedrock of the Sandusky River Basin in Ohio is mostly Silurian-Devonian carbonates (limestone and dolostone), with Devonian shale and Mississippian sandstone further southeast. The relatively nonresistant limestone and dolostone produced the characteristic plains of western Ohio, while the younger, resistant sandstone formed the hills of the state's eastern part. The area lies just east of the crest of the Cincinnati Arch. The mantle, which averages 40 ft in thickness, is composed mostly of glacial till, often covered by thin glacial lake deposits or alluvium. Presently-active geologic processes are flooding and erosion of rivers in the basin, flow of alkaline spring water into the rivers, and flooding and erosion of Lake Erie. Modern Sandusky Basin geologic history begins with the retreat of the last (Wisconsin) glacier from northern Ohio. When the ice margin retreated from the Wabash or Fort Wayne End Moraines, and small shallow lakes or marshes developed, normal drainage of the land began, the start of the Sandusky River system. When the retreating ice finally exposed an eastern outlet lower than any to the west, a greatflood ensued. When it subsided, only two tiny ponds remained in the bottom of the Erie Basin. As the Niagara Falls area slowly rose, the level of Lake Erie also rose. Revegetation of the Sandusky Basin occurred with deglaciation, followed by the reappearance of animals, and shortly after, by early man. (See also W78-01518) (Lynch-Wisconsin)
W78-01520

EFFECTS OF ADVANCED WASTE TREATMENT AND FLOW AUGMENTATION ON WATER QUALITY DURING LOW STREAM FLOWS,
Heidelberg Coll., Tiffin, OH. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-01522

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W78-01541

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, LAND USE-MARINE RESOURCES, VOLUME I-C.
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-01589

AN EXAMINATION OF THE POTENTIAL APPLICATIONS OF AUTOMATIC CLASSIFICATION TECHNIQUES TO GEORGIA MANAGEMENT PROBLEMS,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
B. Q. Rado.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1525-1540, September 1975. 3 fig, 9 ref.

Descriptors: *Remote sensing, *Georgia, *Land classification, Land resources, Land use, Coastal marshes, Agriculture, Census, Planning, Management.
Identifiers: LANDSAT, Technology transfer, Land use allocation model.

State and federal legislation, along with improved methods and techniques for data acquisition and manipulation, has created new opportunities for state, regional, and local planning. One such opportunity included representatives from the State of Georgia and other southeastern states who participated in a workshop at the NASA/Earth Resources Laboratory in Bay St. Louis, Mississippi. The purpose of the workshop was to become more familiar with automatic classification techniques as they may relate to future statewide planning systems. Applications of automatic classification techniques to Georgia management problems were discussed. Presented were some of the issues which need to be addressed in a statewide system, and suggestions for how automatic classification techniques can be made compatible with such a system. The observations regarding the implementation of an automatic classification system in Georgia were based upon preliminary investigations with NASA and potential users throughout the State. (See also W78-01589) (Humphreys-ISWS)
W78-01590

OHIO'S STATEWIDE LAND USE INVENTORY: AN OPERATIONAL APPROACH FOR APPLYING LANDSAT DATA TO STATE, REGIONAL AND LOCAL PLANNING PROGRAMS,
Ohio Dept. of Economic and Community Development, Columbus. Div. of Community Services.
P. E. Baldridge, P. H. Goesling, F. Leone, C. Minchall, and R. H. Rodgers.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1541-1552, September 1975. 8 ref.

Descriptors: *Ohio, *Land use, *Remote sensing, *Census, Remote sensing, Analytical techniques, Cities, Computers, Coasts, Rural areas, Wetlands, Agriculture, Forests, Planning, Land classification, Mapping, Surface waters, Mining, Ranges, Suburban areas.
Identifiers: LANDSAT.

The paper provided a brief description of the programmatic, technical, user application, and cost factors associated with the development of an operational, statewide land use inventory from LANDSAT data. The Ohio land use inventory is a beginning step. As it is completed, it will undergo accuracy and verification tests. Test sites will be randomly selected from the inventory and then compared with available ground truth information. Further, the inventory will undergo continuous and varied user evaluation as it is applied to state, regional, and local planning programs. The combination of random accuracy tests and user assessments will be used as input into inventory update projects. LANDSAT MSS data are subjected to geometrical and categorical processing to produce map files for each of the 200 fifteen minute quads covering Ohio. LANDSAT computer compatible tapes will be rescanned to produce inventory tapes which identify 8 Level I land use categories and a variety of Level II categories. The inventory tapes will then be processed through a series of 10 software programs developed by the State of Ohio. The net result will be a computerized inventory which can be displayed in map or tabular form for various geographic units at a variety of scales and for selected categories of usage. The computerized inventory data files will be applied to technical programs developed by the various state agencies. The entire project will be completed at a lower cost than previous statewide inventories. (See also W78-01589) (Humphreys-ISWS)
W78-01591

THE DESIGN, IMPLEMENTATION, AND USE OF A STATEWIDE LAND USE INVENTORY: THE NEW YORK EXPERIENCE,
Cornell Univ., Ithaca, NY.
E. E. Hardy.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1573-1601, September 1975. 24 fig.

Descriptors: *New York, *Land use, *Census, Analytical techniques, Remote sensing, Land classification, Water, Land, Public lands, Forests, Agriculture, Natural resources, Costs, Mapping.
Identifiers: *LANDSAT, Skylab.

The total cost of the New York State inventory, which was done from 1968-70, was $10 per square mile for 135 items, computerized and geographically recognized. To get satellite information into the system through a manual output, costs about 4 cents per square kilometer for level 1 category from a 671 image. In terms of design concepts, the following 11 steps were found to be very important: (1) The overall design of the project in relation to its uses, (2) The classification based on the needs and resources of value, (3) Data acquisition, (4) Geographic referencing, (5) Data processing, (6) Data storage, (7) Data retrieval, (8) Application, (9) Warehousing of raw data, (10) Development of a user service, and (11) Documentation of the entire operation. The last step includes the computer program, the techniques for doing the work, and, above all, a photographic atlas of the land uses that have been recorded at that time. Without this atlas, we do not really have a resource inventory. If we fail to take time to create this atlas concept, it is impossible to do the work over again. Ninety percent of the thousands of applications and requests are for map overlays, whereas only 10% are for the computer products. Most of us may be overlooking many of the good products that some labor-intensive opportunities still offer for dealing with the large volume of resource information. Another point that many of us overlook is that not every land-use information system is automatically transferable to other parts of the country or to other parts of the world. (See also W78-01589) (Humphreys-ISWS)
W78-01592

ALASKAN RESOURCES, CURRENT DEVELOPMENT, TRADITIONAL CULTURAL VALUES, AND THE ROLE OF LANDSAT DATA IN CURRENT AND FUTURE LAND USE MANAGEMENT PLANNING,
Alaska Univ., College.
A. LaPerriere.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1603-1608, September 1975. 2 ref.

Descriptors: *Alaska, *Land use, *Wildlife habitats, Remote sensing, Wildlife, Resources, Land management, Census, Planning, Mapping, Vegetation, Environment, Analytical techniques.

Identifiers: LANDSAT.

Past, present, and proposed applications of LANDSAT data for renewable resource assessments in Alaska were described. Five specific projects were discussed briefly. The projects include a feasibility investigation applying LANDSAT data to caribou habitat mapping in northeast Alaska, analysis of a native corporate region in southwest Alaska, analysis of a game management unit in interior Alaska, and two proposed analyses in northwest Alaska. The analyses principally address range evaluations concerning caribou, moose, and Dall sheep, but results have application to other renewable resource themes. Renewable resources are the traditional basis for land-use and value in Alaska, but dramatic land status changes are currently occurring. The changes, along with the national demands for non-renewable resources, are resulting in rapidly accelerated development. Statewide synoptic resource assessment using LANDSAT data is tenable and, in fact, occurring, although not as an organized effort directed to that objective. However, LANDSAT analyses for the entire State probably will be available by 1980. The results can be utilized in development of a statewide land-use management plan. (See also W78-01589) (Humphreys-ISWS)
W78-01593

CASES IN THE RELATION OF RESEARCH ON REMOTE SENSING TO THE DECISION-MAKERS IN A STATE AGENCY,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
J. W. Jondrow.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1617-1630, September 1975. 4 fig, 5 ref.

Descriptors: *Decision making, *Management, *Remote sensing, Research and development, Water quality, Land use, Attitudes, Planning, Methodology, Technology, Analytical techniques, Inter-agency cooperation, Communication, Institutions, Information exchange.
Identifiers: *Technology transfer, LANDSAT.

Research on the application of remote sensing can be used effectively in solving problems of water quality and land use if researchers and the state agency personnel responsible for water quality and land use work together to assure that research projects and agency needs are aligned closely. However, developing goals and projects that fit the requirements of research units as well as the state agencies is aided by the use of several management tools. This paper described the characteristics of several processes that transfer research results to government agencies. Also, the management of three projects and the Data Center was delineated to illustrate the application of the mentioned management tools in the effort to guarantee the applicability of university research to agency needs. To include in a research project the dimension of relevance to decisionmaking, objectives and specific tasks should be designed to call attention to the need for communication as part of the process of research. Aids should be available to supplement the communication skills of researchers and decisionmakers. This schedules should allow participants in the research to withhold their judgements of what is being communicated, or whether communication is successful, long enough for the dialogue necessary at crucial points to mature. Participants in the research and decisionmaking aspects of an enterprise must be helped to expect success in finding the relationships between research and use wherever there are possibilities for such a connection. (See also W78-01589) (Humphreys-ISWS)
W78-01594

THE DEVELOPMENT OF A LAND USE INVENTORY FOR REGIONAL PLANNING USING SATELLITE IMAGERY,
Ohio-Kentucky-Indiana Regional Council of Governments, Cincinnati, OH.
A. H. Hessling, and T. G. Mara.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1631-1636, September 1975. 4 fig, 6 ref.

Descriptors: *Land use, *Mapping, *Ohio, *Kentucky, *Indiana, Remote sensing, Planning, Regional analysis, Land classification, Data processing, Forests, Agriculture, Analytical techniques, Census, Land, Water, Natural resources.
Identifiers: LANDSAT.

Under provisions of Section 208 of the Federal Water Pollution Control Act Amendments of 1972, the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) received a grant for water quality planning for a nine county area centered around Cincinnati, Ohio. Because water quality is in large part determined by land-use activities and patterns, detailed up-to-date land-use data is needed. Traditional land-use inventory techniques are too time consuming. Land-use data generated by computer processing of satellite imagery offer a viable alternative for obtaining the needed information. OKI's experience in the development of a land-use inventory was successful. The total acreage for each drainage area as measured from the satellite data matched very closely the acreage measured by using a planimeter. Field checks and interviews with farmers and agricultural agents have shown that the categorization has been accurate within a reasonable level of tolerance. The extent to which satellite imagery and related services will be used for regional planning in the future may depend upon improved communications and the establishment of a closer working relationship between the users and the researchers. (See also W78-01589) (Humphreys-ISWS)
W78-01595

LUMIS-A LAND USE MANAGEMENT INFORMATION SYSTEM FOR URBAN PLANNING,
Caltech Jet Propulsion Lab., Pasadena, CA.
C. K. Paul.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1637-1664, September 1975. 11 fig, 1 tab, 9 ref.

Descriptors: *Land use, *City planning, *California, *Management, Photogrammetry, Terrain analysis, Surveys, Data processing, Census, Planning, Natural resources, Mapping, Information retrieval, Computer programs, Aerial photography, Analytical techniques.
Identifiers: *Los Angeles(Calif), *Santa Monica Mountains, Land use management information system(LUMIS), Polygon intersection overlay system(PIOS).

The Land Use Management Information System (LUMIS) consists of a methodology of compiling land use maps by means of air photo interpretation techniques, digitizing these and other maps into machine-readable form, and numerically overlaying these various maps in two computer software routines to provide land use and natural resource data files referenced to the individual census block. The two computer routines are the Polygon Intersection Overlay System (PIOS) and an interactive graphics APL program. A block referenced file of land use, natural resources, geology, elevation, slope, and fault-line items has been created and supplied to the Los Angeles Department of City Planning for the City's portion of the Santa Monica Mountains. In addition, the interactive system contains 173 socio-econimic data items created by merging the Third count U.S. Census Bureau tapes and the Los Angeles County Secured Assessor File. This data can be displayed graphically for each and every block, block group, or tract for 6 test tracts in Woodland Hills, California. Other benefits of LUMIS are the knowledge of air photo availability, flight pattern coverage and frequencies, and private photogrammetry companies flying Southern California, as well as a formal Delphi study of relevant land use informational needs in the Santa Monicas. (See also W78-01589) (Humphreys-ISWS)
W78-01596

SATELLITE INFORMATION ON ORLANDO, FLORIDA,
Brevard County Planning Dept., Titusville, FL.
J. W. Hannah, G. L. Thomas, and F. Esparza.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1665-1682, September 1975. 10 fig, 1 ref.

Descriptors: *Mapping, *Florida, *Land classification, *City planning, Maps, Land use, Planning, Rural areas, Cities, Urban mapping, Surveys, Satellites(Artificial), Data processing, Monitoring, Water, Marshes, Trees.
Identifiers: *Orlando(Fla), *Orange County(Fla), LANDSAT, Skylab, Thematic maps.

An effective means of coordinating the utilization of Skylab and LANDSAT data is use of the Skylab photography to make generalized land use maps of the larger areas, such as counties and regions, followed by use of multi-spectral scanner data from LANDSAT and Skylab, where available, to provide more detailed information for whatever portion of that area may be needed. This approach has been followed for Orange County, Florida. In Orange County EREP photography was used to prepare a land use map of the county, and LANDSAT and EREP MSS data were used to provide more detailed information on Orlando and its suburbs. The generalized maps were prepared by tracing the patterns on an overlay, using an enlarging viewer. Digital analysis of the multi-spectral scanner data was basically the maximum likelihood classification method, with training sample input and computer printer mapping of the results. It was concluded that: (1) computer classification, accompanied by human interpretation and manual simplification, can produce land use maps which are useful on a regional and county and, for special purposes, a city basis, and (2) change-monitoring is a potentially effective application of such data at all planning levels. (See also W78-01589) (Humphreys-ISWS)
W78-01597

IMPROVED RESOURCE USE DECISIONS AND ACTIONS THROUGH REMOTE SENSING,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 6B.
W78-01599

DEVELOPMENT OF USER APPLICATIONS FOR EARTH RESOURCES SURVEY DATA IN URBAN AND REGIONAL PLANNING IN THE PUGET SOUND AREA,
Washington Univ., Seattle.
F. V. Westerlund.

Descriptors: *Regional analysis, *Land use, *Remote sensing, *Washington, City planning, Planning, Census, Land classification, Monitoring, Decision making, Data processing, Maps, Management.
Identifiers: *Pudget Sound(Wash).

User applications of remote sensing in Washington State are being developed by programs of the State

Department of Natural Resources, the University of Washington, and the Pacific Northwest Regional Commission. The Remote Sensing Applications Laboratory of the University of Washington has been involved for three years in developing applications in urban and regional planning in the Puget Sound area through cooperative programs with governmental agencies. Two such activities were described. The first project created a multitemporal land use/land cover data base for the environs of the Seattle-Tacoma International Airport to serve planning and management operations of the Port of Seattle. The second project is an ongoing effort to develop a capability within the Puget Sound Governmental Conference, a council of governments, to inventory and monitor land use within its four-county jurisdiction. Developmental work has focused on refinement of land use/cover classification systems applicable at this regional scale and various levels of detail in relation to program requirements of the agency. Related research, refinement of manuual methods, user training, and approaches to technology transfer were discussed. (See also W78-01589) (Humphreys-ISWS)
W78-01600

APPLICATION OF SATELLITE REMOTE-SENSING DATA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 7C.
W78-01601

PRESENT AND POTENTIAL LAND USE MAPPING IN MEXICO,
Mexican Water Plan, Mexico City. Physical Resources and Water Uses Group.
H. Garduno, R. Garcia Lagos, and F. Gardia Simo.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1823-1839, September 1975. 8 fig, 5 tab, 3 ref.

Descriptors: *Land use, *Mapping, *Mexico, *Remote sensing, Foreign countries, Surveys, Land classification, Census, Erosion, Water resources, Planning, Vegetation, Irrigated land, Forests, Maps, Agriculture, Manpower, Costs.
Identifiers: LANDSAT.

The Mexican Water Plan conducted studies of present and potential land use in Mexico using LANDSAT-1 satellite imagery. Present land use studies were carried out all over the country (197 million hectares); nine soil uses were mapped according to the first classification level recommended by the U.S. Geological Survey. Also, 6.3 million hectares of land with advanced erosion were detected. Work was executed at a rate of 8 million hectares per month; reliability was 90% and the cost was only 0.1 cents/hectare. The potential land use study was performed in 45 million hectares at a rate of 4 million hectares per month and at a cost of 0.33 cents/hectares. Soil units, according to FAO classification, were delineated scale 1:1 million; interpretative maps also were prepared, dealing with potential agricultural productivity carrying capacity for cattle, water, erosion risk, and slope ranges. The integration of both present and potential land use maps is extremely useful in providing orientations for regional development of water resources in agricultural countries with sparse water suplies. (See also W78-01589) (Humphreys-ISWS)
W78-01603

APPLICATION OF LANDSAT AND SKYLAB DATA FOR LAND USE MAPPING IN ITALY,
Central Lab. for Geophotogrammetry and Remote Sensing, Munich (West Germany).
J. Bodechetel, J. Nithack, G. Di Bernardo, K. Hiller, and F. Jaskolla.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1863-1886, September 1975. 14 fig, 2 tab, 1 ref, 1 append.

Descriptors: *Land use, *Mapping, *Remote sensing, *Foreign countries, *Europe, Surveys, Maps, Land classification, Census, Surface waters, Agriculture, Forests, Glaciers, Snow cover, Cities, Analytical techniques.
Identifiers: *Italy, LANDSAT, Skylab.

Utilizing LANDSAT and Skylab multispectral imagery of 1972 and 1973, a land use map of the mountainous regions of Italy was evaluated at a scale of 1:250,000. Seven level I categories were identified by conventional methods of photointerpretation. Images of multispectral scanner (MSS) bands 5 and 7, or equivalents, were used. If the quality of the data is good and if the interpreter has a general knowledge of the country, categories of levels II to IV can be mapped. Areas of less than 200 by 200 m could be classified. It is possible to establish standard procedures for interpretation of multispectral satellite imagery. In this manner, land use maps can be produced for central and southern Europe. The results proved that the existing land use maps could be updated and optimized. The complexity of European land use patterns, the intensive morphology of young mountain ranges, and time-cost calculations are the reasons that the applied conventional techniques are, for the near future, superior to automatic evaluation. (See also W78-01589) (Humphreys-ISWS)
W78-01604

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME I, SHORT-DURATION PRECIPITATION FREQUENCY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2B.
W78-01648

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME II, LONG-DURATION PRECIPITATION DATA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2B.
W78-01649

A PROCEDURE USED FOR A GROUND TRUTH STUDY OF A LAND USE MAP OF NORTH ALABAMA GENERATED FROM LANDSAT DATA,
National Aeronautics and Space Administration, Huntsville, AL. George C. Marshall Space Flight Center.
For primary bibliographic entry see Field 7C.
W78-01651

4B. Groundwater Management

STUDIES ON SALINIZATION OF GROUNDWATER, 1. THEORETICAL CONSIDERATION ON THE THREE-DIMENSIONAL MOVEMENT OF THE SALT WATER INTERFACE CAUSED BY THE PUMPAGE OF CONFINED GROUNDWATER IN FAN-SHAPED ALLUVIUM,
Ehime Univ., Matsuyama (Japan). Dept. of Applied Physics.
For primary bibliographic entry see Field 2F.
W78-01287

DIFFUSE FLOW AND CONDUIT FLOW IN LIMESTONE TERRAIN IN THE MENDIP HILLS, SOMERSET (GREAT BRITAIN),
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2F.
W78-01288

SILICATE SCALE CONTROL IN GEOTHERMAL BRINES,
Occidental Research Corp., La Verne, CA.
For primary bibliographic entry see Field 3A.
W78-01316

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1976.
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01317

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1975.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01318

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1976.
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01319

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1975.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01320

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1975.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01321

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1975.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01322

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1976.
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01323

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1975.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01324

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1976.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01326

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01328

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01329

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01330

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01331

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01332

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01333

(U)
collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W78-01333) (Woodard-USGS)
For primary bibliographic entry see Field 7C.
iver and intervening Coastal basins. Data consis

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01335

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1975.
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01336

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1976.
Geological Survey, Augusta, ME. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01337

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1975.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01338

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1976.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01339

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01340

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01341

ADVANCED WASTEWATER TREATMENT INCLUDES REVERSE OSMOSIS.
For primary bibliographic entry see Field 5D.
W78-01440

THE ROLE OF STATE LEGISLATION IN GROUND WATER MANAGEMENT,
Arizona Univ., Tucson. Coll. of Law.
R. E. Clark.
Creighton Law Review, Vol. 10, No. 3, March, 1977, p 469-487.

Descriptors: *Groundwater, *Groundwater resources, *Water policy, *Water management(Applied), *Legislation, Legal aspects, Government, Prior appropriation, Regulation, Management, Water rights, Groundwater mining, Southwest U.S., Arizona, California, New Mexico, Texas, Administration, Public benefits, Property rights, Correlative rights.

Groundwater legislation and administration are compared in New Mexico, Arizona, California, and Texas, and problem areas are outlined. A comparison of groundwater law in each state reveals four different legal doctrines. Texas' 'absolute ownership,' California's 'correlative rights,' and Arizona's 'reasonable use' doctrines are essentially rules of private property whereas New Mexico's 'prior appropriation' doctrine is a form of public control. New Mexico law is undergoing changes especially in areas where groundwater supplies are being mined and traditional doctrine cannot be applied. Although there is great variety in groundwater law there are three indispensable elements: maximizing benefits, providing allocation procedures among users in the same class and among competing uses with attention to the relative value of different uses, and providing central responsibility and a management system. Three ways of exercising management control are discussed: restricting property rights; internalizing costs; and direct regulation of withdrawals. Western states have thus far failed in their legislative efforts to provide an adequate framework of public control or to sufficiently emphasize the interrelationships of all resources. The author urges a detailed review of the National Water Commission's recommendations on groundwater management. A list of ten indispensable elements in any groundwater management legislation is offered. (Ullery-Arizona)
W78-01503

ENVIRONMENTAL DEVELOPMENT PLAN (EDP): HYDROTHERMAL ENERGY SYSTEMS FY 1977.
Energy Research and Development Administration, Washington, DC.
Report EDP/G 01(77), June 1977. 9 p, 13 fig, 2 tab, 4 append.

Descriptors: *Geothermal studies, *Environment, *Safety, *Public health, *Standards, Air pollution, Water pollution, Environmental sanitation, Environmental effects, Environmental control, Energy, Subsidence, *Hydrothermal studies, Socioeconomics, Seismicity.

The environmental, health, safety, social, and economic issues that are associated with the development, demonstration, and commercialization of hydrothermal resources and conversion technology and ERDA actions required to resolve the issues are identified. The hydrothermal resource development, conversion technology development, and demonstration projects currently in progress, or planned by ERDA, are listed with schedules and milestones for fiscal year 1977 noted. The ERDA program comprises environmental, health, and safety issued including air and water quality, subsidence, seismicity, socioeconomics, and institutional constraints related to these issues. The ERDA environmental program is described in terms of strategy; responsibility; projects; operations monitoring; environmental, health, and safety effects; environmental control and impact abatement; environmental standards and criteria. The appendices present a forecast guide for active geothermal development areas, discussion of environmental issues, environmental research supporting the resolution of environmental issues, and elements of the hydrothermal environmental projects. (Wares-IPA)
W78-01546

WATER SUPPLY AT LOS ALAMOS DURING 1976,
Los Alamos Scientific Lab., NM.
W. D. Purtymun.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6814-PR, Price codes: A03 in paper copy, A01 in microfiche. Report LA-6814-PR, May 1977. 30 p, 21 fig, 5 tab, 9 ref, 1 append. W-7405-Eng.36.

Descriptors: *Water supply, *Water wells, Aquifers, Deep-well pumping, *New Mexico, *Los Alamos(N Mex).

Pumpage and aquifer conditions for wells in the Los Alamos, Guaje, and Pajarito, New Mexico, well fields are summarized in order to indicate the status of the water supply at Los Alamos during 1976. The Los Alamos water supply for 1976 consisted of production of 1,691 x 1,000,000 gallons from wells in three fields and 4 x 1,000,000 gallons from the gallery in Water Canyon. Under current production practices, water-level trends are as anticipated. The production from the well field was from 15 wells. (Well LA-6 is on standby status to be used only in emergency). The loss of this well has resulted in greater production from wells LA-1B, LA-4, and LA-5 in the field. The construction of a new well in the Pajarito Field has been delayed. An exceedingly dry summer or loss of a high-yield well during a peak demand period will result in a water shortage. Continued rehabilitation of older wells is encouraged to ensure a dependable supply and efficient use of already established

booster stations and transmission lines. The appendix presents a summary of Los Alamos municipal well-field characteristics in terms of aquifer conditions and capacities. (Wares-IPA)
W78-01547

EXPERIENCE IN THE USE OF THE METHOD OF MICROELECTRICAL VERTICAL SOUNDINGS IN STUDYING IRRIGATED SOIL EVOLUTION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
For primary bibliographic entry see Field 2F.
W78-01559

LEAKAGE OF GROUNDWATER THROUGH A SLOT IN A SHEET PILE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-01632

APPARATUS AND PROCESS FOR DRAWING WATER FROM A WATER-BEARING STRATA,
Thyssen Plastik Anger K.G., Munich (West Germany).
L. Fink.
U.S. Patent No 4,014,387, 6 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1669-1670, March 29, 1977.

Descriptors: *Patents, *Wells, *Water wells, Casings, Well casings, Permeability, Pumps, Sands, Well filters, Water pollution sources.

The invention provides an improved apparatus and process for drawing sand-free water from wells drilled in water-bearing strata. The water is flowed from water-bearing strata into a perforated wall of the well. The water is then flowed through a permeable body and subsequently the water is pumped from the well. The apparatus may comprise a perforated tubular filter element defining a well wall and a cylindrical permeable body placed concentrically within the well wall. The lower end of the body is closed and the upper end is open and connected to a pump. The cylindrical body may comprise concentric outer and inner slotted cylinders with a granulate defining a permeable body or a permeable cylinder between the concentric tubes. (Sinha-OEIS)
W78-01695

4C. Effects On Water Of Man's Non-Water Activities

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1973.
Federal Highway Administration, Washington, DC.
For primary bibliographic entry see Field 2J.
W78-01185

HEAVY RAINFALL RELATIONS OVER CHICAGO AND NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-01292

CONTROL OF EROSION AND SEDIMENT DEPOSITION FROM CONSTRUCTION OF HIGHWAYS AND LAND DEVELOPMENT,
Environmental Protection Agency, Washington DC. Office of Water Programs.
For primary bibliographic entry see Field 4D.
W78-01315

FERTILIZATION TO ACCELERATE LOBLOLLY PINE FOLIAGE GROWTH FOR EROSION CONTROL,
Forest Hydrology Lab., Oxford, MS.
For primary bibliographic entry see Field 4D.
W78-01345

APPLICATION OF SEWAGE SLUDGE TO CROPLAND: APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS TO PLANTS AND ANIMALS.
Council for Agricultural Science and Technology, Ames, IA.
For primary bibliographic entry see Field 5C.
W78-01513

REMOTE SENSING IMPACT ON CORRIDOR SELECTION AND PLACEMENT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01598

APPLICATION OF SATELLITE REMOTE-SENSING DATA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 7C.
W78-01601

THREE EXAMPLES OF APPLIED REMOTE SENSING OF VEGETATION,
Texas A and M Univ. College Station.
For primary bibliographic entry see Field 7C.
W78-01602

4D. Watershed Protection

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1973.
Federal Highway Administration, Washington, DC.
For primary bibliographic entry see Field 2J.
W78-01185

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, BUREAU OF RECLAMATION, DENVER, COLORADO, MAY 6-8, 1947.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 379, Price codes: A00 in paper copy, A01 in microfiche. SED/COM-01. January 1948. 323 p.

Descriptors: *Sedimentation, *Conferences, *Reservoir silting, *Programs, *Laboratory tests, *Rivers, Canals, Sediment discharge, Aggradation, Instrumentation, Degradation(Streams), Estuaries, Bed load, Surveys, Model studies, Floodways, Erosion, Erosion control, Sediment control, Land management, Watershed management, Bank stabilization, Stream erosion.

This publication contained the 24 papers and discussions of the first Federal inter-agency sedimentation conference. The conference was a working conference in which representatives of Federal agencies confronted with sedimentation problems could discuss the problems and the methods being used for problem investigations and solution. The 218 engineers in attendance represented federal agencies, state agencies, universities, and other organizations. The broad topics covered included: statements of sedimentation problems; agency sedimentation programs; determination and identification of sediment load; reservoir sedimentation; rivers, floodways and canals; laboratory investigations; and sedimentation control. (See also W77-00775) (Humphreys-ISWS)
W78-01188

DATA FOR A SMALL WATERSHED, IT IS POSSIBLE TO DEFINE THE SIMPLEST KINEMATIC CASCADE GEOMETRY WHICH WHEN USED IN SIMULATION WILL PRESERVE SELECTED HYDROGRAPH CHARACTERISTICS TO A GIVEN DEGREE OF ACCURACY. (SIMS-ISWS)
d to coordinate data from topographic maps by a least-square procedure. Residuals of the fit formed a geometric goodness-of-fit statistic as the improvement over using the mean elevation. An overall goodness-of-fit statistic was the drainage density ratio, the ratio of drainage density in the cascade of planes and channels to drainage density of the watershed. Given rainfall, runoff, and topograph
For primary bibliographic entry see Field 2A.
echniques for and consequences of such simplifica

AN EROSION EQUATION DERIVED FROM BASIC EROSION PRINCIPLES,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-01295

A RUNOFF EROSIVITY FACTOR AND VARIABLE SLOPE LENGTH EXPONENTS FOR SOIL LOSS ESTIMATES,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-01296

EVALUATING COMPONENTS OF THE USDAHL HYDROLOGY MODEL APPLIED TO GRASSLAND WATERSHEDS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-01297

RUNOFF AND EROSION CHARACTERISTICS OF SURFACE-MINED SITES IN WESTERN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-01298

EVALUATION OF SEDIMENT CONTROL DAMS,
Pennsylvania Dept. of Transportation, Harrisburg. Bureau of Materials, Testing and Research.
W. G. Weber, Jr., and C. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 040, Price codes: A03 in paper copy, A01 in microfiche. Report No FHWA-PA-76-7321, March 1976. 34 p, 19 fig, 17 tab, 1 append.

Descriptors: *Dams, *Sediment control, *Sedimentation, *Evaluation, Bed load, Suspended load, Erosion, Trap efficiency, Channels, Dam construction, Construction, Excavation.

The Pennsylvania Department of Transportation has used small dams extensively to control erosion in waterways. This report presented the results of evaluation of the performance characteristics of the small dams as to their efficiency in removing sediment load from the flowing water. A comparison also was made of the various methods of constructing these small dams. The results indicated that only a small portion of the suspended materials were removed by the dams. However, it was pointed out that the dams were very efficient in trapping the bed load. (Bhowmik-ISWS)
W78-01313

ACOP PUMPING SAMPLER. ALLUVIAL RIVER MECHANICS PROJECT,
Colorado State Univ., Fort Collins. Engineering Research Center.
K. Mahmood, and G. L. Eyster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 181, Price codes: A03 in paper copy, A01 in microfiche. Report CER74-75 KM-GLE 39, March 1975. 29 p, 7 fig, 1 ref, 3 append. NSF ENG 72-00274-A01.

Descriptors: *Measurement, *Instrumentation, *Sediment distribution, *Suspended load, Suspended solids, Sediment transport, Laboratory tests, Alluvial channels, Rivers, Sampling, Pumping.
Identifiers: *Sediment samplers, *Sediment measurement, Sediment concentration, Pumping samplers, Integrating samplers.

A point integrating pumping sampler for suspended sediment in sand size and finer ranges was described. The sampler uses a positive displacement pump driven by a D.C. motor. The discharge of the pump is regulated by its speed. A sampler was designed on the premise that the average velocity at the sampling point is known and that representative samples can be obtained by maintaining the intake velocity at the same rate. The sampler can be operated in a Cartridge Sampling Mode when large volumes of the sampled flow are sieved through 230 mesh U.S. Standard Sieve or in a Pint Bottle Mode, when nearly instantaneous samples are obtained in pint bottles. (Adams-ISWS)
W78-01314

CONTROL OF EROSION AND SEDIMENT DEPOSITION FROM CONSTRUCTION OF HIGHWAYS AND LAND DEVELOPMENT,
Environmental Protection Agency, Washington, DC. Office of Water Programs.
R. E. Thronson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 418, Price codes: A04 in paper copy, A01 in microfiche. EPA Report, September 1971. 50 p, 38 fig, 45 ref.

Descriptors: *Erosion control, *Sedimentation, *Erosion, *Construction, *Land development, Cost allocation, Cost sharing, Costs, Runoff, Deposition(Sediments), Highways.

Sedimentation involves three basic processes: erosion, transportation, and deposition. Costs of correcting erosion and sediment deposition problems resulting from highway construction and land development activities often unjustifiably are transferred to the taxpayer. The costs result when consequences of the construction operations on downstream areas are not properly considered. The report discussed deposition and control methods. (See also W72-02106) (Bhowmik-ISWS)
W78-01315

FERTILIZATION TO ACCELERATE LOBLOLLY PINE FOLIAGE GROWTH FOR EROSION CONTROL,
Forest Hydrology Lab., Oxford, MS.
P. D. Duffy.
Research Note SO-230, 4 p. 1977. Southern Forest Experiment Station, New Orleans, La.

Descriptors: *Erosion control, *Loblolly pine trees, *Vegetation establishment, *Fertilization, Slope protection, Gulf Coastal Plain, Mississippi, Nutrient requirements, Phosphates, Nitrogen components.
Identifiers: Pinus taeda L., Ammonium nitrate, Superphosphate, Potash, Ureaform.

On the southern Coastal Plain, loblolly pine (Pinus Taeda L.) can be used to help control erosion because it produces abundant soil-protecting litter. The species requires several years to produce enough litter for adequate soil protection, but on loamy soils fertilization can reduce the time by a year or more. When five fertilizer combinations were tested, one application of N at 150 lb/acre together with P at 33 lb/acre, and K at 62 lb/acre was best. Seedlings fertilized with this combination produced 1.6 times the foliage weight of unfertilized seedlings through their first 2 years without decreased survival. Additions of N up to 300 lb/acre in several small applications may further stimulate foliage growth. Foliage growth responses to fertilization were smaller on sandy soils and occurred only for seedlings planted in a year with normal summer rainfall. No response occurred on sandy soils in a dry year. The pattern of height growth response to fertilization during the first 2 years paralleled that of foliage growth. (Forest Service)
W78-01345

ETHEPHON ADVANCES LOBLOLLY PINE NEEDLE CAST,
Forest Hydrology Lab. Oxford, MS.
For primary bibliographic entry see Field 2D.
W78-01347

DESIGNATION OF NEW RIVER SEGMENT AS A COMPONENT OF THE WILD AND SCENIC RIVERS SYSTEM.
For primary bibliographic entry see Field 6E.
W78-01365

THE FISHES OF THE SANDUSKY RIVER SYSTEM, OHIO,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5C.
W78-01527

HELLEY-SMITH BED LOAD SAMPLERS,
Agricultural Research Service, Boise, ID.
For primary bibliographic entry see Field 2J.
W78-01641

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS. PART IV: FINAL REPORT-FIELD TESTING PROGRAM,
Arizona Transportation and Traffic Inst., Tucson.
H. A. Sultan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 603, Price codes: A07 in paper copy, A01 in microfiche. Report ADOT-RS-13(141), February 1976. 138 p, 22 fig, 19 tab, 11 ref, 3 append. 40 M 4-082, HPR-1-10-(141) 72-29.

Descriptors: *Erosion control, *Soil stabilization, *Highways, *Wind erosion, *Soil erosion, Dusts, Embankments, Oil, *Arizona, *Aerospray 70, Surfaseal, Petroset SB, Coherex, Dresinate DS-60W-80F, Paracol 1461, Terakrete No. 2, Dust stop, Foramine 99-194, Norlig 41+F-125, Dust Bond 100+F-125, Curasol AE.

Several chemical stabilizers were used in a large scale field application, based on a laboratory testing program. To control dust and wind erosion on untrafficable areas, spray-on application of eleven chemicals was made. Five chemicals were used on an unpaved road using a spray-on application to control erosion and dust behind traffic. Three chemicals were also used on the unpaved road using a mixed-in application. Methods of field application are given; details of monitoring techniques, including Hi-Vol dust collection, dust fall collection in cups, and extraction tests are discussed. Results indicate availability of several chemicals that proved successful in controlling dust on untrafficable areas. Degrees of dust control exceeding 88%, as compared with control sections, were achieved using chemical treatments costing between 4.3 cents and 10.9 cents per square yard. These chemicals were: Terakrete No. 2, Surfaseal, Dust Control Oil Aerospray 70, Norlig 41+F-125, and Paracol 1461. The field monitoring technique, using the Hi-Vol and blower combination appears to serve as a good method for quantitatively assessing the degree of effectiveness of a chemical treatment in collecting dust. In the road tests, Dust Control Oil, Aerospray 70, Dust Bond 100+F-125 and Curasol AE provided excellent control at a cost between 21.5 and 47.2 cents per square yard. The mixed-in application of the chemicals provided excellent degrees of dust control after exposure to traffic at a cost of 21.5 to 53 cents per square yard for a 3-inch thick mat. Field evaluation methods, using the Hi-Vol dust collection and the dust-fall collection (using cups), appear to provide a good numeric estimate for the effectiveness of the chemical treatments. Only Dust Control Oil provided a reasonable degree of dust control behind traffic using the spray-on application. The mixed-in application of the Redicote E52 asphalt emulsion provided an excellent degree of dust control behind traffic along with a good wearing surface after 15 months of exposure. Dust Control Oil Failed in the laboratory, but performed well in the field. (Wares-IPA)
W78-01658

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RAPID DETERMINATION OF TOTAL ORGANIC CARBON AND ITS APPLICATION TO WATER RESEARCH (IN JAPANESE).
T. Yoshikura, I. Fukunago, K. Oda, S. I. Kawai, and G. Uno.
Bull Jpn Soc Sci Fish 42(12): 1423-1429. 1976.

Descriptors: *Organic compounds, Chemical oxygen demand, Biochemical oxygen demand, *Carbon, *Oxidation, Rivers.

The quality of water polluted with organic compounds is usually expressed in terms of COD (chemical O2 demand) or BOD (biochemical O2 demand). Recently, a rapid combustion method for measuring total organic C (TOC) content of water was developed. The determination of TOC in the river water polluted with organic compounds was attempted and compared with other pollution parameters: BOD, COD, NH4-N and bacterial counts. The measurement of TOC was not significantly influenced by the presence of toxic substances, biodegradability, chemical structure, molecular weight of organic substances or their susceptibility to chemical oxidants. TOC correlated well with BOD, COD, NH4-N, Kjeldhal-N, and bacterial counts. TOC measurement provides rapid and accurate analysis of the extent of organic pollution in water.
W78-01197

SEASONAL DYNAMISM OF NITROGEN FIXERS AND CELLULOSE DEGRADING MICROORGANISMS IN WATERS AND SEDIMENTS OF THE DANUBE RIVER. (IN FERBO-CROATIAN),
Institute for Biological Research, Belgrade, (Yugoslovia).
O. Simic.
Arh Biol Nauka 25(3/4): 167-176. 1973. (English summary).

Descriptors: *Nitrogen fixation, *Danube River, Cellulose, Wood wastes, *Microbial degradation, Sediments.

Aerobic N fixers (bacteria) and aerobic cellulose degrading microorganisms of the Danube River have not yet been researched. Samples of the Danube water and sediments were taken from the left bank, right bank and middle course. These samples were collected during April, Aug. and Oct. 1972 and Feb. 1973. They were collected on 2

transverse profiles upstream of Zemun (1179 km) and Visnijica (1162 km) (Yugoslavia). A quantitative determination of the aerobic N fixers and cellulose degrading microorganisms was performed on slica gel. The N fixers showed clearly seasonal variations; the cellulose degrading microorgaisms did not.--Copyright 1977, Biological Abstracts, Inc.
W78-01211

SAMPLING AND ANALYSIS OF MINNESOTA TRIBUTARIES AND MUNICIPAL POINT SOURCES TO LAKE SUPERIOR.
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5B.
W78-01229

AMBIENT AIR CONTAMINATION BY MICRON AND SUBMICRON PARTICLES FROM WELDING OPERATIONS,
Lund Inst. of Tech. (Sweden). Dept. of Nuclear Physics.
H. O. Lannefors, and K. R. Akselsson.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 5, p 521-527, May, 1977. 1 fig, 3 tab, 9 ref.

Descriptors: *Air pollution, *Metals, *Environmental effects, *Analytical techniques, *X-ray analysis, Iron, Potassium, Manganese, Particle size, Air pollution effects, Path of pollutants, Sampling, Industrial wastes, *Pollutant identification.
Identifiers: Welding wastes, X-ray emission analysis, Impactor sampling.

Impactor sampling and analysis of size fractions by particle-induced X-ray emission analysis (PIXE) is suggested as a means of distinguishing industrial particulate matter from particulate matter of other origins. Two rooftop samplings in downtown and industrial areas in a small Swedish town were equipped with single orifice cascade impactors of Bat elle design to collect micron- and submicron-sized airborne particulates. Size distribution of particulates containing sulfur, iron, potassium, manganese, zinc, and lead indicated that trends in size could be used to define possible sources for fractions of the particulate matter. In this example, fumes from adjacent welding operations were indicated as the source of iron, potassium, and manganese. Multi-element analysis with PIXE in combination with impactor sampling is recommended for detecting the influence of fugitive emissions and ventilation air on ambient air quality. (Schulz-FIRL)
W78-01251

ELECTROPLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W78-01262

DETERMINATION OF TRACE ELEMENT CONTAMINATION OF SEDIMENTS BY MULTIELEMENT ANALYSIS OF CLAY-SIZE FRACTION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W78-01311

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1976.
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01317

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1975.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01318

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1976.
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01319

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1975.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01320

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1975.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01321

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1975.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01322

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1976.
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01323

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1975.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01324

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1976.
Geological Survey, Iowa City, IA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01326

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01328

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01329

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01330

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01331

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01332

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01333

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01334

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01335

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1975.
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01336

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1976.
Geological Survey, Augusta, ME. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01337

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1976.
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01339

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01340

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01341

EVALUATION OF SEWAGE TREATMENT FACILITIES, SAN FRANCISCO, CALIFORNIA, SEPTEMBER 1975.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5D.
W78-01409

CHLORINATED WASTEWATER OUTFIT IS PORTABLE.
Water and Pollution Control, Vol 115, No 8, p 28, August, 1977.

Descriptors: *Hydrogen ion concentration, *Dissolved oxygen analyzers, *Chlorine, *Analytical techniques, *Monitoring, Equipment, *Pollutant identification, Instrumentation, Chemical analysis, Effluents, Waste water treatment, *Chlorination.
Identifiers: Hydrogen ion concentration meters, Chlorine meters.

The LaMotte Chemical Products Company of Chestertown, Maryland, produces a combination monitoring unit (Model MH-3) for chlorine, dissolved oxygen, and pH. For use with chlorinated waste water discharges, the unit includes a waterproof carrying case, solid state electrical components, and a combination electrode. It is a lightweight field instrument which uses a DPD-FAS titration procedure to determine free and combined chloride over a 0.1-5.0 ppm range. Dissolved oxygen in the 0-20 ppm range is determined with a microburette procedure in an Azide modification of the Winkler method. A battery-operated LaMotte pH meter is provided to measure pH from 0 to 14 within 0.1 pH units. (Schulz-FIRL)
W78-01473

THE DETERMINATION OF TRACE ACRYLAMIDE IN WATER AND SLUDGE (MIZUOYOBI SURAJJI NAKA NO BIRYO AKURIRUAMIDO NO TEIRYO HO),
H. Nakamura.
Suido Kyokai Zasshi, No. 514, p 37-41, July, 1977. 5 fig, 2 tab, 11 ref.

Descriptors: *Analytical techniques, *Gas chromatography, *Mass spectrometry, *Polymers, Organic wastes, Chemical analysis, Sludge, Waste water, Water analysis, Sea water, *Path of pollutants, *Pollutant identification.
Identifiers: *Acrylamide.

Trace acrylamide concentrations in municipal water, artificial seawater, and sewage sludge were measured with a gas chromatograph-mass spectrometer equipped with an electron capture detector. The sample containing acrylamide was brominated with the addition of a large amount of KBr and 0.1% M KBr03. The gas chromatograph column was filled with 15% EGS and the Florisil clean-up method was used in the determinations. With this method the detection range for acrylamide was 0.1-1,000 ng/liter. With the use of the standard addition method in the analysis of municipal water, artificial seawater, and sludge, acrylamide was determined within 86-93% with a relative standard deviation of less than 2%. (Schulz-FIRL)
W78-01475

OPTIMAL USE OF INSTRUMENTAL NEUTRON AND PHOTON ACTIVATION ANALYSES FOR MULTIELEMENT DETERMINATIONS IN SEWAGE SLUDGES,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
A. Chattopadhyay.
Journal of Radioanalytical Chemistry, Vol. 37, No. 2, p 785-799, 1977. 4 tab, 28 ref.

Descriptors: *Neutron activation analysis, *Analytical techniques, *Pollutant identification, *Irradiation, *Trace elements, Chemical analysis, Fertilizers, Sludge, Chemical reactions, Municipal wastes, Industrial wastes, Metals, Sewage disposal, Waste water treatment.
Identifiers: *Photon activation analysis.

A procedure involving a combination of instrumental neutron activation analysis (INAA) and photon activation analysis (IPAA) for multielement determinations in a variety of sludges and fertilizers is described. The method was devised in experiments with raw and anaerobically digested chemically conditioned sludges, agricultural lime, N-P-K fertilizers, ammonium nitrate, muriate of potash, Milorganite, cattle manure, and sewage-based fertilizers. Details of the neutron and photon irradiation of the samples are presented. Experiments on the INAA method indicated that a total of 50 elements could be measured in sludge samples with 15 min and 60 hr irradiation times. Irradiation periods of 2 min and 6 hr allowed measurements of 36 elements with the IPAA method. Nuclear data for the elements detected with the methods are presented, including activation reactions, product half-lives, gamma-ray energy, and decay times. Replicate analyses of a homogenized chemical sludge sample were used to evaluate the reproducibility and accuracy of both methods. The analyses indicated that the standard deviations of most of the elements examined were 5-10% of the mean value. The choice of the analytical method should be based on the irradiation facilities available. (Schulz-FIRL)
W78-01476

EXPERIENCES WITH THE ALGAL ASSAY PROCEDURE (ERFAHRUNGEN MIT DER ALGAL ASSAY PROCEDURE),
Hoechst A.G., Frankfurt am Main (West Germany). Pflazenschutzforschung-Biologie.
P. Hartz.
Gas- and Wasserfach, Wasser-Abwasser, Vol. 118, No. 8, p 272-278, 1977. 6 fig, 7 tab, 6 ref.

Descriptors: *Algae, *Analytical techniques, *Eutrophication, *Sulfates, *Chemical analysis, Environmental effects, Algicides, Iron compounds, Waste water treatment, *Pollutant identification, *Bioassay.
Identifiers: *Algal assay procedure.

The Algal Assay Procedure was studied with respect to its suitability for the assessment of the eutrophication of biological purified waste water and of surface water bodies. Bottle tests with purified waste water from the last biological stage revealed that precipitation with aluminum sulfate causes a considerable reduction of the algal growth compared with that observed before precipitation. Tests with Rhine water showed that iron (II) sulfate is unsuitable for the precipitation of phosphates, if the phosphate sludge can not be removed within a short time, because the phosphate may be remobilized. Moreover, considerable growth stimulation of Anabaena flos-aquae was observed in surface water treated with iron (II) sulfate, which can be explained by the specific stimulating effect of iron. By contrast, the algal growth was significantly depressed in water treated with aluminum sulfate. (Takacs-FIRL)
W78-01478

COMPARISON OF FOUR-HOUR AND TWENTY-FOUR-HOUR REFRIGERATED STORAGE OF NONPOTABLE WATER FOR FECAL COLIFORM ANALYSIS,
Wisconsin Univ.-Madison. Dept. of Natural Resources.
J. H. Standridge, and D. J. Lesar.
Applied and Environmental Microbiology, Vol. 34, No. 4, p 398-402, October, 1977. 1 tab, 14 ref.

Descriptors: *Sampling, *Analytical techniques, *Coliforms, *Sewage bacteria, *Microbiology, Water analyses, Testing procedures, Statistics, Sewage treatment, *Bioassay, *Pollutant identification, Municipal wastes, Industrial wastes, Waste water treatment.
Identifiers: Sample storage, Membrane filter technique, Fecal coliforms.

Fecal coliform levels observed in water samples stored for 4 hr at 4C were compared with those observed in the samples after 24 hr of storage. Samples for analysis were obtained for secondary sewage treatment plants receiving only domestic wastes, from plants receiving a combination of municipal and industrial wastes, and from rivers and streams receiving a mixture of municipal and agricultural wastes. The membrane filter technique was used in the 30 replicate analyses of each sample at 4- and 24-hr periods. The 5-day biochemical oxygen demand in mg/liter was measured for each sample. A statistical comparison of theanalyses conducted for 4- and 24-hr storage periods indicated that fecal coliform levels obtained were equivalent within the 95% confidence interval for all but three sampling sites. Two of three sites were reported as grossly overloaded sewage plants producing a poor final effluent, and the third was one in which vacuum filtration was used after final clarification. the test results suggested that storage of samples for 24 hr could result in reliable analyses with economic and qualitative advantages over storage for 4 hr. (Schulz-FIRL)
W78-01479

ANALYSIS FOR TOXIC SUBSTANCES PRESENT IN WASTE WATER FOR BIOLOGICAL PURIFICATION PURPOSES (PRUEFUNG VON ABWASSERINHALTSSTOFFEN AUF GIFTWIRKUNG FUER DIE BIOLOGISCHE KLAERSTUIE),
Eidgenoessische Materialpruefungs- und Versuchsanstalt, Sankt Gallen (Switzerland). Vorsteher der Abt. Chemie.
W. Schefer.
Gas-Wasser-Abwasser, Vol. 57, No. 7, p 520-523, 1977. 4 fig, 1 tab, 7 ref.

Descriptors: *Analytical techniques, *Activated sludge, *Toxicity, *Oxygen demand, *Chemical analysis, Sludge digestion, Sludge treatment, Biological treatment, Microorganisms, Waste water treatment, *Pollutant identification.

A simple method for testing inorganic and organic substances for their toxicity with respect to the activated sludge of biological waste water treatmrnt plants is described. The substance to be tested is added in various concentrations ranging from 5 to 1,000 mg/liter to activated sludge taken from biological waste water treatment plants, and the resulting reduction in the oxygen consumption is determined by a known (barometric, coulometric, etc.) method. Substances which reduce the oxygen consumption to 50% in concentrations over 500 mg/liter are considered as nontoxic or low toxicity, while substances with LC50 under 100 mg/liter are highly toxic to the activated sludge. (Takas-FIRL)
W78-01480

PERFORMANCE INVESTIGATION OF THE MANNING MODEL S-4000 PORTABLE WASTEWATER SAMPLER AND THE MODEL F-3000 DIPPER FLOWMETER,
Environmental Monitoring and Support Lab., Cincinnati, OH.
P. R. Lauch.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 150, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/4-76-059, December 1976. 62 p, 13 fig, 23 tab, 4 ref, 1 append.

Descriptors: *Water sampling, *Data collections, *Flowmeters, *Laboratory tests, *Water analysis, On-site data collections, Equipment, Analytical techniques, Laboratory equipment, Reliability, Operation and maintenance, Sewage treatment, Monitoring, Effluents, Waste water treatment, Sampling.
Identifiers: Waste water samplers, Manning model S-4000 portable waste water sampler, Manning model F-3000 dipper flowmeter.

The objective of this study was to examine the operation and performance of two automatic monitors used in waste water treatment plants, the Manning model S-4000 waste water sampler and the Manning model F-3000 flowmeter. Descriptions of the two monitoring devices are presented. The sampler was tested in a laboratory environmental chamber at temperatures of 2, 20 and 35C. Accuracy and precision, multiplexer runs, multiple bottle sampling, battery endurance, sample preservation with ice, sample representativeness, and reliability were evaluated. Tracking, analog to digital conversion, electronic drift, deadband, and overall accuracy and precision were evaluated in laboratory tests of the flowmeter. Results of laboratory studies indicated that the overall design and performance of the devices tested were above average when compared with similar equipment available for use in waste water treatment plants. Deadband or backlash in the gearing which produced an error of 11.63-6.14% was considered the most serious shortcoming of the flowmeter. In field tests with treatment plant influent and effluent, the sampler reliably collected suspended solids and raw sewage while left unattended for a 24-hr period. (Schulz-FIRL)
W78-01516

CHEMICAL/BIOLOGICAL IMPLICATIONS OF USING CHLORINE AND OZONE FOR DISINFECTION,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-01517

REMOTELY SENSED AND LABORATORY SPECTRAL SIGNATURES OF AN OCEAN-DUMPED ACID WASTE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
B. W. Lewis, and V. G. Collins.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA-TN-D-8467, Price codes: A03 in paper copy, A01 in microfiche. Report NASA TN D-8467, 1977. 36 p, 12 fig, 3 tab, 6 ref, 1 append. 176-30-31-11.

Descriptors: *Spectrometers, *Mathematical models, *Water pollution, *Oceans, *Iron, Acidic water, Waste water(Pollution), Reflectance, Waste disposal, *Pollutant identification, *Remote sensing, Plumes.

A rapid scanning spectrometer remotely measured ocean radiance from a helicopter to study an ocean-dumped acid waste plume. An ocean spectral reflectance signature and a laboratory spectral transmission signature were established for the iron-acid waste pollutant. The spectrally and chemically significant component of the acid waste pollutant was determined to be ferric iron. The concentration of the acid waste in the plume was determined with a simple mathematical model using the remotely sensed ocean spectral reflectance of the plume and the laboratory spectral transmissivity as a function of iron concentration. The method compares the shape (color) of the spectral reflectance curves, calculated for various iron concentrations from laboratory transmissivity data, with the remotely measured spectral radiance curves of the plume. The calculated curve that most nearly matches the shape (color) of the plume curve gives the estimated concentration of iron in the plume at the point of measurement. The agreement with sea-truth iron concentration was quite good in the limited number of stations where good remote spectral data were obtained. The results indicate the remotely sensed monitoring of acid waste is feasible. (Wares-IPA)
W78-01545

DETECTION OF FILAMENTOUS IRON BACTERIA IN OPEN RECIRCULATING COOLING WATER SYSTEMS,
H. E. Hilliard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 117, Price codes: A02 in paper copy, A01 in microfiche. Report of Investigations 8204, 1976. 11 p, 3 fig, 5 ref, 3 append.

Descriptors: *Microorganisms, *Iron bacteria, Water supply, Sampling, Water pollution, Testing procedures, Pollutant identification, Methodology, Analytical techniques, *Millipore Total Count Sampler.

A method for detecting and counting filamentous iron bacteria in open recirculating cooling water systems was investigated. Samples from 26 water systems were examined, cultivating cells on commercially prepared media (the Millipore Total Count Sampler). Cultures grew well on this medium and were identified as filamentous iron bacteria by microscopic examination and by their ability to deposit iron using the Prussian blue reaction. Results demonstrated that most cooling water systems are likely to contain filamentous iron bacteria and that they can be detected and counted with the Millipore sampler. The procedure described is simpler and faster than conventional techniques for microbiological detection and enumeration such as the pour plate method. Three appendices present information on aseptic technique of inoculation or transfer of a culture, preparation of a smear, and glycerol glutamate medium. (Wares-IPA)
W78-01548

WORKSHOP ON NUCLEAR TECHNIQUES FOR ENVIRONMENTAL TRACE ELEMENT INFORMATION RELATIVE TO ENERGY PRODUCTION AND CONSUMPTION, FLORIDA STATE UNIVERSITY, TALLAHASSEE, JUNE 23-26, 1974.
National Science Foundation, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 964, Price codes: A03 in paper copy, A01 in microfiche. August 1974. 45 p, 3 tab, 18 ref, append. GP-44333.

Descriptors: *Analytical techniques, *Environment, *Nuclear physics, Air pollution, Water pollution, Aerosols, Measurement, Methodology, *Trace elements, Biology, Energy.

A summary of workshop viewpoints and problems and technical summaries of workshop discussions is presented. Participants generally agreed that recent refinements in nuclear techniques for trace elements measurement now make possible new advances in the investigation of the flow of material through the environment and of the impact of trace elements on the biosphere and man. Problems addressed by the workshop included: flow of materials through the environment, perturbations by energy-intensive activities, trace element impacts on man and the biosphere, the place of trace elements in immediate national environmental missions, potential for nuclear techniques to meet environmental research and monitoring needs, and evaluation of nuclear techniques for environmental trace element research by examples of aerosol studies. The workshop set forth two long-term objectives needed in federal funding of environmental trace elements research: continuing research in important areas and the generation of manpower for continuing research. The special role of nuclear scientists in environmental trace elements research is seen as the transfer of identification with original specialties to emphasis on environmental quality, characterized by a high level of mass interdisciplinary interaction. Technical papers on air pollution research; interlaboratory data comparison; aerosol composition, collection, and analysis; environmental sampling; particulate sampling and analysis; nuclear methods of analysis; water pollution; and biological systems are summarized. The appendix contains statements by persons unable to attend the workshop, a workshop outline, and a list of attendants. (Wares-IPA)
W78-01550

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES. VOLUME I. EXECUTIVE SUMMARY,
Battelle-Northwest, Richland, WA. Pacific Northwest Lab.
G. W. Dawson, M. W. Stradley, and A. J. Shuckrow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 793, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-440/9-75-005-a, 1975. 33 p, 4 fig, 2 tab. EPA-68-01-2268.

Descriptors: *Water pollution, *Accidents, *Regulation, *Penalties(Legal), Law enforcement, Econometrics, Resources, Methodology, Value, Cost allocation, Freshwater, Saline water, Lakes, Estuaries, Water quality standards.
Identifiers: *IMCO/GESAMP methodology, DOHM methodology, *Hazardous materials.

Four methodologies for use in developing regulatory control programs for the prevention and/or removal of spills of hazardous substances as required under Section 311 of the Water Pollution Control Act of 1972 are summarized. Specific hazardous substances, their harmful quantities, and penalty rates for spills were designated. The resource value methodology directs attention to the economic value of environmental resources and the potential loss as a result of hazardous material spillage, defining a threshold dollar value selected through a decision analysis process. Rates of penalty derive from the value of resources lost. The modified IMCO/GESAMP methodology is a procedure designating harmful quantities and rates of penalty based on a proposed international hazardous material rating/classification system which has been submitted to the United Nations for adoption. This methodology utilizes the system to profile hazardous materials on the basis of their relative hazard potentials, relegating materials to categories, determining critical concentration, and then deriving a harmful quantity and base rate of penalty for each category using the resource value methodology. The penalty rate is then modified for individual hazardous materials by an adjustment factor based on hazard potential properties. The unit of measurement methodology addresses legalities using common trade practice measurement and fixed monetary guidelines. The Division of Oil and Hazardous Materials (DOHM) methodology uses a simplified plug flow model to assess the quantity of a hazardous material (harmful quantity) which when spilled is capable of inflicting substantial harm to key aquatic organisms in a stream. The rate of penalty is equated to the cost that would have been incurred by the discharger had preventive measures been instituted. (See also W78-01552 and W78-01553) (Wares-IPA)
W78-01551

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES,
Battelle-Northwest, Richland, WA. Pacific, Northwest Lab.
For primary bibliographic entry see Field 5G.
W78-01552

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES,
Battelle-Northwest, Richland, WA. Pacific Northwest Lab.
For primary bibliographic entry see Field 5G.
W78-01553

LEUCOCRIT: A SIMPLE HEMATOLOGICAL TECHNIQUE FOR MEASURING ACUTE STRESS IN SALMONID FISH, INCLUDING STRESSFUL CONCENTRATIONS OF PULP MILL EFFLUENT,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5C.
W78-01564

ANNUAL BOOK OF ASTM STANDARDS. PART 31. WATER.
American Society for Testing and Materials, Philadelphia, PA.
1977. 1108 p.

Descriptors: *Water quality standards, *Water analysis, Water, Specifications, Sampling, Flow measurement, Water properties, Acidity, Alkalinity, Hydrogen ion concentration, Conductivity, Corrosion, Hardness(Water), Odor, Surface tension, Chemical oxygen demand, Oxidation-reduction potential, Toxicity, Turbidity, Dissolved solids, Suspended solids, Inorganic compounds, Metals, Anions, Cations, Organic matter, Oil, Pesticides, Herbicides, Phenols, Surfactants, Polychlorinated biphenyls, Radioactivity, Radioisotopes, Bacteria, Sediments, Chemicals, Ion exchange, Membranes, Heavy water, Water treatment.
Identifiers: Hydrazine.

This volume (one of a 48-volume set) comprises the testing and analytical standards of Committee D-19 on water. The 9 sections deal with definitions, specifications, reagents, and reporting of results; sampling and flow measurement; general properties of water (acidity, alkalinity, pH, conductivity, corrosivity, hardness, odor, surface tension, COD, redox potential, toxicity, turbidity, particulate and dissolved solids, etc.); inorganic constituents (metals, nonmetals, cations, anions, hydrazine, etc.); organic constituents (including waterborne oils, pesticides and herbicides, phenolic compounds, surfactants, PCB's, etc.); radioactivity (including specific radionuclides and heavy water); bacteriological examination; water-formed deposits; and water-treatment materials (chemicals, ion-exchangers, and membrane filters). A numeric list of standards and a subject index are included. (Brown-IPC)
W78-01576

THE EFFECT OF ANAEROBIOSIS ON MEASUREMENT OF SULFITE PULP MILL EFFLUENT CONCENTRATION IN ESTUARINE WATER BY U.V. SPECTROPHOTOMETRY,
Fisheries and Marine Service, St. Andrews (New Brunswick).
D. J. Wildish, N. J. Poole, and D. D. Kristmanson.
Bulletin of Environmental Contamination and Toxicology, 16, No 2, p 208-213, 1976. 1 fig, 12 ref, 3 tab.

Descriptors: *Pulp wastes, *Anaerobic conditions, *Sulfite liquors, *Water analysis, *Spectrophotometry, *Sea water, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Lignins, Microbial degradation, Ions, Air, Nitrogen, Filters, Filtration, Sterilants, Storage.
Identifiers: Lignosulfonates, Bisulfite, Spent pulping liquor.

Dissolved substances in effluents from the sulfite pulping process consist of approximately one-third soluble carbohydrates (principally hexoses and pentoses) and two-thirds lignin and lignosulfonates. Because of their persistent nature, lignins and lignosulfonates are frequently used to measure sulfite mill effluent concentration. Two potential errors were found in the determination of sulfite pulp mill effluents in seawater by ultraviolet spectrophotometry: loss of absorption due to microbial degradation of lignosulfonates, particularly under anaerobic conditions, and interference due to bisulfite ion under anaerobic conditions. Interference due to bisulfite can be removed by purging with air or nitrogen. Field samples sterilized by filtration through 0.22 or 0.45 micrometer membrane filters can be stored at least three months without loss of absorbance. (Buchanan-IPC)
W78-01577

ANALYSIS OF A PULP AND PAPER MILL EFFLUENT PLUME,
Canada Centre for Inland Waters, Burlington (Ontario).
C. K. Minns.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 776-783, June, 1977. 8 fig, 7 ref, 4 tab.

Descriptors: *Pulp wastes, *Water analysis, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, *Lake Superior, Great Lakes, Dyes, Tracking techniques, Waste dilution, Sodium, Carbon, Nitrogen.
Identifiers: *Nipigon Bay(Lake Superior).

Several chemical surveys of a pulp and paper mill effluent plume in Nipigon Bay, Lake Superior, are analyzed to determine the average area and volume contained by a range of isoconcentration boundaries. Sodium, dissolved organic carbon, particulate organic carbon, and particulate organic nitrogen are the chemical variables used to examine changes occurring in the plume. Data are analyzed from three sampling regimes: (1) dye-slug tracking which allows interpretation of time-related processes, (2) surface surveys which indicate the areal extent of the plume, and (3) vertical profile surveys which indicate the degree of depth penetration for effluent components. Dilution dominates in the plume, though the nonconservative substances undergo significant changes. The plume area enclosed in a contour of 1% effluent is approximately 1.5 sq km. Mass balance calculations indicate exchanges occurring between the plume and the older fiber beds in the vicinity of the effluent outfall. (Witt-IPC)
W78-01584

OCEAN COLOR IMAGERY- COASTAL ZONE COLOR SCANNER,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
W. A. Hovis.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1989-2003, September 1975. 10 fig, 1 tab.

Descriptors: *Remote sensing, *Oceans, *Pollutant identification, *Coasts, Aircraft, Chlorophyll, Aerial photography, Instrumentation, Sediment distribution, Path of pollutants, Water pollution.

Investigations into the feasibility of sensing ocean color from high altitude for determination of chlorophyll and sediment distributions were carried out using sensors on NASA aircraft coordinated with surface measurements carried out by oceanographic vessels. Spectrometer measurements in 1971 and 1972 led to development of an imaging sensor now flying on a NASA U-2 and the Coastal Zone Color Scanner to fly on Nimbus G in 1978. Results of the U-2 effort have shown the imaging sensor also to be of great value in sensing pollutants in the ocean. Quantification of parameters such as chlorophyll concentration, on a global scale, will require extensive research effort, prior to the launch of the Nimbus G CZCS, to include high altitude aircraft scanner flights coordinated with far more extensive surface truth measurements than have been accomplished to date. (See also W78-01589) (Humphreys-ISWS)
W78-01610

SKYLAB INVESTIGATION OF THE UPWELLING OFF THE NORTHWEST COAST OF AFRICA,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-01611

QUANTITATIVE SUSPENDED SEDIMENT MAPPING USING AIRCRAFT REMOTELY SENSED MULTISPECTRAL DATA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 7B.
W78-01615

NITRATE LEVELS IN ESSEX RIVER WATERS,
Essex Water Co. (England).
For primary bibliographic entry see Field 5B.
W78-01626

AD HOC ADVISORY PANEL ON EVALUATED PHYSICAL PROPERTY DATA IN AID OF AQUEOUS ENVIRONMENTAL PROBLEMS.
National Academy of Sciences and National Research Council, Washington, DC. Numerical Data Advisory Board.
For primary bibliographic entry see Field 5B.
W78-01654

MAJOR, MINOR, AND TRACE ELEMENTS OF BOTTOM SEDIMENTS IN LAKE DU QUOIN, JOHNSTON CITY LAKE, AND LITTLE GRASSY LAKE IN SOUTHERN ILLINOIS,
Illinois State Geological Survey, Urbana.
G. B. Dreher, C. B. Muchmore, and D. W. Stover.
Environmental Geology Note No. 82, August 1977. 37 p, 10 fig, 8 tab, 7 ref.

Descriptors: *Lake sediments, *Illinois, *Elements(Chemical), *Trace elements, Silica, Aluminum, Potassium, Calcium, Magnesium, Iron, Titanium, Manganese, Phosphates, Carbon, Carbon dioxide, Boron, Copper, Cobalt, Nickel, Beryllium, Chromium, Zinc, Strontium, Sampling, Chemical analysis, Clay minerals, Cores, X-ray fluorescence, Spectrometers, Statistical methods.
Identifiers: Factor analysis, Cluster analysis.

Bottom sediments from 3 Southern Illinois lakes, Lake Du Quoin, Johnston City Lake, and Little Grassy Lake, were analyzed chemically for 11 major and minor constituents-SiO2, A1203, K20, Ca0, Mg0, Fe203, Ti02, Mn0, P205, CO2, and total carbon; and 10 trace elements-B, Cu, Co, Ni, Be, Cr, V, Zn, Sr, and Zr. The less-than-two micrometer clay-size fraction was determined by the pipet method. The sediments from Lake Du Quoin and Johnston City Lake have a high clay content in the upper portions of the bottom sediment cores and a low clay content in the lower portions, with a definite transition point demonstrated in 12 of 14 cores. Above the transition point, copper and zinc have maximum concentrations of 476 and 252 ppm, respectively, in Lake Du Quoin and max-

imum concentrations of 238 and 259 ppm, respectively, in Johnston City lake sediments. Copper and zinc have been contributed from external sources. The lower portions of the cores from these 2 lakes and the entire cores from Little Grassy Lake are chemically similar to sediment samples from ancient (Wisconsin and Holocene) Lake Saline. (Visocky-ISWS)
W78-01655

A SOLENOID-ACTUATED CHEMICAL-METERING APPARATUS FOR USE IN FLOW-THROUGH TOXICITY TESTS,
Fish and Wildlife Service, Warm Springs, GA. Southeaster Fish Control Lab.
J. H. Chandler, Jr, and S. K. Partridge.
The Progressive Fish Culturist, Vol. 37, No. 2, p. 93-95, 1975. 1 fig, 5 ref.

Descriptors: *Laboratory equipment, *Instrumentation, *Research equipment, Analysis, Laboratory tests, Testing, Monitoring, Methodology, Equipment, Research and development, Analytical techniques, Bioassay, Pollutant identification, *Flow-through toxicity tests.

The assembly and operation instructions for a simple, easily fabricated, relatively inexpensive and reliable chemical-metering apparatus were presented. The apparatus was suitable for use in long-term studies of the effects of chemicals on aquatic organisms. (Katz)
W78-01665

SPAWNING SUCCESS OF FATHEAD MINNOWS ON SELECTED ARTIFICIAL SUBSTRATES,
Environmental Research Lab., Duluth, MN.
D. A. Benoit, and R. W. Carlson.
The Progressive Fish Culturist, Vol. 39, No. 2, p. 67-69, 1977. 1 tab, 5 ref.

Descriptors: *Spawning, *Artificial substrates, *Fish eggs, *Minnows, Fish reproduction, *Aquiculture, Laboratory animals, Research and development, Laboratory equipment, Laboratory tests, Methodology, Fathead minnow.

Spawning success of fathead minnows (Pimephales promelas) on six different substrates was tested and evaluated. Egg adhesiveness was equally good on cement-asbestos tile and sand-coated stainless steel substrates, but was poor on unaltered stainless steel, shot-peened stainless steel, stainless steel screen, and glass substrates. Viability and number of eggs spawned were not significantly different for any of the substrates tested. These results demonstrate the importance of evaluating laboratory spawning substrates before using them in a life-cycle chronic exposure. (Katz)
W78-01667

DIPHENYL ETHER - ANOTHER MARINE ENVIRONMENTAL CONTAMINANT,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
R. F. Addison.
Marine Pollution Bulletin, Vol. 8, No. 10, p. 237-240, 1977. 2 fig, 2 tab, 18 ref.

Descriptors: *Ethers, *Gulls, *Herrings, *Chemical oxygen demand, *Gas chromatography, *Snow, *Precipitation(Atmospheric), *Path of pollutants, *Polychlorinated biphenyls, *Toxicity, Organic compounds, Analytical techniques, Chemical analysis, Canada, Pollutant identification, Tissue analysis, Bioaccumulation, *Seal, *Mackerel, *Cod.

Residues of diphenyl ether, a compound which has been used industrially for several decades, have been found in samples of seawater, lake water and snow, and in fat from fish, a seal and a gull collected from various points around Nova Scotia. (Katz)
W78-01668

TOTAL AND ORGANIC MERCURY IN THE PACIFIC BLUE MARLIN,
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
C. D. Shultz, D. Crear, J. E. Pearson, J. B. Rivers, and J. W. Hylin.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 2, p 230-234, 1975. 2 tab, 23 ref.

Descriptors: *Mercury, *Organic compounds, Fish physiology, *Inorganic compounds, Analytical techniques, Chemical analysis, Spectrophotometry, Metals, Water pollution, *Path of pollutants, *Pollutant identification.
Identifiers: Tissue analysis, Bioaccumulation, Biotransformation, *Methyl mercury, Pacific Blue Marlin, Organic mercury.

Samples from muscle, liver, central nervous tissue, and gonads of the marlin were analyzed for total and organic mercury content. Unlike many other studies of mercury contamination in fish summarized in the paper, the authors found a low level of organic mercury in the marlin tissues sampled. The biotransformation of organic mercury to less toxic and more easily excretable inorganic mercury by marline liver and/or intestinal bacteria was postulated as a possible explanation for the low mercury (organic) levels in this species. (Katz)
W78-01673

EFFICIENT ALGORITHMS FOR STATISTICAL ESTIMATION IN COMPARTMENTAL ANALYSIS: MODELLING 60CO KINETICS IN AN AQUATIC MICROCOSM,
Georgia Univ., Athens. Dept. of Statistics and Computer Science.
For primary bibliographic entry see Field 5B.
W78-01676

THE SPECIES DIVERSITY INDEX OF SOME IN-SHORE DIATOM COMMUNITIES AND ITS USE IN ASSESSING THE DEGREE OF POLLUTION ON PARTS OF THE NORTH COAST OF COMWALL,
For primary bibliographic entry see Field 5B.
W78-01678

TRACE METAL CONCENTRATIONS IN TWO SHELLFISH SPECIES OF COMMERCIAL IMPORTANCE,
Raytheon Oceanographic and Environmental Services, Portsmouth, RI.
J. B. Palmer, and G. M. Rand.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 4, p 512-520, 1977. 1 fig, 2 tab, 19 ref.

Descriptors: *Heavy metals, *Trace elements, *Cadmium, *Chromium, *Copper, *Lead, *Nickel, *Zinc, *Commercial shellfish, *Spectrophotometry, Animal physiology, *Animal metabolism, Standards, Mollusks, *Clams, Tissue analysis, Bioaccumulation.

Two species of salt water shellfish were analyzed for whole body concentrations of seven trace metals (Cd, Cr, Cu, Pb, Hg, Ni, Zn). All metal concentrations except Cd were what might be expected on an anatomical basis. The higher levels of Cd in an area considered relatively unpolluted and distant from any major sources of input suggests a natural propensity to concentrate this metal. (Katz)
W78-01681

5B. Sources Of Pollution

IMPORTANCE OF HOMOLOGY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATION OF WATER BODIES (IN RUSSIAN),
S. N. Cherkinskii, and V. P. Laskina.
Gig Sanit 9. 12-17. 1976. (English summary).

Descriptors: *Organic compounds, *Biological properties, Bodies of water.

Data on hygienic standardization of homologs of various organic compounds in water bodies were analyzed; 14 homlogous series were formed. The data collected makes it possible to forecast the biological effect of certain still unknown components of homolgous series.--Copyright 1977, Biological Abstracts, Inc.
W78-01199

TIME SERIES ANALYSIS ON AMMONIA CONCENTRATION AND LOAD VALUES OF THE RIVER RHINE,
Nijmegen Univ. (Netherlands). Dept. of Analytical Chemistry.
P. J. W. M. Mueskens, and W. G. J. Hensgens.
Water Research Vol. 11, No. 6, p 509-515, 1977. 2 fig, 4 tab, 8 ref.

Descriptors: *Time series analysis, *Statistical methods, *Stochastic processes, *Ammonia, Mathematical studies, Nitrogen compounds, Data collections, Measurement, Sampling, Waste disposal, Frequency, *Waste water disposal, *Path of pollutants.
Identifiers: *Rhine River, Autocorrelation.

The autocorrelation technique was used to statistically evaluate a series of data on ammonia concentrations and load values collected for the Rhine River over a 5-yr period. The purpose of the investigation was to separate observation noise from process fluctuations and to prove the presence of a periodicity or trend in the process. A derivation of the autocorrelation function is presented. Standard deivations and means were calculated for ammonia concentrations and load over 4 biannual periods and the total period of 5 yrs. An autocorrelation program was used to calculate autocorrelograms. Analysis of variance indicated that three factors could cause variance in sample values: analytical errors, sampling errors, and fluctuations in ammonia concentrations. Examination of ammonia concentrations in the time series revealed that ammonia load was a stochastic variable with an annual periodicity and a slightly decreasing trend. For ammonia concentrations distinct trends were observed within but not between the biannual periods. (Schulz-FIRL)
W78-01219

CHARACTERISTICS OF THE RUN-OFF RATE OF POLLUTION LOAD IN AN UNSEWERAGED AREA,
Kansai Univ., Osaka (Japan). Dept. of Engineering.
Y. Wada.
Technology Reports of the Kansai University, No. 18, p 111-120, March, 1977. 4 fig, 4 tab, 7 ref.

Descriptors: *Waste assimilative capacity, *Self purification, Streamflow, *Waste dilution, *Surface waters, Waste treatment, Mathematical models, Streams, Rivers, Hydrologic data, Model studies, Water pollution effects, Environmental effects, Water pollution sources.
Identifiers: Akashi River(Japan).

Studies were conducted on the Akashi River in Japan to determine average loading rates on the river and examine the river's capacity for self-purification. The objectives were to characterize pollutant loading rates in an area which is not serviced by a sewage collection system, and to derive re-

sidence times of various pollutants as a function of their loading rates. A series of mathematical equations to determine residence times and loading rates are presented. Major factors affecting the degree of loading are rainfall, stream characteristics, vegetation, the amount of available pollutants, and previous accumulations. Major factors affecting residence times include permeation, erosion, absorption, and dilution. On-site data collections were used to test the validity of the model in predicting the residence times of BOD, COD, suspended solids, total nitrogen, and total phosphorus. These parameters were measured at five locations along the Akashi River in Tokyo, Yokohama, Nagoya, Osaka, and Kobe. The survey indicated that at average flow rate much of the observed reduction in pollutants occurred over a short distance in the river, while at low flow rates the reduction occurred over a larger distance. (Schulz-FIRL)
W78-01222

SAMPLING AND ANALYSIS OF MINNESOTA TRIBUTARIES AND MUNICIPAL POINT SOURCES TO LAKE SUPERIOR.
Minnesota Pollution Control Agency, Roseville.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 526, Price codes: A11 in paper copy, A01 in microfiche. Technical Report EPA-905/4-75-002. 1975. 234 p, 2 fig, 4 tab, 7 ref, 2 append.

Descriptors: *Minnesota, *Water quality, *hydrology, *On-site data collections, *Sampling, Regional analysis, Hydrologic data, Tributaries, River basins, Water pollution sources, Lake Superior, Great Lakes, Treatment facilities, Effluents, Waste water treatment.
Identifiers: Nemadji River(MN), St Louis River(MN).

Results of a sampling program to determine constituent loadings of Minnesota tributaries to Lake Superior are presented. The geology, topography, climate, and population of the area are described. Sampling and analytical techniques used in the study are presented. Stream descriptions and stream flow values comprise the section on hydrology. Effluent standards and characteristics are presented for municipal-industrial discharges. Classification codes for the intrastate and interstate tributaries in the area are listed. Water quality data are given for three sub-basins, including the Nemadji River, the St. Louis River, and Lake Superior. Stream loadings for major tributaries in the sub-basins are given. Effluent quality and loadings are given for the four sewage treatment plants which discharge directly into Lake Superior. Appendices include a summary of tributary and sewage treatment plant loadings, as well as lists of data obtained at tributaries and sewage treatment plants during the study. (Schulz-FIRL)
W78-01229

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY STUDIES; PRELIMINARY REPORT,
Texas A and M Univ., College Station. Dept. of Oceanography.
Fo. primary bibliographic entry see Field 5C.
W78-01278

DISTRIBUTION AND COMPOSITION OF THE SUSPENDED PARTICULATE MATTER IN THE WATERS OF THE DOMES REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
E. T. Baker, R. A. Feely, J. Nevins, and K. Takahashi.
Deep Ocean Mining Environmental Study (DOMES), Unpublished Manuscript No. 1, 1977. 60 p, 26 fig, 5 tab, 22 ref.

Descriptors: *Particle size, *Plumes, *Environmental effects, *Baseline studies, Resources development, Suspended sediments.
Identifiers: Suspended particulate matter, Manganese nodules, Ocean mining, Particulate matter.

The DOMES (Deep Ocean Mining Environmental Study) project is a multidisciplinary research effort designed to assess the marine environmental impacts resulting from commercial mining of deep-ocean manganese nodules. Results are described of the suspended particulate matter (SPM) program conducted during DOMES cruises RP-8-OC-75 (August 24 to October 16, 1975) and RP-8-OC-76 (February 11 to April 17, 1976) onboard the NOAA ship OCEANOGRAPHER. (NOAA)
W78-01279

REPORT ON EVALUATION OF WASTE SOURCES IN THE MEMPHIS, TENNESSEE AREA.
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 330, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-330/2-72-011, 1975. 190 p, 20 fig, 25 tab, 3 append.

Descriptors: *Water pollution sources, *Industrial wastes, *Interceptor sewers, *Mississippi River, Water pollution control, Organic wastes, Monitoring, Environmental effects, On-site data collections, Pollution abatement, Waste water treatment.
Identifiers: Memphis(TN).

The purposes of this study were to analyze waste water discharges from major industries in the Memphis, Tennessee, metropolitan area and to evaluate water quality of the Mississippi River upstream and downstream from the Nonconnah and Wolf interceptor sewers. Background information, waste sources and treatment, and a discussion of in-plant evaluations and results are presented. Average daily loads discharged by the 19 industries recognized as waste sources are given. Effluents of one military installation and one municipal waste water treatment plant were also evaluated. Treatment recommendations for each source of pollution are given. Industries which now discharge or plan to discharge wastes to the Memphis sewer system and do not meet pretreatment requirements were identified. (Schulz-FIRL)
W78-01282

REPORT ON WATER QUALITY AND WASTE-SOURCE INVESTIGATIONS-MISSOURI RIVER AND PAPILLION CREEK, OMAHA, NEBRASKA.
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 936, Price codes: A11 in paper copy, A01 in microfiche. Report EPA-330/2-73-001, 1973. 242 p, 4 fig, 9 tab, 12 ref, 8 append.

Descriptors: *Sewerage, *Water quality, *Water pollution control, *Sewerage, *Combined sewers, Municipal wastes, Industrial wastes, Sewage treatment, Effluents, Hydrologic data, On-site data collections, Sampling, Waste water treatment, *Missouri River.
Identifiers: Omaha(NB), Missouri River(NB).

Studies of municipal and industrial waste water treatment facilities, as well as limited stream surveys of the Missouri River and Papillion Creek, were conducted in Omaha, Nebraska, to evaluate water pollution control practices, examine the adequacy of Omaha's sewer system, and evaluate pollution abatement progress. Surveys indicated that municipal and industrial waste water sources discharged daily loads of 135,000 lb BOD and 170,000 lb suspended solids. Removal of BOD and suspended solids by primary treatment at the Missouri River plant was 13% and 22%, respectively. Secondary treatment for all waste waters discharged to the Missouri River was recommended by 1975. An investigation of the sewage system indicated that raw waste water was often by-passed directly to the river. Replacement of the deteriorating combined sewers with separate storm and sanitary sewers was recommended. Principal municipal and industrial waste sources are described. Aspects of the sewerage system which are discussed include diversion structures, grit removal facilities, and lift stations. Results of stream surveys, recommended standards for effluent quality, and the status of water pollution abatement measures in the area are discussed. (Schulz-FIRL)
W78-01283

EFFECTS OF A RECREATIONAL IMPOUNDMENT ON NEARBY NATURAL LAKES: A CASE STUDY,
Wisconsin Univ.-Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-01291

RUNOFF FREQUENCY FROM SMALL STORMS AND IMPLICATIONS FOR WATER QUALITY,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 2E.
W78-01294

SIGNIFICANCE OF DIURNAL VARIATIONS IN FECAL COLIFORM DIE-OFF RATES IN THE DESIGN OF OCEAN OUTFALLS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5E.
W78-01471

POLLUTION STUDIES OF TRACE ELEMENTS IN SEDIMENTS FROM THE UPPER SARONIKOS GULF, GREECE,
Democritus Nuclear Research Center, Athens (Greece). Chem. Dept.
A. P. Grimanis, M. Vassilaki-Grimani, and G. B. Griggs.
Journal of Radioanalytical Chemistry, Vol 37, No 2, p 761-773, 1977. 8 fig, 1 tab, 20 ref.

Descriptors: *Trace elements, *Geochemistry, *Estuaries, Soil chemical properties, *Path of pollutants, Water pollution sources, Soil analysis, Heavy metals, Analytical techniques, Neutron activation analysis, Outfalls, Industrial wastes, Municipal wastes, Fertilizers, Waste water disposal, Sediments.
Identifiers: *Saronikos Gulf(Greece).

Instrumentation neutron activation analysis was used to analyze 84 sediment samples collected from Elefsis, Keratsini, and Piraeus Bays of the upper Saronikos Gulf in Greece. Concentrations of 17 elements were measured: As, Ce, Co, Cr, Eu, Fe, Hg, Hf, La, Lu, Rb, Sb, Sc, Sm, Yb, and Z. Isopleths for the concentrations of these elements in the upper Saronikos Gulf were extrapolated from experimental data. Lower and upper limit values of trace element concentrations in sediments are presented. Sediments collected in the vicinity of the Athens sewage outfall exhibited the highest concentrations of Cr, while all the other elements occurred at their greatest concentrations in the Piraeus Harbor region. In general, trace element concentrations were lower for Elefsis Bay than for Keratsini Bay. Industrial plants at the entrance of Piraeus Harbor, the Athens sewage outfall, and industries in the northern and eastern regions of Elefsis Bay were suggested as the major sources for the increased trace element concentrations in upper Saronikos Gulf sediments. (Schulz-FIRL)
W78-01474

THE DETERMINATION OF TRACE ACRYLAMIDE IN WATER AND SLUDGE (MIZUOYOBI SURAJJI NAKA NO BIRYO AKURIRUAMIDO NO TEIRYO HO),
For primary bibliographic entry see Field 5A.
W78-01475

BIODEGRADATION OF POLYMERIC BUILDERS--EXPERIMENTS WITH A C-14 LABELLED SODIUM POLY(ALPHA-HYDROXYACRYLATE),
Solvay and Cie, S.A., Brussels (Belgium). Central Lab.
J. Mulders, and J. Gilain.
Water Research, Vol. 11, No. 7, p 571-574, 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Polymers, *Biodegradation, *Activated sludge, *Detergents, *Chemical wastes, Microorganisms, Organic wastes, Sewage treatment, Waste water treatment.
Identifiers: Sodium poly(Alpha-hydroxyacrylate).

Eutrophication of surface waters brought about by the use of phosphate-bearing detergents has prefaced this investigation of the biodegradation of polymeric polyelectrolytes, in particular sodium poly(alpha-hydroxyacrylate). Oxygen consumption and mineralization were measured in laboratory experiments. Removal of a C-14 labelled product was investigated in continuous activated sludge tests. Studies indicated that the sludge was capable of rapidly and quantitatively adsorbing the polymer and that microorganisms did not have to adapt to the product. A co-metabolism mechanism of removal is suggested by the high degree of transformation and low mineralization. Tests with acclimated sludge resulted in a higher rate of polymer assimilation and a low rate of mineralization. More than 95% of the polymer was biodegraded. (Schulz-FIRL)
W78-01477

MODELS FOR PREDICTING THE IMPACT OF IRRIGATION ON SOIL SALINITY,
Hebrew Univ., Jerusalem (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 3C.
W78-01495

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALITY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,
Agricultural Research Service, University Park, PA. Northeast Watershed Research Center.
A. S. Rogowski, H. B. Pionke, and J. G. Broyan.
Journal of Environmental Quality, Vol 6, No 3, July-Sept 1977, p 237-244, 64 ref.

Descriptors: *Model studies, *Strip mine wastes, *Coal mine wastes, *Mine wastes, *Spoil banks, Strip mines, Chemistry, Mine acids, Water pollution sources, Water pollution, Water quality, Evapotranspiration, Erosion, Surface runoff, Temperature, Pyrite, Mathematics.

Current energy conditions require increased strip-mining of shallow coal deposits, yet there is at present no single technique available to assess the future effects of strip mining on the quality and quantity of water. The authors describe the current state-of-the-art with regard to modeling strip-mined areas, choosing specific references helpful in modeling the system mathematically. Two principal questions addressed: (1) what approaches to modeling have others taken; and (2) what data are currently available in the literature and how transferable are they. Summaries of pertinent modeling studies are assembled, as well as a review of concepts and laboratory and field procedures that can be used to model the impact of strip mining on a given site. The current literature includes several studies of acid generation, neutralization, and transformation in strip mine spoil materials, but the processes which determine their rates on the field scale are not well understood. Less is known about spoil water flow, oxygen diffusion, surface runoff, erosion, evapotranspiration, and temperature distribution within the spoil banks. The authors conclude that hydrology of the spoil system could be simulated with standard modeling techniques. Experimentally obtained temperature and oxygen distributions could probably delineate acid-producing areas, assuming pyrite is not limiting, and is evenly distributed throughout a zone. (Ullery-Arizona)
W78-01501

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT, APPENDIX F: SELECTED COMPUTER INPUT AND OUTPUT,
Battelle Pacific Northwest Labs., Richland, WA. Water and Land Resource Dept.
A. Brandstetter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 644, Price codes: A17 in paper copy, A01 in microfiche. Report EPA-600/2-76-175b, August 1976. 387 p.

Descriptors: *Storm water, *Water management(Applied), *Urban runoff, *Mathematical models, *Computer models, Combined sewers, Water pollution control, Overflow, Sewerage, Urban drainage, Waste water treatment.
Identifiers: Battelle Urban Waste Water Management Model, Chicago Flow Simulation Program, Dorsch Consult Hydrograph-Volume Method, Storm Water Management Model, MIT Urban Watershed Model, SOGREAH Looped Sewer Model, Water Resources Engineers Storm Water Management Model, Storm water management models.

Input data and selected output are presented as part of a general evaluation of storm water management models. Hypothetical catchments and pipe systems were used in simulations. Storm water management models which are considered include: Battelle Urban Waste Water Management Model, Chicago Flow Simulation Program, Dorsch Consult Hydrograph-Volume, Environmental Protection Agency Storm Water Management Model (SWMM), Massachusetts Institute of Technology Urban Watershed Model, SOGREAH Looped Sewer Model, and Water Resources Engineers Storm Water Management Model. (See also W78-03468) (Schulz-FIRL)
W78-01514

SIMULATION OF NUTRIENT LOADINGS IN SURFACE RUNOFF WITH THE NPS MODEL,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and N. H. Crawford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 967, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/3-77-065, June 1977. 110 p, 30 fig, 8 tab, 24 ref, 3 append.

Descriptors: *Organic loadings, *Storm water, *Mathematical models, *Nutrients, *Urban runoff, Computer models, Phosphorus, Nitrogen, Iron, Suspended solids, Monitoring, Waste water treatment.
Identifiers: Nonpoint Source Pollutant Loading(NPS) Model, Durham(NC), Watkinsville(GA), East Lansing(MI).

The Nonpoint Source Pollutant Loading (NPS) Model was evaluated for simulation of nutrient loading in surface runoff with one urban and two small agricultural watersheds. The NPS model was used to simulate total solids, total Kjeldahl nitrogen, total phosphorus, and iron for storm runoff over an 18-month period. Phosphorus, total nitrogen, and iron values predicted by the model compared favorably with observed values. Other parameters such as ammonia nitrogen, nitrate nitrogen, and phosphate phosphorus, which are transported in solution rather than in the sediment fraction of surface runoff, were not predicted as accurately. The NPS model is suggested as an adequate means of simulating nutrient loadings on the basis of sediment loss. Application of the model may be limited if subsurface flow in the area being considered is a major portion of total runoff. (Schulz-FIRL)
W78-01515

PROCEEDINGS OF SANDUSKY RIVER BASIN SYMPOSIUM, HELD AT TIFFIN, OHIO ON MAY 2-3, 1975.
International Reference Group on Great Lakes Pollution from Land Use Activities.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 262, Price codes: A20 in paper copy, A01 in microfiche. Sponsored by Heidelberg Coll., Tiffin, Ohio. Dept. of Biology., and Bowling Green State Univ., Ohio. Environmental Studies Center. May 1975. 465 p. Edited by D.B. Baker, W.B. Jackson, and B.L. Prater.

Descriptors: *Water pollution, *Land use, *Lake Erie, *Conferences, Hydrogeology, Sediments, Phosphorus, Erosion control, Agriculture, Water quality, Management, Diatoms, Fishes, Mollusks, Benthos, Mercury, *Ohio.
Identifiers: Water quality data, Institutional framwork, *Sandusky River basin(Ohio).

The Sandusky River Basin occupies a 1450 square mile area in Northwestern Ohio and has a population of about 140,000. Within the basin, water quality management objectives include both reduction of adverse impacts on Lake Erie and improvement of stream water quality. Management options include: agricultrual pollution abatement measures, advanced treatment of municipal wastes, flow augmentation from pumped storage upground reservoirs, improved sewer collection systems and more strict home sewage regulations in rural developments. The publication covers the proceedings of the Sandusky River symposium, which includes 34 papers concerned with planning and improvements. (See also W78-01519 thru W78-01534)
W78-01518

INTRODUCTION TO THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
D. B. Baker.
In: Proceedings of the Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 2-11. 2 fig, 7 ref.

Descriptors: *River basins, *Water pollution, *Water quality, *Water quality control, *Eutrophication, *Sewage, Ohio, Land use, Rivers, Tributaries, Drainage area, Watersheds(Basins), Dissolved oxygen, Coliforms, Bacteria, Oxygen sag, Sewage treatment, Algae, Lake Erie.
Identifiers: *Sandusky River Basin(Ohio), Sandusky Bay(Ohio).

The Sandusky River in northwestern Ohio is 130.2 mi long, with a basin extending over 1,421 sq mi. The river empties into Lake Erie at Sandusky Bay. The basins population of about 140,000 people is half rural and half urban (cities and small towns). Heavily-wooded banks characterize the river and its tributaries, and help maintain a great diversity of wildlife. A 70-mile segment has been designated an Ohio State Scenic River. The river provides the water supply for the four largest cities, Bucyrus, Upper Sandusky, Tiffin, and Fremont. Seventy per cent of the basin land is devoted to cultivation, 9% is in permanent pasture, 9% is forested, 6% is in other rural uses, and 6% is urban. The average discharge of the river is 946 cu ft/sec. Two sections of the river have serious and chronic oxygen deficiencies. Sewage flow at Bucyrus often exceeds treatment plant capacity, and frequently

more than 50% of the stream flow below the city is treatment plant effluent. Consequently, during low-flow conditions the stream below Bucyrus shows the dissolved-oxgyen sag typical of sewage pollution. Below Fremont, the river often shows anaerobic conditions; in late summer organic wastes from food-processing plants exceed treatment plant capacity. Although the rest of the river is generally free of organic pollution, secondary water quality problems plague the river, including high sediment concentration, turbidity, fecal coliform bacteria, algal blooms, offensive taste and odor, oil and chemical spills, dissolved solids, and hardness. Solutions to these problems are discussed. (See also W78-01518) (Lynch-Wisconsin).
W78-01519

THE GEOLOGIC SETTING OF THE SANDUSKY RIVER BASIN,
Bowling Green State Univ., OH. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W78-01520

DISTRIBUTION OF NON-POINT SOURCES OF PHOSPHOROUS AND SEDIMENT IN THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
D. B. Baker, and J. W. Kramer.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 61-88. 3 fig, 6 tab, 16 ref.

Descriptors: *Water pollution sources, *Phosphorus, *Surface runoff, *River basins, Eutrophication, Nutrients, Runoff, Tributaries, Lake Erie, Watersheds(basins), Water quality control, Water quality, Rivers, Ohio.
Identifiers: *Nonpoint pollution, *Sandusky River Basin(Ohio).

Even though most of the efforts to reduce phosphorus loading into Lake Erie have been concentrated on municipal sewage treatment plants (apparently the major source of phosphorus enrichment in the lake), at least 75% of phosphorus delivered from the Sandusky Basin to Lake Erie comes from nonpoint sources. Data given on phosphorus and sediment balances for five subbasins of the system reflects the status of phosphorus sources before removal measures were begun at sewage treatment plants. Data were collected over a six year period, manually and with automatic sequential samplers. For each subbasin point source inputs of phosphorus were subtracted from total output, which provided an estimate of nonpoint source runoff coefficients. The coefficients for the five subbasins in kg/ha/yr were: Tymochtee, 1.35; Bucyrus, 0.07; Upper Sandusky, 1.29; Mexico, 1.18; and Tiffin, 1.02. The annual yield of total phosphorus from nonpoint sources in the basin was 390 tons, or 77% of the total annual yield. Most of the phosphorus is associated with clay particles which dominate the suspended solids loaded in the stream. The data indicate that nonpoint source phosphorus loading is more uniformly distributed over the landscape than is sediment loading. (See also W78-01518) (Lynch-Wisconsin)
W78-01521

EFFECTS OF ADVANCED WASTE TREATMENT AND FLOW AUGMENTATION ON WATER QUALITY DURING LOW STREAM FLOWS,
Heidelberg Coll., Tiffin, OH. Dept. of Biology.
D. B. Baker, and J. W. Kramer.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 123-142. 5 fig, 2 tab, 12 ref.

Descriptors: *Algae, *Waste treatment, *Water quality control, *Streamflow, *Dissolved oxygen, *River basins, Diurnal, Phosphorus, Sewage treatment, Ohio, Photosynthesis, Nutrients, Eutrophication, Runoff, Chlorophyll.
Identifiers: *Sandusky River Basin(Oh).

Oxygen violations (a dissolved oxygen level below 4.0 mg/l) in the Sandusky River in Ohio are mainly associated with diurnal oxygen fluctuations, indicating that photosynthetic plant metabolism is a major determinant of oxygen concentrations. Attached algae or phytoplankton appear to be responsible for these diurnal oxygen variations. Algal growth often reaches nuisance levels during periods of low stream flow, especially late summer and fall, which also coincides with drops in dissolved oxygen concentrations. Reasons presented for the association of algal increase with decreases in stream flow are: (1) an increase in phosphorus concentrations (due to lower dilution of the constant phosphorus inputs from sewage treatment plants); (2) a decrease in sediment concentrations, which permits greater light penetration; and increase in travel time. It was found that stream flow augmentation monitored in the form of runoff events, would appear to be more effective than phosphorus removal at sewage treatment plants in preventing the development of nuisance levels of algae. Such flow augmentation reduced diurnal oxygen fluctuations and also, therefore, oxygen violations. Nutrient and chlorophyll concentrations were monitored in the basin between June and September of 1974. No significant correlation was found between phosphorus and chlorophyll concentrations, or between chlorophyll concentrations and stream flow. (See also W78-01518) (Lynch-Wisconsin)
W78-01522

PLANKTONIC CENTRIC DIATOMS OF THE SANDUSKY RIVER NEAR FREMONT, OHIO,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-01523

SEASONAL DISTRIBUTION OF PERIPHYTIC DIATOMS COMMUNITIES OF TYMOCHTEE CREEK,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-01524

PHYTOPLANKTON OF THE SANDUSKY RIVER NEAR FREMONT, OHIO,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-01525

A COMPARISON OF THE WINTER DIATOM FLORA OF THE SANDUSKY RIVER AND TYMOCHTEE CREEK,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-01526

THE FISHES OF THE SANDUSKY RIVER SYSTEM, OHIO,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5C.
W78-01527

SANDUSKY RIVER BORDERS AND RESERVOIRS AS MIGRATORY BIRD REFUGES,
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 6G.
W78-01528

THE AQUATIC COLEOPTERA OF THE SANDUSKY RIVER, OHIO,
Bowling Green State Univ., OH. Environmental Studies Center.
For primary bibliographic entry see Field 5C.
W78-01529

THE ECOLOGY OF RUNNING WATERS: THEORY AND PRACTICE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 6G.
W78-01530

BENTHIC MICROINVERTEBRATE POPULATIONS OF SANDUSKY BAY,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-01531

ABUNDANCE AND POPULATION TRENDS OF SANDUSKY BAY FISHES,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-01532

USE OF HEAVY METAL POLLUTION IN SANDUSKY BAY SEDIMENTS TO DETERMINE SEDIMENTATION RATES,
Bowling Green State Univ., OH. Dept. of Geology.
L. J. Walters, Jr., and C. R. Herdendorf.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 426-453. 8 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Water pollution, *Sediments, *Mercury, *Lake Erie, Water pollution sources, Pollutants, Chromium, Nickel, Ohio, Water quality.
Identifiers: *Sandusky Bay(Ohio), *Sandusky River Basin(Ohio).

Sediment core samples collected at 60 stations in Sandusky Bay, Sandusky River, Tymochtee Creek, and Broken Sword Creek (Ohio), in September 1972 and January-February 1975 were analyzed for mercury, chromium, and nickel content. The objective of the study were to confirm the nature of pollution in Sandusky Bay sediments, to determine the source of the mercury pollution, and to estimate recent average sedimentation rates using the mercury pollution method of Wolery and Walters. Sandusky Bay sediments averaged 24 ppm chromium and 40 ppm nickel, about the same as Lake Erie background levels of 18 ppm and 45 ppm. Tymochtee and Broken Sword creeks were used as controls, since they are in agricultural areas far from cities. Chromium and nickel levels in the two creeks averaged 13 and 25 ppm respectively and were not considered significantly different from the bay sediments. Mercury levels in Sandusky Bay were 10-20 times above the background levels established for the two creeks, which averaged 0.031 ppm Hg (dry weight) in the less than 60 mesh fraction. The Sandusky Bay sediments ranged from 0.10 to 0.80 ppm Hg (dry weight). In the Sandusky River the highest level was recorded downstream from the Bucyrus Sewage Treatment Plant (0.7 ppm). Average sedimentation in Sandusky Bay was calculated at 0.3 to 2.0 cm./yr, higher in the western bay than the eastern bay. (See also W78-01518) (Lynch-Wisconsin)
W78-01533

SOME BRIEF REFLECTIONS ON THE SYMPOSIUM, THESE PROCEEDINGS AND WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
D. B. Baker.

In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 473-475.

Descriptors: *River basins, *Water quality, *Water pollution, *Watersheds(Basins), *Rivers, *Aquatic life, Ohio, Sedimentation, Fish, Insects, Plankton, Algae, Birds, Water quality control, Eutrophication, Sewage, Tributaries, Water pollution sources, Runoff, Erosion, Ecology, Bays, Streams.
Identifiers: *Sandusky River Basin(Ohio).

The Sandusky River Basin Symposium, held at Heidelberg College in Tiffin, Ohio on May 2-3, 1975, was sponsored by Heidelberg and Bowling Green State University. The program included 34 papers, of which 21 are published in full and 13 as abstracts in these Proceedings. The Sandusky River and its tributaries occupy a 1,450 sq mi area in northwestern Ohio; the Sandusky River empties into Lake Erie at Sandusky Bay. The papers covered geology, nonpoint sources of phosphorus and sediment, soil surveys, erosion control, water quality studies, flow augmentation effects, phytoplankton (including centric and periphytic diatoms), zooplankton, fish, naiad mollusks, migratory birds, benthic macroinvertebrates, aquatic coleoptera, ecology of running waters, vascular plants, shoreline and bathymetric changes, heavy metal pollution, watershed planning, NPDES permits, agency cooperation, and citizen input. The major goal of the symposium was to foster information exchange. Presented data will allow more accurate assessments of water quality and will facilitate setting of priorities for pollution abatement programs. These studies should also prove relevant to programs in other river basins. (See also W78-01518) (Lynch-Wisconsin)
W78-01534

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY: A USERS' MANUAL FOR THE TWO DIMENSIONAL HYDRODYNAMIC MODEL,
Alabama Univ., University. Dept. of Chemical Engineering.
S. Ng, and G. C. April.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18630, Price codes: A06 in paper copy, A01 in microfiche. Interim Report, BER Report No. 203-112. Prepared for the National Aeronautics and Space Administration, Marshall Space Flight Center, Alabama, January 1976. 97 p, 33 fig, 1 tab, 10 ref, append.

Descriptors: Hydrodynamics, *Mathematical models, *Rivers, *Tides, *Bays, Water resources, Planning, Behavior, Computer models, Weirs, Marshes, Water quality, Ships, Channels, Bottom sampling, Drainage, Systems analysis.
Identifiers: *Mobile Bay(Ala), Water movement, *Tidal elevation, Water depth, Sea boundaries, Water cell segments, Mean sea level, Wind conditions, Natural systems.

To better understand the complex, interactive effects influencing water movement and water quality in natural systems, several mathematical models based on the laws of conservation of mass, momentum and energy have been developed. Models describing the hydrodynamic and material transport behavior of Mobile Bay, Alabama have been formulated and tested. Demonstrated is how the model which describes water movement and tidal elevation is formulated, computed and used to provide basic data about the system, using Mobile Bay in a case study with comments as to how the formulations might be expanded to describe other areas which qualify under model restrictions as assumptions. The hydrodynamic model is based on two-dimensional, unsteady flow equations. Results can be calculated for unsteady flow when boundary conditions are available as a function of time (dynamic), or for quasi-steady flow when conditions are stable for a time period encompassing several tidal cycles or longer priods. The solutions of the equations have been used to investigate the influence that river discharge rate, wind direction and speed, and tidal condition have on water circulation and holdup within the bay. The report has four parts: (1) basic concepts in applying the model to a real system; (2) model input requirements; (3) a detailed illustration of the application of Mobile Bay; and (4) a program listing of the hydrodynamic model. (Bell-Cornell)
W78-01544

ENVIRONMENTAL DEVELOPMENT PLAN (EDP): HYDROTHERMAL ENERGY SYSTEMS FY 1977.
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 4B.
W78-01546

DETECTION OF FILAMENTOUS IRON BACTERIA IN OPEN RECIRCULATING COOLING WATER SYSTEMS,
For primary bibliographic entry see Field 5A.
W78-01548

WORKSHOP ON NUCLEAR TECHNIQUES FOR ENVIRONMENTAL TRACE ELEMENT INFORMATION RELATIVE TO ENERGY PRODUCTION AND CONSUMPTION, FLORIDA STATE UNIVERSITY, TALLAHASSEE, JUNE 23-26, 1974.
National Science Foundation, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-01550

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES. VOLUME I. EXECUTIVE SUMMARY,
Battelle-Northwest, Richland, WA. Pacific Northwest Lab.
For primary bibliographic entry see Field 5A.
W78-01551

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES,
Battelle-Northwest, Richland, WA. Pacific, Northwest Lab.
For primary bibliographic entry see Field 5G.
W78-01552

APPENDIX H LISTS HAZARDOUS MATERIALS BY IMCO HAZARD CATEGORY. APPENDIX I IS A DETERMINATION OF IMCO METHODOLOGY ADJUSTMENT FACTORS FOR DEGRADABILITY AND DISPERSIBILITY THROUGH THE USE OF A DELPHI TECHNIQUE. APPENDIX J PRESENTS THE DERIVATION OF REPRESENTATIVE STREAM FLOW. APPENDIX K LISTS ESTUARINE TYPES AND PRESENTS A MODEL EQUATION DERIVATION. APPENDIX L DESCRIBES DERIVATION OF THE TIME AT WHICH THE MINIMUM HARMFUL QUANTITY IS OBTAINED IN THE PLUG FLOW MODEL. APPENDIX M PRESENTS THE TOTAL COST OF PREVENTION ADJUSTMENT FACTORS. APPENDIX N LISTS FINAL HARMFUL QUANTITIES AND RATES OF PENALTY.
ostment factors for the resource value methodology. Appendix D presents mathematical model determination of the total water volume subjected to a critical concentration from a point source spill of a hazardous material. Appendices E and F present IMCO/GESAMP guidelines for profiling and categorizing hazardous materials. Appendix G is a table of IMCO methodology classification of hazardous materials
For primary bibliographic entry see Field 5G.
l/chemical and toxicological data employed in nav

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
D. A. Rokosh, S. S. Rao, and A. A. Jurkovic.
Journal of the Fisheries Research Board of Canada, Vol 34, No 6, p 844-849, June, 1977. 5 fig, 7 ref.

Descriptors: *Pulp wastes, *Aquatic bacteria, *Lake Superior, *Water pollution effects, Wastes, Industrial wastes, Water pollution, Water pollution sources, Lakes, Great Lakes, Coliforms, Pulp and paper industry, Effluents, Outlets, Sulfur bacteria, Population, Microorganisms, Distribution patterns, Aquatic populations, Aquatic microorganisms, Water analysis, Bioassay.
Identifiers: Kraft mills, *Nipigon Bay(Lake Superior).

Populations of heterotrophic bacteria, total and fecal coliforms, and sulfur cycle bacteria were measured in Nipigon Bay, Lake Superior, receiving the effluent from a kraft pulp and paper mill. Elevated bacterial populations were detected near the effluent outfall but persistent populations, larger than those in unaffected lake water, extended as far as 19 km from the effluent outfall. This ability to detect influences to distances up to 19 km adds a new dimension to a description of a mixing zone receiving industrial effluents. (Witt-IPC)
W78-01558

DENSITY, DISTRIBUTION, AND MOVEMENT OF NIPIGON BAY FISHES IN RELATION TO A PULP AND PAPER MILL EFFLUENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-01563

ANALYSIS OF A PULP AND PAPER MILL EFFLUENT PLUME,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-01584

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,
Canada Centre for Inland Waters, Burlington (Ontario).
M. E. Fox.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 798-804, June, 1977. 3 fig, 12 ref, 3 tab.

Descriptors: *Pulp wastes, *Organic compounds, *Effluent streams, *Water pollution, Wastes, Industrial wastes, Water pollution sources, Persistence, *Lake Superior, Pulp and paper industry, Effluents, Dispersion, Pollutants, Waste dilution, Great Lakes, Waste dilution.
Identifiers: Dehydroabietic acid, Resin acids, Kraft mills.

The persistence of dissolved organic compounds in the effluent plumes from a kraft pulp and paper mill on the north shore of Lake Superior was studied in 1974. Approximately 90 organic compounds were observed of which 36 (including all the major ones) were identified. The dispersion of five of these compounds was examined quantitatively. Dehydroabietic acid was the only major organic compound observed to exhibit measurable persistence greater than 2000 m from the effluent discharge. At 2000 m from the discharge, levels of approximately 30 micrograms/liter dehydroabietic acid were detected within the plume and approximately 15 micrograms/liter outside the effluent plume. The disappearance of dehydroabietic acid parallels that of the conservative sodium ion, in-

dicating dilution by the receiving water as the only significant shortnterm removal mechanism. (Witt-IPC)
W78-01587

NITRATE LEVELS IN ESSEX RIVER WATERS,
Essex Water Co. (England).
J. G. Slack.
Journal of the Institution of Water Engineers, Vol. 31, No. 1, p 43-53, January 1977. 7 fig, 8 tab, 4 ref, 1 append.

Descriptors: *Nitrates, *Nitrogen compounds, *Water quality, *Water analysis, *Nitrogen, Analytical techniques, Fertilizers, Leaching, Runoff, Water pollution sources, Analysis, Chemical analysis, Chemistry, Potable water, River systems, Public health, Rivers, Foreign countries, Foreign research.
Identifiers: *Essex river waters(England).

The Essex Water Company supplies an average daily quantity of water of 350 Ml, of which 250 Ml is from the rivers Blackwater, Chelmer, and Stour, either by direct intakes at Langford, Sandford Mill, and Langham, or by way of pumped storage reservoirs at Hanningfield and Abberton. The dissolved mineral content and particularly the nitrate content of the river waters is at times higher than any other river waters used in this country for major potable supplies. Levels in excess of 20 mg/l of nitrate nitrogen have been recorded at times. In February 1974 the following figures were obtained: River Chelmer 22.5, River Blackwater 20.0, River Stour 21.0, as mg/l N. This paper described the variations in the nitrate content of the river waters over the last 5 years and demonstrated the relationship between river flow and nitrate content. The influence of land drainage was described and discussed, and the effects of impounding the high nitrate waters also were documented. Measures taken by the Company to avoid high nitrate concentrations in supply were described. (Henley-ISWS)
W78-01626

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
R. W. Johnson, I. W. Duedall, R. M. Glasgow, J. R. Proni, and T. A. Nelsen.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2063-2073, October 1977. 11 fig, 2 tab, 13 ref.

Descriptors: *Sludge disposal, *Remote sensing, *Monitoring, *New York, *Waste water disposal, Mathematical models, Analytical techniques, Mathematics, Data collections, Measurement, Water quality, Disposal, Water pollution, Oceans, Ocean circulation, Satellites(Artificial), Sludge, Suspended solids.
Identifiers: *Wastewater sludge plumes, *New York Bight, *Sludge plume mapping, Sludge plumes, Pollutant plumes, Multispectral scanner, Quantitative mapping, Spectral signatures, Remote sensing techniques, Dredge spoils.

Statistical analysis techniques were applied to develop quantitative relationships between aircraft remotely sensed data and measurements made in the plume resulting from ocean dumping of waste water in the New York Bight. A correlations coefficient of 0.96 was obtained between suspended solids in the plume and remotely sensed data from an aircraft multispectral scanner. The standard error of estimate was 4.11 mg/l over a measured range of 1.11 to 32.20 mg/l. A calibrated regression equation from the analysis was used to develop a map of quantitative distributions of suspended solids in waste water sludge dump plumes. Spectral signatures were obtained that may be useful for identification of waste water sludge plumes relative to other pollution features, such as acid waste plumes. (Henley-ISWS)
W78-01627

SHORT-TERM WATER COLUMN PERTURBATIONS CAUSED BY WASTEWATER SLUDGE DUMPING IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
I. W. Duedall, H. B. O'Conners, S. A. Oakley, and H. M. Stanford.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2074-2080, October 1977. 6 fig, 1 tab, 13 ref.

Descriptors: *Sludge disposal, *Chemical properties, *New York, *Sludge, *Ocean currents, Water circulation, Analytical techniques, Hydrography, Surveys, Monitoring, Data collections, Oceanography, Ocean circulation, Sewage sludge, Wastes, Thermocline.
Identifiers: *Wastewater sludge dumping, *Water column perturbations, Ocean dumping.

Water column properties in the New York Bight apex were monitored before and after a controlled spot dump of waste water sludge. Ammonium, phosphate, and suspended solids in the discharged waste water sludge dispersion plume caused the greatest water column perturbations. Temperature, salinity, pH, and the concentrations of dissolved oxygen and chlorophyll a in the water column were not significantly affected by the waste water sludge dumping, thus suggesting, for the hydrographic and discharge conditions of the experiment, a relatively rapid descent rate for the particular wastewater sludge. By 110 minutes after dumping, the water column above the thermocline (approximately 17 m) had nearly returned to its background condition with respect to the variables measured. Below the thermocline, however, concentrations of ammonium, phosphate, and suspended solids remained high for a period greater than 2.5 hours. (Henley-ISWS)
W78-01628

RADON 222 DISTRIBUTION AND TRANSPORT ACROSS THE SEDIMENT-WATER INTERFACE IN THE HUDSON RIVER ESTUARY,
Lamont-Doherty Geological Observatory Palisades, NY.
D. E. Hammond, H. J. Simpson, and G. Mathieu.
Journal of Geophysical Research, Vol. 82, No. 27, p 3913-3920, September 20, 1977. 6 fig, 5 tab, 20 ref. EPA R-803113-01.

Descriptors: *Estuaries, *Hudson River, *New York, *Sediment-water interfaces, Tracers, Sampling, Surveys, Sediments, Spatial distribution, Profiles, Runoff, Analytical techniques, Testing, Groundwater, Surface waters, Water quality, Salinity, Interfaces, Radium radioisotopes.
Identifiers: Radon 222.

Radon 222 concentrations in waters of the Hudson River estuary show little consistent vertical, axial, or seasonal variation. The median of 106 summer measurements is 1.43 + or - 0.25 dpm/l, and the median of 17 winter measurements is 1.30 + or - 0.35 dpm/l. A budget was constructed for the water column which balances the rate of radon input against the rate of radon loss for two regions, one of which is broad and shallow and the other narrow and deep. The primary supply of radon for the two regions is from the sediments (75-90%), with minor inputs from radium 226 decay in the water column, stream runoff, and tidal pumping of groundwater. Loss of radon occurs by evasion to the atmosphere and decay in the water column in roughly equal amounts. The activity of mobile radon in sediments (per wet sediment volume) is 0.33 + or - 0.10 dpm/cu cm in the broad, shallow area of the estuary and 0.42 + or - 0.11 dpm/cu cm in the narrow, deep reach immediately upstream. When these values are used, the flux supplied by molecular diffusion is approximately 40% of the total input. Constant physical stirring of the upper few centimeters of sediments by bottom currents over large areas and stochastic reworking to somewhat greater depth in localized sediment deposits appear to be primarily responsible for augmenting the flux from sediments provided by molecular diffusion. (Humphreys-ISWS)
W78-01635

A NOTE ON HORIZONTAL GRADIENTS IN FJORDS,
Oslo Univ. (Norway). Inst. of Geophysics.
For primary bibliographic entry see Field 2L.
W78-01638

TRANSVERSE DISPERSION IN RECTANGULAR CHANNELS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 8B.
W78-01639

BACTERIAL RELATIONSHIPS IN STORMWATERS,
Texas Univ. Health Science Center at Houston. School of Public Health.
E. M. Davis, D. M. Casserly, and J. D. Moore.
Water Resources Bulletin, Vol. 13, No. 5, p 895-905, October 1977. 7 fig, 2 tab, 8 ref. EPA R802433, Subgrant 733.

Descriptors: *Coliforms, *Bacteria, *Storm runoff, *Urbanization, *Water quality, Water pollution, Pathogenic bacteria, Analytical techniques, Water pollution sources, Disinfection, Storm water, Environmental engineering, Water treatment, Chlorination, Urban drainage, Urban runoff, Pollutants, Rural areas.
Identifiers: *Bacterial relationships, Bacterial pathogens, Fecal coliform, Fecal streptococci.

Data were developed within a three-year period for indicator bacteria and three species of bacterial pathogens following rural storm event hydrographs. The first flush concept was confirmed in all hydrographs. Bacterial density peaking occurred at or before the hydrograph peaks. FC and FS values were higher in more developed areas than the primary rural test site, and their numerical ratios followed similar trends. Chlorine demand of storm waters varied between 8 and 16 mg/l and, the ozone requirement was greater than 32 mg/l in the same waters. Aftergrowth of total coliform bacteria occurred following chlorine and ozone doses of 16 mg/l and 32 mg/l respectively. Fecal coliform, fecal streptococci, Salmonella sp., and Pseudomonas sp. all were reduced to near detectable limits by the disinfectants up to 8 days. Staphylococcus sp. demonstrated a propensity to reestablish their populations. Multiple regression analysis of the bacterial groups and species in storm waters suggested the fecal streptococci to have been the most useful group in evaluating bacterial storm water quality, with staphylocci having been closely related insofar as their statistical significance was concerned. (Henley-ISWS)
W78-01640

LAND USE REPORT.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-01653

AD HOC ADVISORY PANEL ON EVALUATED PHYSICAL PROPERTY DATA IN AID OF AQUEOUS ENVIRONMENTAL PROBLEMS.
National Academy of Sciences and National Research Council, Washington, DC. Numerical Data Advisory Board.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 588, Price codes: A05 in paper copy, A01 in microfiche.
Report of Meeting, August 14-15, 1975. 92 p.

Descriptors: *Path of pollutants, *Water quality, *Pollutants, *Monitoring, Organic compounds, Inorganic compounds, Chemical reactions, Anions, Cations, Metals, Pesticides, Herbicides, Chemical properties, Physical properties, Radioactive wastes, Effluents, Water pollution, Environment.

An NAS-NRC Panel discussed needs for evaluated physical and chemical property data of importance for environmental monitoring and effluent control, for the study of the fate of pollutants, and for the establishment of meaningful standards. Systems include both organic and inorganic pollutants in solution and in the presence of particulate matter; properties include analytical, equilibrium, and surface properties. Seven presentations to the panel were included, along with a summary of recommendations. (Sims-ISWS)
W78-01654

DIPHENYL ETHER - ANOTHER MARINE ENVIRONMENTAL CONTAMINANT,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W78-01668

TOTAL AND ORGANIC MERCURY IN THE PACIFIC BLUE MARLIN,
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
For primary bibliographic entry see Field 5A.
W78-01673

CONCENTRATION OF CADMIUM, COPPER, LEAD AND ZINC IN SIX SPECIES OF FRESHWATER CLAMS,
Northern Illinois Univ., DeKalb. Dept. of Biological Sciences.
R. V. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 4, p 492-496, 1977. 1 fig, 1 tab, 12 ref.

Descriptors: Animal physiology, *Animal metabolism, *Clams, *Zinc, *Lead, *Cadmium, *Copper, *Absorption, *Adsorption, *Membrane processes, *Heavy metals, *Mollusks, Sediments, Metals, Shellfish, Path of pollutants.
Identifiers: Tissue analysis, Bioaccumulation, Gills.

The metal (Cd, Cu, Pb, Zn) concentrations in the bodies of the freshwater clams studied generally reflected that found in the environment, with the exception of Zn. The shell had comparatively lower concentrations of all metals which reflects its inactive role in filtering and feeding. While concentrations of the metals are not the same between salt water and freshwater clams, the relationships between the metals, body parts, and environment were similar. (Katz)
W78-01675

EFFICIENT ALGORITHMS FOR STATISTICAL ESTIMATION IN COMPARTMENTAL ANALYSIS: MODELLING 60CO KINETICS IN AN AQUATIC MICROCOSM,
Georgia Univ., Athens. Dept. of Statistics and Computer Science.
R. E. Bargmann, and E. Halfon.
Ecological Modelling, Vol 3, p 211-226, 1977. 1 fig, 3 tab, 21 ref.

Descriptors: *Mathematical models, Mathematical studies, *Radioisotopes, *Cobalt radioisotopes, *Tracking techniques, *Kinetics, *Algorithsm, Aquatic environment, Ecosystems, *Regression analysis, Aquaria, *Methodology.
Identifiers: *Linear ecosystem models.

A mathematical model of radionucleide kinetics in a laboratory microcosm was built by systems identification techniques. Insight into the functioning of the system was obtained from analysis of the model. Methods employed have allowed movements of radioisotopes not directly observable in the experimental system to be distinguished. Results are generalized to whole ecosystems. (Katz)
W78-01676

THE SPECIES DIVERSITY INDEX OF SOME IN-SHORE DIATOM COMMUNITIES AND ITS USE IN ASSESSING THE DEGREE OF POLLUTION ON PARTS OF THE NORTH COAST OF COMWALL,
N. I. Hendey.
In: Fourth Symposium on Recent and Fossil Marine Diatoms, Oslo, Aug 30-Sept 3, 1976, Proceedings R. Simonsen, ed., p 354-377. 2 fig, 2 tab, 25 ref. J. Kramer, Vaduz, 1977.

Descriptors: *Diatoms, *Bioindicators, Biological communities, Population, *Seasonal, Mathematical studies, *Epiphytology, *Biomass, *Coasts, Water pollution effects, Analytical techniques, Domestic wastes.
Identifiers: Species diversity index, *Cornwall(England).

The Species Diversity Index of a community indicates the degree of 'pollution insult' imposed upon the community by the environment. When the indices of six diatom communities collected from the north coast of Cornwall were ranked in a decreasing order, it was found that three of the sites enjoyed values higher than average while the others were lower. The values decreased during the summer (indicating worsening environmental conditions), the time of year when the population of the County rises steeply due to the influx of summer visitors. (Katz)
W78-01678

TOXICITY OF N-PHENYL-A-NAPHTHYLAMINE AND HYDRAZINE TO XENOPUS LAEVIS EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
For primary bibliographic entry see Field 5C.
W78-01680

BEHAVIOR OF MERCURY IN BIOSYSTEMS I. UPTAKE AND CONCENTRATION IN FOOD-CHAIN,
Georgia Univ., Athens. Dept. of Food Science.
N. V. Prabhu, and M. K. Hamdy.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 4, p. 409-417, 1977. 2 fig, 2 tab, 27 ref.

Descriptors: *Mercury, *Heavy metals, *Food chains, Food pyramids, *Bacteria, Fish physiology, *Larvel growth stage, *Mosquitos, *Tracers, *Radioisotopes, *Trophic level, *Water temperature, *Absorption, *Membrane processes, *Animal metabolism, Metabolism, Tissue analysis, Bioaccumulation, Lebistes, Bacillus, Biotransformation, Gills.

This study was conducted to measure the rate of uptake of two mercurial compounds in a simple model food-chain consisting of three trophic levels (bacteria, larvae and fish) and to ascertain the mercury-concentration factor in each. Data were presented on the effects of exposure time, temperature, and form of radioactively-labeled mercury on uptake and concentration factor. (Katz)
W78-01682

MERCURY IN FISH AND SHELLFISH OF THE NORTHEAST PACIFIC. III. SPINY DOGFISH, SQUALUS ACANTHLAS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
A. S. Hall, F. M. Teeny, and E. J. Gauglitz, Jr.
Fishery Bulletin, Vol. 75, No. 3, p. 642-645, 1977. 2 fig, 2 tab, 10 ref.

Descriptors: *Mercury, *Heavy metals, *Commercial fish, *Marine fish, Commercial fishing, Size, *Path of pollutants, Fish physiology, *Standards, Public health, Water pollution sources, Chemical analysis, Tissue analysis, Bioaccumulation, *Dogfish, Squalus, *Puget Sound(Wash).

In response to a growing foreign market for dogfish, investigations were undertaken to determine the tissue mercury levels in relation to import regulations of various countries. Mean mercury levels in specimens from six sampling areas in Puget Sound were at or above the action level of 0.50 ppm set by the U.S. FDA. In addition, a significant relationship was noted between body weight and total mercury content. (See also W77-05865) (Katz)
W78-01683

APPARATUS AND PROCESS FOR DRAWING WATER FROM A WATER-BEARING STRATA,
Thyssen Plastik Anger K.G., Munich (West Germany).
For primary bibliographic entry see Field 4B.
W78-01695

5C. Effects Of Pollution

ALGOLOGIC AND CHEMICAL-BACTERIOLOGIC STUDY OF THE WATER OF THE RESERVOIR OF THE PUBLIC PROMENADE OF CURITIBA, STATE OF PARANA, BRAZIL: I. GENERA OF MICROSCOPIC ALGAE (IN PORTUGUESE),
Universidade Federal de Pernambuco, Recife (Brazil). Inst. of Biological Sciences.
I. I. Trippa-Cecy, I. M. V. Moreira, and E. Hohmann.
Bol Mus Bot Munic (Curitiba) 25. 1-37. 1976. (English summary).

Descriptors: *Algae, *Artificial lakes, Chlorophyta, Chrysophyta, Cyanophyta, Euglenophyta, *Pollutant identification, Brazil.

The distribution of microscopic algae in an artificial lake in Curitiba, Parana, Brazil was studied. Of the 54 genera detected, 75% were Chlorophyta, 15% Chrysophyta, 5% Cyanophyta and 5% Euglenophyta. The pollution indicator algae Scenedesmus, Euglena, Gomphonema and Microcystis prevailed in Nov. and Dec. of 1973 and March-Oct. of 1974, indicating the occurrence of pollution for almost the entire year. Chemical and bacteriological tests confirmed the psycological results.--Copyright 1977 Biological Abstracts, Inc.
W78-01198

IMPORTANCE OF HOMOLOGY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATION OF WATER BODIES (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W78-01199

HYGIENIC PROBLEMS OF PROTECTING WATER RESERVOIRS FROM POLLUTION WITH THERMAL ELECTRIC POWER PLANTS (IN RUSSIAN),
Yu. V. Novikov, L. V. Kudrin, and N. P. Pushkina.
Gig Sanit 9. 84-88. 1976.

Descriptors: *Potable water, *Heated effluent, Reservoirs, *Thermal power plant, Industrial wastes.

Environmental pollution (water reservoirs for human drinking water, air soil) with warm water

from thermal electric power plants and related industrial sewage with different chemical and physical composition is discussed. Necessity to develop purification and utilization methods for the sewage and to establish hygienic recommendations for locating thermal electric power plants on water reservoirs used as drinking water sources is indicated.--Copyright 1977 Biological Abstracts, Inc.
W78-01200

RECOMMENDATIONS FOR MICROBIOLOGICAL STUDIES IN THE CONTINENTAL SHELF AREAS. RESULTS FROM TWO WORKSHOPS CONVENED 10-11 AUGUST 1976 AND 19-20 OCTOBER 1976 IN BOULDER, COLORADO. OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
Technical Memorandum ERL MESA-16, October 1977. 50 p.

Descriptors: *Microbial degradation, Resources development, *Baseline studies, *Water pollution, *Environmental effects, *Oil spills, Microorganisms, Biomass, Continental Shelf, Alaska, Organic compounds.
Identifiers: *Outer Continental Shelf.

During the preparation of a five-year plan for Bureau of Land Management-supported studies, to be conducted in the Alaskan Outer Continental Shelf (OCS) before oil and gas development, workshop participants were asked to draw up and provide techniques for the following studies: general characterization of the existing microbial populations; the effect of human activities on natural microbiological communities and their functioning; the effect of natural microbial communities on OCS activities; and requirements for supporting data and information on related processes. Temperature, salinity and inorganic nutrient data are some of the parameters considered. This report contains a detailed listing of microbiological studies that the group agreed should be included in marine assessment programs. It also contains a section explaining the necessary sampling procedures and requirements, in order to standardize these techniques. (NOAA)
W78-01274

FIELD STUDIES ON BENTHIC COMMUNITIES IN THE NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (NOMES),
New Hampshire Univ., Durham.
L. G. Harris.
Final Report to NOAA, Environmental Research Laboratories, 1977. 135 p, 4 fig, 16 tab, 76 ref.

Descriptors: *Environmental effects, *Sands, *Gravels, *Mining, *Benthic fauna, *Benthic flora, *Resources development, Dredging, Bioindicators, Water pollution, *New England.
Identifiers: Ocean mining, Outer Continental Shelf, Indicator species.

The purpose of the benthic communities study, within the multi-disciplinary, multi-institutional New England Offshore Mining Environmental Study (NOMES), was to describe the environmental effects of sand and gravel mining and to develop criteria for predicting the potential impact of future mining operations in the sea. Results are summarized of field studies conducted during 1972 and 1973. In line with the original goals of the NOMES Project, identification of indicator species, an evaluation of procedures used and recommendations for conducting future environmental impact studies related to marine mining are included. (NOAA)
W78-01275

REVIEW OF EXISTING INFORMATION ON FISHES IN THE DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES) AREA OF THE TROPICAL PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. Blackburn.
Report to NOAA, Environmental Research Laboratories, IMR Ref. 76-1, January 1976. 79 p, 11 fig, 5 tab, 139 ref. 04-4-022-6.

Descriptors: *Turbidity, *Water pollution effects, Resources development, *Mining, *Environmental effects, *Baseline studies, Bioindicators, Plankton, Fisheries, Sediments.
Identifiers: *Ocean mining, Nodules, Tropical Pacific Ocean, Manganese nodules.

The Deep Ocean Mining Environmental Study (DOMES) development plan gives an idea of the ways in which the so-called mining operations will affect the marine environment. The bottom will be scraped and a mixture of nodules, sediment and water taken up the water column to the sea surface, either hydraulically or mechanically. If a hydraulic system is used the bottom will be disturbed and a turbidity plume created just above it. In addition bottom water will be discharged at the sea surface, creating another turbidity plume as in sinks. If a mechanical (continuous line bucket) system is used the bottom will be disturbed and there will be a continuous rain of fine particles down most of the water column, especially the lower part. These changes could locally affect fish, indirectly by altering the kind or amount of food available to them, or directly by altering their physical environment. The alteration to the food supply might be significant or insignificant, adverse of favorable. The alteration to the physical environment would probably be significant and adverse. (NOAA)
W78-01276

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY STUDIES; PRELIMINARY REPORT,
Texas A and M Univ., College Station. Dept. of Oceanography.
S. Z. El-Sayed, S. Taguchi, G. Fryxell, and K. Buck.
NOAA, Environmental Research Laboratories, Deep Ocean Mining Environmental Study (DOMES), Unpublished Manuscript No. 2, May 1976. 50 p, 19 fig, 10 tab, 10 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Baseline studies, Resources development, *Environmental effects, Pigments, Standing crops, Seasonal.
Identifiers: *Outer Continental Shelf, Ocean mining, Seasonal changes.

Data from the phytoplankton studies obtained during RP-8-OC-75, Legs I and II, and leg IV of RP-8-OC-76 are presented, summarized, and discussed. The first objective was to provide the baseline information on the phytoplankton community which will be necessary to evaluate post mining populations to determine what, if any, effects mining has on them. The parameters of standing crop and primary production are used to define the baseline population. The physiological state and efficiency of the organisms, determined from pigment ratios, cell counts and assimilation ratios as well as the depth of the pigment and primary production maxima, the amount of standing crop and production below the 1% light level and the presence or absence of seasonal changes in standing crop and primary production are all factors which are used to characterize this pre-mining population. The second objective is to predict in advance what effects mining will have upon the phytoplankton of the DOMES region. Enrichment experiments will be the basis for these predictions. (NOAA)
W78-01278

EUTROPHICATION: A THREAT TO NEW HAMPSHIRE'S LAKES AND PONDS - WHAT LEGAL TOOLS ARE AVAILABLE FOR PROTECTION,
Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5G.
W78-01359

SEWAGE SLUDGE ANSWERS ARE STILL NEEDED.
Farm Chemicals, Vol 140, No 6, p 40, 42, June, 1977.

Descriptors: *Fertilizers, *Heavy metals, *Agricultural practices, *Nutrient removal, *Trace elements, Crops, Cadmium, Copper, Molybdenum, Zinc, Lead, Mercury, Chromium, Nitrogen, Phosphorus, Sludge disposal, Waste water disposal, Environmental effects, Path of pollutants, Bioassay, Absorption.

Various aspects related to the environmental effects of the application of sewage sludge to cropland are discussed. Although only 1% of the total 1970 cropland would be required for disposal of all of the sludge produced annually in the United States, one of the problems associated with land application as a means of sludge disposal is that the highest quantities of sludge are produced in highly populated areas where the amount of land available for agricultural purposes is limited. Studies on the long-term environmental impact of sludge application have indicated that the uptake of metals in sludges by plants is greater during the initial application than during subsequent periods. Criteria for the feasibility of land application programs are based on the nitrogen, phosphorus, and heavy metal contents of the sludges. Various studies on the uptake by plants and adverse effects of heavy metals are discussed. Elements which are considered to pose relatively little hazard to crop production incluude Mn, Fe, Al, Cr, As, Se, Sb, Pb, and Hg. Elements which are discussed as posing hazards under certain conditions include Cd, Cu, Mo, Ni, and Zn. (Schulz-FIRL)
W78-01449

EXPERIENCES WITH THE ALGAL ASSAY PROCEDURE (ERFAHRUNGEN MIT DER ALGAL ASSAY PROCEDURE),
Hoechst A.G., Frankfurt am Main (West Germany). Pflazenschutzforschung-Biologie.
For primary bibliographic entry see Field 5A.
W78-01478

APPLICATION OF SEWAGE SLUDGE TO CROPLAND: APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS TO PLANTS AND ANIMALS.
Council for Agricultural Science and Technology, Ames, IA.
Available from GSA, Centralized Mailing List Services, Bldg. 41, Denver, Colo. 80225. as MCD-33. Report EPA 430/9-76-013, 1976. 69 p, 23 tab, 87 ref, 1 append.

Descriptors: *Heavy metals, *Return flow, *Environmental effects, *Fertilizers, *Land management, Land reclamation, Toxicity, Soil contamination effects, Food chain, Lethal limit, Crop response, Nutrient requirements, Nitrogen, Phosphorus, Manganese, Iron, Aluminum, Chromium, Selenium, Antimony, Lead, Mercury, Cadmium, Copper, Molybdenum, Nickel, Zinc.

A state-of-the-art survey on the potential effects of heavy metals in land-applied sewage sludges on agricultural crops, animals, and groundwater is presented. Quantitative and qualitative data are given for sludge production, cropland requirements, and the metal content of crops. Limiting factors on the application of municipal sludges to cropland are examined, including the rate of application, nitrogen content, heavy metal concentrations, phosphorus, boron, and soluble salts. Accessory criteria are described, including soil pro-

perties, reclamation of disturbed lands, groundwater protection, surface water protection, crop selection, and monitoring needs. Aspects of monitoring which are considered include sampling methods, sample preservation, and analytical procedures. Heavy metals and other elements which may be present in sewage sludge but do not pose a significant hazard to plants and animals are examined, including: manganese, iron, aluminum, chromium, arsenic, selenic, antimony, lead, and mercury. Elements which pose a potentially serious hazard because of their toxicities or concentrations include cadmium, copper, molybdenum, nickel, and zinc. (Schulz-FIRL)
W78-01513

CHEMICAL/BIOLOGICAL IMPLICATIONS OF USING CHLORINE AND OZONE FOR DISINFECTION,
Minnesota Univ., Duluth. Dept. of Chemistry.
R. M. Carlson, and R. Caple.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 694, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-77-066, June 1977. 88 p, 7 fig, 17 tab, 151 ref, 2 append.

Descriptors: *Disinfection, *Chlorination, *Ozone, *Environmental effects, *Chemical reactions, Toxicity, Biochemical oxygen demand, Daphnia, Aquatic life, Organic compounds, Phenols, Waste water treatment, Bioassay, Chemical analysis, Analytical techniques.
Identifiers: Daphnia magna, Anilines, Benzoic acid, Chlorination byproducts.

Chemical and biological studies were conducted to determine the fate, distribution, speciation, and effects of chlorine, ozone and associated byproducts in waste water disinfection. The product distribution and individual components were examined for chlorinated or ozonated waste water containing the following: aromatics, alphaterpineol, oleic acid, fatty acids, resin acids, cholesterol, and phenols. The toxicological effects of disinfection byproducts were examined for Daphnia magna. Hansch 'structure-activity' relationships are suggested as useful in predicting phenol toxicities. The observed toxicity of phenols to Daphnia magna was attributed to the compound's lipiphilic nature. A method for determining the partition coefficient with a 'reverse-phase' high liquid chromatography column was devised to predict the effects of a compound on the environment. Laboratory studies were conducted to determine the effect of chlorination on the biochemical oxygen demand of effluents containing phenols, benzoic acid, and anilines. Lower BOD values and higher toxicities were associated with chlorination byproducts than with parent compounds. (Schulz-FIRL)
W78-01517

PLANKTONIC CENTRIC DIATOMS OF THE SANDUSKY RIVER NEAR FREMONT, OHIO,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
R. L. Lowe, and P. A. Kline.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 144-152. 2 fig, 6 ref.

Descriptors: *Plankton, *Algae, *Diatoms, *Phytoplankton, *River basins, Standing crops, Data collections, Aquatic algae, Aquatic plants, Ohio, Rivers, Census, Classification.
Identifiers: *Sandusky River(Ohio), *Centric diatoms.

Species variety and absolute abundances, of centric diatoms, often the most abundant river phytoplankton, were established for the Sandusky River in Ohio at a point 10 km upstream from Sandusky Bay. Collections were made between October 1973 and May 1974. Phytoplankton were concentrated 10 to 50 fold, and analyzed for standing crop. Twelve taxa were observed: Cyclotella atomus, C. meneghiniana, C. pseudostelligera, C. stelligera, Melosira granulata, M. varians, Microsiphona potamos, Stephanodiscus astraea var. minutula, S. hantzschii, S. invisitatus, Thalassiosira fluviatilis, and T. pseudonana. Cyclotella atomus was the most abundant fall species, with over 41,000 cells/ml. Stephanodiscus invisitatus dominated the spring samples with over 49,000 cells/ml. All species of Cyclotella except C. pseudostelligera, which was numerically insignificant, were more abundant in fall than in spring. All Stephanodiscus species reached a maximum in spring. Microsiphona potamos was important numerically in the spring. (See also W78-01515) (Lynch-Wisconsin)
W78-01523

SEASONAL DISTRIBUTION OF PERIPHYTIC DIATOMS COMMUNITIES OF TYMOCHTEE CREEK,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
P. A. Pryfogle.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p. 153-173. 2 fig, 3 tab, 9 ref.

Descriptors: *Algae, *Diatoms, *Seasonal, *Periphyton, *River basins, Ohio, Streams, Aquatic algae, Aquatic plants, Ecology, Ecological distribution.
Identifiers: *Sandusky River Basin(Ohio), *Tymochtee Creek(Ohio), *Autecology, *Periphytic diatoms.

Periphytic diatoms were collected seasonally for a year in Tymochtee Creek, a major tributary of the Sandusky River in Ohio. All diatoms were identified as to species and noted whether living or dead by means of staining with acid fuschin. Seventy species were identified and nine additional unidentified specimens were collected. Autecological information was compiled by comparison with previous research. A table is included giving seasonal data on abundance. The study concludes that sufficient information about diatom autecology is present to warrant their use as water quality indicator organisms. When put to this use it is important to distinguish between live and dead cells. In the summer collection, of 710 cells counted, 69% were alive. In summer the figure was 52% of 754.5 cells, in fall 65% of 502.5 cells, and in winter 87% of 550 cells counted. (See also W78-01515) (Lynch-Wisconsin)
W78-01524

PHYTOPLANKTON OF THE SANDUSKY RIVER NEAR FREMONT, OHIO,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
P. A. Kline, and R. L. Lowe.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 176-208. 3 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Phytoplankton, *Aquatic plants, *Algae, *Diatoms, *Plankton, *River basins, Rivers, Ohio, Seasonal, Spatial distribution, Water temperature, Turbidity, Standing crops, Discharge(Water), Data collections, Monitoring, Ecology.
Identifiers: *Sandusky River(Ohio).

Taxonomic, seasonal, spatial, and ecological data on phytoplankton are given for a 12-km segment of the Sandusky River near Fremont, Ohio. Four sampling sites were monitored October 1973-May 1974. Results are also given for alkalinity, hardness, nitrate nitrogen, nitrite nitrogen orthophosphate, silica, transparency, and turbidity. Of the 265 algal taxa identified, diatoms were dominant, comprising 78-93% of the phytoplankton (206 species). Forty-three taxa of green algae were identified (5.1-16.4%). Other specimens included chrysophytes (2 taxa), blue-green algae (8 taxa), euglenoids (4 taxa), and dinoflagellates (2 taxa). There was a strong relationship between mean stream temperature and standing crop values. Lowest values were recorded between December and April when temperatures were low and stream discharge high. Autumn and spring maxima were observed during periods of low river discharge and water temperature. Spatial variations among the four sites were not significant. The expected response of the phytoplankton to higher nutrient levels below the effluent of the city was absent. A complete taxonomic inventory is included. (See also W78-01518) (Lynch-Wisconsin)
W78-01525

A COMPARISON OF THE WINTER DIATOM FLORA OF THE SANDUSKY RIVER AND TYMOCHTEE CREEK,
Bowling Green State Univ., OH. Dept. of Biological Sciences.
R. J. Stevenson, and P. A. Pryfogle.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 209-231. 4 fig, 3 tab, 18 ref.

Descriptors: *Diatoms, *Algae, *Aquatic plants, *Periphyton, *River basins, Rivers, Streams, Tributaries, Ohio, Data collections, Effluents.
Identifiers: *Sandusky River(Ohio), *Tymochtee Creek(Ohio), *Epilithic diatoms.

Epilithic diatoms were collected in the Sandusky River of Ohio and a major tributary, Tymochtee Creek, and analyzed for species composition, abundance, diversity, and community similarities. Ten stations on the Sandusky River and four stations on Tymochtee Creek were sampled in February-March, of 1975. Simpson's similarity index was calculated for each possible combination of any two of the 14 stations. Of 89 taxa representing 21 genera identified, 40 taxa were found to be common to both streams. Twenty-one were found only in the Sandusky River and 28 only in Tymochtee Creek. Nitzschia dissipata was the most abundant diatom observed, and comprised 93% of the community at one station on the Sandusky River. Ten other taxa were classified as abundant (20% of one or more stations): Achnanthes haukiana, Gomphonema olivaceum, Navicula radiosa var. tenella, N. secreta var. apiculata, N. tantula, N. tripunctata, N. viridula, Nitzschia frustulum var. perpusilla, Rhoicosphenia curvata, Surirella ovata var. ovata. Speciation was generally more diverse in Tymochtee Creek than in the Sandusky River, possibly because high water scoured the epilithic communities between the Sandusky sampling on February 15 and the Tymochtee sampling on March 6. Recolonization generally is accompanied by greater species diversity. Distinct distributional differences were noted among the Tymochtee Creek stations, among the Sandusky River stations, or between the Tymochtee Creek stations and the Sandusky River stations. (See also W78-01518) (Lynch-Wisconsin)
W78-01526

THE FISHES OF THE SANDUSKY RIVER SYSTEM, OHIO,
Ohio State Univ., Columbus.
M. B. Trautman.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 233-241. 6 ref.

Descriptors: *Fish, *Turbidity, *River basins, Rivers, Tributaries, Lake Erie, History, Ohio.
Identifiers: *Sandusky River System(Ohio).

Before 1850 erosion in the Sandusky River Basin in Ohio was minimal because soils were largely held in place by swamp forests and prairies. Decomposing vegetation on the great swamps furnished both food and cover for several fish species. Waters apparently were rarely turbid, and many species intolerant to turbidity were present.

Early Ohio literature often refers to a great abundance of fish in Lake Erie and its tributaries. Many fish species migrated into and spawned in the Sandusky River before the advent of dams, extensive drainage, increased turbidity, and pollutants. Sturgeon, walleye, and muskellunge, formerly of economic importance, are nearing extirpation today. Rockfish, white bass, catfish, pike, and pickerel were also abundant. Since 1850, 88 species of fish have been recorded. Of these, 41 species show little evidence of a decrease in numbers; most are tolerant to pollutants and silt turbidity. Thirty-five species have decreased in abundance, none of which have not been recorded since 1940. Dams prevented upstream migration of some species, ditching and draining destroyed spawning habitats, and decrease of aquatic vegetation and increased turbidity caused the decline of some fish. Six of the remaining 12 species appear to be recent invaders, including the sea lamprey, suckermouth minnow, and orangespotted sunfish. Carp and goldfish are now very numerous. (See also W78-01518) (Lynch-Wisconsin)
W78-01527

SANDUSKY RIVER BORDERS AND RESERVOIRS AS MIGRATORY BIRD REFUGES,
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 6G.
W78-01528

THE AQUATIC COLEOPTERA OF THE SANDUSKY RIVER, OHIO,
Bowling Green State Univ., OH. Environmental Studies Center.
B. L. Prater, H. P. Brown, and W. D. Shephard.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 255-276. 4 fig, 12 tab, 8 ref.

Descriptors: *Insects, *Aquatic insects, *River basins, Data collections, Standing crops, Ohio, Rivers, Census, Seasonal.
Identifiers: *Sandusky River(Ohio), *Coleoptera, *Aquatic coleoptera, Elmidae, Psephenidae.

Samples of families and 18 species of aquatic coleoptera were collected, as part of a much larger survey of all the benthic macroinvertes of the Sandusky River in Ohio. Some species that might be expected to occur were absent from the results, due to sampling techniques not specifically geared to aquatic coleoptera. Riffle, pool and marginal samples were combined at each of 10 stations for 12 months in 1973-74. Stenelmis was relatively most abundant with 31.6%; Psephenus herricki was next with 22.1%. The largest standing crop of coleoptera (421/sq m) was recorded in August, 1974. The greatest number of different species at one station was nine; the least was zero. The family Elmidae contained the greatest number of species collected. Elmids seem to have at least five instars, and pupate under stones or in wood in water. They over-winter in all stages. Only 10 Psephenidae were collected. Aquatic coleoptera should be considered as water quality indicators; elmid and dryopoid beetles, for example, are virtually eliminated by soapy water. Extensive tables with study results are presented. (See also W78-01518) (Lynch-Wisconsin)
W78-01529

THE ECOLOGY OF RUNNING WATERS: THEORY AND PRACTICE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 6G.
W78-01530

BENTHIC MICROINVERTEBRATE POPULATIONS OF SANDUSKY BAY,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
C. E. Herdendorf, and W. K. Lindsay.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 359-377. 2 fig, 3 tab, 7 ref.

Descriptors: *Invertebrates, *Benthic fauna, *Insects, *Oligochaetes, *Diptera, *River basins, Seasonal, Data collections, Annelids, Sludge worms, Midges, Aquatic populations, Environmental effects, Eutrophication, Bays, Ohio.
Identifiers: *Sandusky Bay(Ohio), *Sandusky River Basin(Ohio).

A study of the benthic macroinvertebrate community of Sandusky Bay and tributaries, largely composed of oligochaete worms and chironomid (midge) larvae, was undertaken in part to determine the environmental suitability of a tract of land on the bay for an electric generating plant. Forty-three stations were sampled from November 1972 to October 1974. Six species comprised 90% of the fauna; there were three oligochaetes (Branchiura sowerbyi, Limnodrelus hoffmeisteri, and Peloscolex ferox) and three dipterans (Chironomus c. plumosus, Procladius bellis, and Coelotanypus scapularis). Thirty-one genera were recorded from about 300 samples. The highest mean number of organisms at one station was 3,374/sq m, with a monthly high of 17, 673/sq m in March 1973. That station was the most sheltered and therefore probably the most stable habitat. At all stations the largest number of organisms was collected in March 1973, 4,485/sq mi, followed by a monthly decline to a low in August 1973. Subsequent monthly increases lasted again until March (1974); decline persisted through October 1974. The low density in July and August is probably due to the emergence of chironomids and the natural mortality of oligochaetes. Highest density was in mid-bay, and lowest near the shore. The data show no correlation between the density of one species against another, and little evidence of geographic preference by species. Both oligochaetes and chironomids prefer highly eutrophic conditions, such as the highly organic mud and silt substrates of Sandusky Bay. (See also W78-01518) (Lynch-Wisconsin)
W78-01531

ABUNDANCE AND POPULATION TRENDS OF SANDUSKY BAY FISHES,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
S. M. Hartley, and C. E. Herdendorf.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 380-422. 16 fig, 8 tab, 15 ref.

Descriptors: *Fish, *Lake Erie, *River basins, Freshwater fish, Bays, Environmental effects, Fish populations, Ohio, Seasonal, Aquatic populations, Data collections, Food chains.
Identifiers: *Sandusky Bay(Ohio), *Sandusky River Basin(Ohio).

Twenty-three species of fish in 13 families were collected at 32 sampling sites on Sandusky Bay in Lake Erie from November 1972 to November 1974 as part of an environmental assessment conducted in connection with a proposed nuclear power plant on the bay. Gizzard shad (Dorosoma cepedianum) and yellow perch (Perca flavescens) dominate the population (40% and 22%). Other significant species are: white bass (Morone chrysops) 8.4%, carp (Cyprinus carpio) 7.4%, goldfish (Carassius auratus) 7.4%, white crappie (Pomoxis annularis) 6.2%, brown bullhead (Ictalurus nebulosus) 6.0%, freshwater drum (Aplodinotus grunniens) 4.2%, channel catfish (Ictalurus punctatus) 1.2%, and walleye (Stizostedion v. vitreum) 1.0%. Rough and nongame fish make up 63.0% of the species collected, game fish 35.8%, and forage fish 1.2%. The smallest mesh size of the gear used to collect fish was one-half inch. This tended to eliminate the forage base from the samples. The bluntnose minnow, spotfin shiner, spottail shiner, and emerald shiner are presumed present and abundant. In total fish population, August was the peak month for 1973 and 1974, followed by April-May 1974. Several species were analyzed for stomach content. Diptera, and fish, Oligochaetes and Deatoms are the major food items of most species. Environmental stress in the last 150 years has caused the decline of many species, including white bass (once the most abundant species), walleye, northern pike, and muskellunge. Currently abundant species have either stable or increasing populations. (See also W78-01518) (Lynch-Wisconsin)
W78-01532

SOME BRIEF REFLECTIONS ON THE SYMPOSIUM, THESE PROCEEDINGS AND WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 5B.
W78-01534

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES. VOLUME I. EXECUTIVE SUMMARY,
Battelle-Northwest, Richland, WA. Pacific Northwest Lab.
For primary bibliographic entry see Field 5A.
W78-01551

EFFECT OF PULP MILL EFFLUENT ON SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
R. G. Sandilands.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 817-823, June, 1977. 5 fig, 24 ref, 2 tab.

Descriptors: *Pulp wastes, *Lake sediments, *Lake Superior, *Water pollution, Lakes, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, Hydrogen ion concentration, Organic matter, Sediments, Bottom sediments, Sulfur, Mercury, Foreign countries, Canada.
Identifiers: Kraft mills, *Nipigon Bay(Lake Superior).

Bottom sediment samples were obtained in June 1974 to determine the zone of influence of a point source discharge from the kraft paper mill at Red Rock, Ontario. The composition of the samples were described by particle-size distribution, organic and inorganic carbon, major elements and trace element analyses. Correlation coefficients and cluster analysis were used to determine any characteristic association. The results showed that the mill discharge decreased pH and increased organic matter in the sediment. Above average concentrations of total sulfur and mercury appeared to be associated with this organic matter. These effects were localized around the point source (1.5 km) and were detectable to about 5 km downstream from the mill outfall. (Witt-IPC)
W78-01554

ADAPTIVE REACTIONS OF CARP TO CHANGES IN CONCENTRATION OF FREE CARBON DIOXIDE IN WATER, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
N. I. Kotsar.
Dopov Akad Nauk Ukr Rsr Ser B Heol Khim Biol Nauky 9, p 826-829, 1976.

Descriptors: *Carbon dioxide, Carbonates, *Carp, Equations, *Hypercapnia, *Phosphates, Urine.

The dependence between the concentrations of free CO2 in the environment and carp blood (Cyprinus carpio) was studied within a CO2 range of 0.10-2.05 mmol/l of water. An equation was ob-

tained characterizing the dependence in a generalized form. The dynamics of CO2 and phosphate excreation in the urine was studied with respect to fish adaptation to hypercapnia. The limit level of biocarbonates in the blood plasma is established under which the intensity of their formation is balanced with the intensity of their excretion from the organism with hypercapnia.--Copyright 1977, Biological Abstracts, Inc.
W78-01556

EXTENT OF EFFLUENT INFLUENCE ON LAKE WATER DETERMINED BY BACTERIAL POPULATION DISTRIBUTIONS,
Ontario Ministry of the Environment, Rexdale. Lab Service Branch.
For primary bibliographic entry see Field 5B.
W78-01558

EXPERIMENTAL STUDY OF SOME PROBLEMS OF THE BIOLOGICAL EFFECT OF WATER TREATED BY A CONSTANT MAGNETIC FIELD, (IN RUSSIAN),
Medical Academy, Varna (Bulgaria).
For primary bibliographic entry see Field 5F.
W78-01561

ASSESSMENT OF THE ACUTE TOXICITY, GROWTH IMPAIRMENT, AND FLESH-TAINTING POTENTIAL OF A BLEACHED KRAFT MILL EFFLUENT ON RAINBOW TROUT (SALMO GAIRDNERI),
Ontario Ministry of the Environment, Rexdale. Water Resources Branch.
D. M. Whittle, and K. W. Flood.
Journal of the Fisheries Research Board of Canada, Vol 34, No 6, p 869-878, June, 1977. 1 fig, 27 ref, 7 tab.

Descriptors: *Pulp wastes, *Toxicity, *Rainbow trout, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Bioassay, Effluents, Pulp and paper industry, Lethal limit, Animal growth, Taste, Fish, Aquatic animals, Aquatic life, Trout, Water pollution.

Static and continuous-flow bioassays utilizing juvenile rainbow trout were conducted on a bleached kraft mill effluent to assess the range of acute toxicity and related sublethal effects. The acute toxicity of the total mill effluent, as determined by static bioassay procedures, ranged from a 96-hr LC(50) value of 14-49.0% vol/vol. The results of these bioassays depended on testing methodology and effluent treatment systems employed by the mill. Continuous-flow bioassays conducted on the effluent produced 96-hr LC(50) values of 21.8 and 24.8% vol/vol. Growth rate of juvenile rainbow trout (1-2 g) held under continuous-flow conditions for 18 days was significantly reduced at 6% effluent concentration. Flavor of yearling rainbow trout (ca. 200 g) exposed to 3% effluent for 48 hr was significantly impaired. This effluent concentration, the lowest level impairing flavor, represents approximately 0.12 of the 96-hr LC(50) derived from continuous-flow bioassays. No significant flavor impairment was detected in fish exposed for 144 hr to a 2% effluent concentration. Flavor impairment at a 3% effluent concentration, the most sensitive sublethal response measured in this study, may also be the most critical response when assessing the economic impact of a kraft mill discharge to a freshwater ecosystem. (Witt-IPC)
W78-01562

DENSITY, DISTRIBUTION, AND MOVEMENT OF NIPIGON BAY FISHES IN RELATION TO A PULP AND PAPER MILL EFFLUENT,
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. M Kelso.
Journal of the Fisheries Research Board of Canada, Vol 34, No 6, p 879-885, June, 1977. 5 fig, 15 ref, 1 tab.

Descriptors: *Pulp wastes, *Fish, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Water pollution, Canada, Foreign countries, Distribution patterns, Fish populations, Density, Movement, *Lake Superior, Great Lakes.
Identifiers: *Nipigon Bay(Lake Superior).

The density of pelagic fish in accessible portions of Nipigon Bay, Lake Superior, was lower offshore (less than 100 fish/10,000 cu m) and greater nearshore (less than 1800 fish/10,000 cu m). Conditions at Red Rock, Ontario, caused intense aggregation there and caused species dominance to shift to suckers at the kraft mill discharge from yellow perch elsewhere. Plume shape and direction did not alter the localized pattern of distribution. Two typical responses to plume concentrations were found using suckers fitted with ultrasonic transmitters. Fish released in high discharge concentrations (greater than 15% dilution by volume) became disoriented for as much as several hours, then appeared to search for background conditions. Fish released in low discharge concentrations (less than 15%) immediately initiated an avoidance reaction. Although individuals tended to avoid areas of altered water quality, the community aggregated at Red Rock in response to, perhaps, increased production of benthic macroinvertebrates. Residence time was short in the area of altered water quality. (Witt-IPC)
W78-01563

LEUCOCRIT: A SIMPLE HEMATOLOGICAL TECHNIQUE FOR MEASURING ACUTE STRESS IN SALMONID FISH, INCLUDING STRESSFUL CONCENTRATIONS OF PULP MILL EFFLUENT,
British Columbia Research Council, Vancouver.
D. J. McLeay, and M. R. Gordon.
Journal of the Fisheries Research Board of Canada, Vol 34, No 11, p 2164-2175, November, 1977.

Descriptors: *Pulp wastes, *Water pollution effects, *Fish, Bioassay, Wastes, Industrial wastes, Water pollution sources, Rainbow trout, Salmon, Pulp and paper industry, Effluents, Bleaching wastes, Aquatic animals, Aquatic life, Trout.
Identifiers: Coho salmon, Kraft mills.

The number of leucocytes and thrombocytes in the circulating blood of fishes seems to reflect more accurately than the number of erythrocytes the fish's reaction to acute stress, including that caused by pollution. To facilitate the estimation of leucocytes in fish blood, a new test is being introduced called leucocrit, which is based on the determination of the volume of packed leucocytes-thrombocytes expressed as a percentage of the whole blood. The mean leucocrit values for juvenile coho salmon (Onchorhynchus kisutch) and rainbow trout (Salmo gairdneri) held in freshwater under a variety of conditions varied from 0.55 to 1.91%. Variations in age, species, food ration, degree of crowding, and prior disturbances of fish stocks were associated with these differences. Leucocrit and leucocyte-thrombocyte counts for both species were depressed from stock values after 96-hr or shorter (rainbow) exposure to stressful (high-temperature crowded) conditions; values for these measures were positively correlated but uncorrelated with hematocrit values. Leucocrit values for stocks of coho (1.30 plus or minus 0.27%) and rainbow (0.92 plus or minus 0.12%) were depressed due to transfer or acute exposure to bleached kraft pulp mill effluent. A 24-hr exposure to kraft mill effluent after 2 days' acclimation caused consistent leucocrit depressions, with median effective concentrations of 0.28 of the 96-hr LC(50) value for coho and 0.16 LC(50) for rainbow. Hematocrit showed less sensitive or consistent changes due to stress or effluent exposure than leucocrit. (Witt-IPC)
W78-01564

CONTRIBUTIONS TO THE ECOLOGY OF BENTHIC ALGAE IN THE ALPINE ZONE OF THE PYRENEES: II. CYANOPHYCEANS AND OTHER ALGAL GROUPS, (IN GERMAN),
Baden-Wuerttemberg Landesanstalt fuer Umweltschutz (West Germany). Inst. of Wasserund Abfallwirtschaft.
For primary bibliographic entry see Field 2H.
W78-01583

QUALITY OF EFFLUENTS FROM MECHANICAL PULPING PROCESSES,
Pulp and Paper Research Inst., Point Claire (Quebec).
For primary bibliographic entry see Field 5D.
W78-01659

ECOLOGICAL EFFECTS OF HEAVY METAL DISCHARGE IN A SALMON RIVER,
Umea Univ. (Sweden). Dept. of Biology.
S. Sodergren.
Institute of Freshwater Research, Drottningholm, Report No. 99, p. 91-131, 1976. 21 fig, 17 tab, 73 ref.

Descriptors: *Cobalt, *Heavy metals, Industrial wastes, *Chemical wastes, *Toxicity, *Salmonids, *Atlantic salmon, *Fish populations, *Nickel, *Bottom sediments, *Juvenile growth stage, *Acidic water, Aquatic plants, Aquatic animals, Path of pollutants, Water pollution sources, Invertebrates, Environmental effects, Ricklea River, Sweden.

The salmon population in the Ricklea river has been studied since 1961. In 1966 a drastic reduction in the numbers of sea-migration salmon smolts was recorded. An extensive investigation linked this decrease with heavy metal discharge, primarily cobalt, from a diamond factory. (Katz)
W78-01661

THE GROWTH AND YEAR-CLASS STRENGTH OF PERCH (PERCA FLUVIATILIS L.) IN SOME BALTIC ARCHIPELAGOES, WITH SPECIAL REFERENCE TO TEMPERATURE,
National Swedish Environment Protection Board, Stockholm. Research Lab.
E. Neuman.
Institute of Freshwater Research, Drottningholm, Report, No 55, p. 51-70, 1976. 8 fig, 9 tab, 24 ref.

Descriptors: *Fish populations, *Growth rates, *Growth stages, *Animal growth, *Age, Fish physiology, *Water temperature, *Air temperature, *Perches, *Animal metabolism, Population, Operular bone, Year class strength.

The effect of natural temperature variations on the yearly length increment and year-class strength of perch was investigated using the opercular bone as an age indicator. The year-to-year variation in growth and its dependence on temperature increased markedly with age. However, the correlation between growth and temperature dropped below the level of significance if the mean values of year classes were replaced by the length increments of single individuals in the analysis. (Katz)
W78-01662

ALTERATION AND DESTRUCTION OF ESTUARIES AFFECTING FISHERY RESOURCES OF THE GULF OF MEXICO,
National Marine Fisheries Service, St. Petersburg, FL. Southeast Regional.
W. N. Lindall, Jr, and C. H. Saloman.
Marine Fisheries Review, Vol. 39, No. 9, p. 1-7, 1977. 9 fig, 3 tab, 18 ref.

Descriptors: Estuaries, *Estuarine environment, *Estuarine fisheries, *Marine fisheries, Commercial fishing, Sport fishing, *Gulf Coastal Plain, *Gulf of Mexico, *Commercial shellfish, *Tidal waters, *Tidal marshes, Land management, *Land use.

Both the commercial and recreational fishing industries of the Gulf of Mexico are overwhelmingly dependent of estuaries. About 90 percent of the commercial catch and 70 percent of the recreational catch are made up of species that are estuarine dependent. Man's alteration of estuaries is threatening these fishery resources. Data from recently published inventories quantify the degree to which the estuarine environment is being altered. (Katz)
W78-01663

TOXICITY OF FOUR TOXICANTS TO GREEN EGGS OF SALMONIDS,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
L. E. Olson, and L. L. Marking.
The Progressive Fish Culturist, Vol. 37, No. 3, p. 143-147, 1975. 2 tab, 7 ref.

Descriptors: *Pescicides, *Fish eggs, *Fry, *Salmonids, *Salmon, *Trout, Fish physiology, *Toxicity, Mortality, Organic compounds, Rotenone, Antimycin A, Pesticides, Fish control agents, Bioassay, Brown trout, Chinook salmon, Lake trout, *Lampricides, *TFM, *Bay 73, *Noxfish, LC50, Coho salmon.

The toxicity of four piscicides to green eggs and fingerlings of various salmonid species was investigated. The eggs were more resistant than fingerlings to Bay 73, antimycin, and Noxfish. Egg and fingerling resistance to TFM was similar. In addition, the suitability of green eggs as test organisms was researched. (Katz)
W78-01664

A SOLENOID-ACTUATED CHEMICAL-METERING APPARATUS FOR USE IN FLOW-THROUGH TOXICITY TESTS,
Fish and Wildlife Service, Warm Springs, GA. Southeaster Fish Control Lab.
For primary bibliographic entry see Field 5A.
W78-01665

CONTROLLING GRASS CARP (CTENOPHARYNGODON IDELLA) WITH ANTIMYCIN, ROTENONE, AND THANITE AND BY ELECTROFISHING,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
K. B. Cumming, R. M. Burress, and P. A. Gilderhus.
The Progressive Fish Culturist, Vol. 37, No. 2, p. 81-84, 1975. 2 tab, 14 ref.

Descriptors: *Fish control agents, *Piscicides, *Rotenone, *Antimycin A, *Electro-fishing, *Electric shocking gear, *Carp, Toxicity, Pesticides, Mortality, Lethal limit, Sunfishes, Catfishes, *Thanite, *Selective toxicity, *Ctenopharyngodon, Grass carp. Herbivorous fish.

The grass carp, which was introduced into the United States in 1963 as an experimental fish to control aquatic weeds, is now commercially available throughout the nation and has escaped into natural waters. As a result, great concern has been expressed about the potential impact of this species on existing ecological relationships. The two piscicides (antimycin and rotenone) were very effective against grass carp, but also caused a high mortality among green sunfish. The unselective toxicity of Thanite also was a problem. Electrofishing was an impractical control method, but could prove useful as a survey tool to detect the presence of grass carp. (Katz)
W78-01666

SPAWNING SUCCESS OF FATHEAD MINNOWS ON SELECTED ARTIFICIAL SUBSTRATES,
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-01667

SALINITY TOLERANCE OF GAMBUSIA AFFINIS (BAIRD AND GIRARD) AND HETEROPNEUSTES FOSSILIS (BLOCH),
Basrah Univ., Al Basrah (Iraq). Dept. of Fisheries.
K. Al-Daham, and M. N. Bhatti.
Journal of Fish Biology, Vol. 11, p. 309-313, 1977. 4 tab, 4 ref.

Descriptors: *Salinity, *Salt tolerance, *Resistance, Fish physiology, *Animal metabolism, Mortality, *Sodium chloride, *Salts, *Saline water, *Calcium chloride, Sea water, *Dissolved oxygen, Freshwater fish, Potassium compounds, *Livebearers, *Heteropneustes.

Results are presented of a study on the salinity tolerance of two freshwater fishes. The two species were treated with various concentrations of sea water and three most common salts found in the saline waters of Iraq, namely sodium chloride, calcium chloride and potassium chloride. The mortality rates following these treatments were recorded. Both species showed the highest degree of resistance for sea water and sodium chloride, and the lowest degree of tolerance to potassium chloride. G. affinis was more resistant to these salts and sea water than H. fossilis. (Katz)
W78-01671

EVALUATION OF FUNGICIDES FOR HALIPHTHOROS MILFORDENSIS AND THEIR TOXICITY TO JUVENILE EUROPEAN LOBSTERS,
California Univ., Davis, CA. Inst. of Marine Resources.
D. Abrahams, and W. D. Brown.
Aquaculture, Vol 12, p 31-40, 1977. 1 fig, 6 tab, 10 ref.

Descriptors: *Toxicity, Mortality, *Fungi, *Pathogenic fungi, *Fungicides, *Lobsters, *Juvenile growth stage, *Animal diseases, Animal physiology, *Growth rates, Bioassay.
Identifiers: *Haliphthoros, *Malchite green, Furnace.

Twenty-two potentially fungitoxic compounds were evaluated for their in vitro inhibition of mycelial growth. Eight compounds completely inhibited mycelial growth at concentrations of 10 micrograms/ml or less. These eight compounds were then tested as to their toxic effects on juvenile lobsters. Significant mortality was observed upon lengthy exposure to these compounds. Molting during application of the chemical by the dip method appears to affect survival adversely. (Katz)
W78-01672

SHORT-TERM EFFECTS OF TWO SILVER SALTS ON TISSUE RESPIRATION AND ENZYME ACTIVITY IN THE CUNNER (TAUTOGOLABRUS ADSPERSUS),
National Marine Fisheries Service, Milford, CT. Milford Lab.
E. Gould, and J. R. MacInnes.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 4, p 401-408, 1977. 3 tab, 23 ref.

Descriptors: Fish physiology, *Animal metabolism, *Toxicity, *Silver, *Nitrates, *Heavy metals, *Respiration, *Oxygen requirements, *Salts, *Enzymes, Animal physiology, Metabolism.
Identifiers: Tissue analysis, Bioaccumulation, *Cunner, Tautogolabrus, *Silver salts.

The relative toxic effects of a 96-h exposure to silver nitrate and silver acetate were examined. Short-term exposure to 0.5 pp silver in either form causes respiratory distress. Differing responses were noted in an analysis of the activities of two liver enzymes. The nitrate salt induces a slightly higher metabolic stress than does the acetate. (Katz)
W78-01674

CONCENTRATION OF CADMIUM, COPPER, LEAD AND ZINC IN SIX SPECIES OF FRESHWATER CLAMS,
Northern Illinois Univ., DeKalb. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W78-01675

LOCALIZED MASS MORTALITY OF RED SEA URCHIN, STRONGYLOCENTROTUS FRANCISCANUS NEAR SANTA CRUZ, CALIFORNIA,
California Univ., Santa Cruz. Center for Coastal Marine Studies.
J. S. Pearse, D. P. Costa, M. B. Yellin, and C. R. Agegian.
Fishery Bulletin, Vol 75, No 3, p 645-648, 1977. 2 fig, 6 ref.

Descriptors: *Animal diseases, *Animal pathology, *Mortality, Population, *Epidermis, Pathology, Diseases, Coasts, California, Invertebrates, Benthos, Marine animals.
Identifiers: *Sea urchin, Santa Cruz(Calif).

Two instances of localized mass mortalities of red sea urchins in Central California were reported. Diseased animals were described as having test plates partially denuded of spines. This and other characteristics of the disease were very similar to those reported for a mass mortality in the San Diego area in 1970. The etiology of the disease remains unknown. (Katz)
W78-01677

SHORT-TERM THERMAL RESISTANCE OF ZOEAE OF 10 SPECIES OF CRABS FROM PUGET SOUND, WASHINGTON,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
B. G. Patten.
Fishery Bulletin, Vol 75, No 3, pp 55-559, 1977. 2 tab, 11 ref.

Descriptors: *Crabs, *Commercial shellfish, *Electric powerplants, *Water cooling, *Thermal pollution, *Water temperature, *Steam turbines, *Standards, *Heat exchangers, *Heat transfer, *Heated water, *Thermal stress, Crustaceans, Washington.
Identifiers: *Zoeae, Cancer, Pagurus, *Puget Sound(Wash).

Zoeae of 10 crab species were subjected to tests that simulated thermal stress associated with steam-powered electric stations. Shortly after hatching, the unfed zoeae were subjected to conditions simulating passage through heat exchangers (held at elevated test temperatures for 20 min with an abrupt increase and decrease from ambient) or mixing with thermal plumes (held at test temperature 1 to 4 h with temperatures gradually rising and decreasing from ambient). Thermal conditions in heat exchangers are postulated to be more critical to the survival of zoea than mixing with thermal plumes. The maximum temperature that should be permitted in heat exchangers to protect the most sensitive species studied is 24C for the Puget Sound area. (Katz)
W78-01679

TOXICITY OF N-PHENYL-A-NAPHTHYLAMINE AND HYDRAZINE TO XENOPUS LAEVIS EMBRYOS AND LARVAE,
California Univ., Irvine. Dept. of Anatomy; and California Univ., Irvine. Dept. of Developmental and Cell Biology.
G. A. Greenhouse.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 4, p. 503-511, 1977. 8 fig, 4 tab, 10 ref.

Descriptors: *Toxicity, *Mortality, *Organic compounds, *Larval growth stage, *Embryonic growth stage, *Frogs, *Lethal limit, *Fuels, *Path of pollutants, Amphibians, Water pollution effects, Bioassay.
Identifiers: *Teratogens, *Xenopus.

Previous studies by the author have demonstrated the toxic and teratogenic nature of N-phenyl-a-naphthylamine and hydrazine. The data presented in this study establish the LD50 of N-phenyl-a-naphthylamine for Xenopus laevis larvae and the ED50 (teratogenic) of N-phenyl-a-naphthylamine, hydrazine, and 1,1-dimethylhydrazine for X. laevis embryos. (Katz)
W78-01680

TRACE METAL CONCENTRATIONS IN TWO SHELLFISH SPECIES OF COMMERCIAL IMPORTANCE,
Raytheon Oceanographic and Environmental Services, Portsmouth, RI.
For primary bibliographic entry see Field 5A.
W78-01681

BEHAVIOR OF MERCURY IN BIOSYSTEMS I. UPTAKE AND CONCENTRATION IN FOOD-CHAIN,
Georgia Univ., Athens. Dept. of Food Science.
For primary bibliographic entry see Field 5B.
W78-01682

MERCURY IN FISH AND SHELLFISH OF THE NORTHEAST PACIFIC. III. SPINY DOGFISH, SQUALUS ACANTHLAS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5B.
W78-01683

5D. Waste Treatment Processes

CATALYTIC PROCESS FOR OZONATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Environmental Research and Application, Inc., Briarcliff Manor, NY. (Assignee).
A. Turk.
U.S. Patent No. 4,029,578, 6 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 752, June 14, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Waste water treatment, Industrial wastes, Ozone, Catalysts, Metals.
Identifiers: Ozonation.

Water containing orgaic cantaminants is ozonated by contacting the water with ozone in the presence of a mixed heterogeneous catalyst comprising water insoluble salts, preferably an insoluble carbonate, sulfate, oxide, halide or sulfide, of at least two metals selected from the group consisting of copper, cadmium and the Group VIII metals, preferably iron, cobalt or nickel. During ozonation, the pH of the water is monitored and it is adequately buffered, if necessary, so as to maintain a pH within the range of about 6.8 to about 7.8. The catalyst is supported on an insoluble carrier such as aluminum oxide or a simple or complex silicate and is of a controlled particle size and density. (Sinha-OEIS)
W78-01189

PROCESS AND APPARATUS FOR THE PURIFICATION OF ORGANICALLY CONTAMINATED SEWAGE,
Linde A.G., Wiesbaden (West Germany). (Assignee).
H. Reimann.
U.S. Patent No. 4,029,574, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 751, June 14, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Organic wastes, Oxygen, Aeration, Activated sludge, Gases, Oxygenation, Carbon dioxide.

An activated sludge process for the purification of sewage by aerating a sewage-activated sludge mixture with oxygen or oxygen-enriched air is described. At least a portion of the gaseous mixture exiting from the aeration tank is collected, at least a portion of gaseous metabolic product is separated, and the purified gas is recycled to the aeration tank. Concentration gradients of O2 and gaseous metabolic products are thereby reduced, improving the efficiency of the sewage treatment processing, and pure CO2 can be recovered as an end product. (Sinha-OEIS)
W78-01193

TREATMENT OF WATER CONTAINING CYANIDE,
Thiokol Corp., Newtown, PA. (Assignee).
W. N. Christensen, and L. W. Poulter.
U.S. Patent No. 4,029,557, 4 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 746, June 14, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water pollution control, Electrolysis, Sodium chloride, Chlorine, Chemical reactions.
Identifiers: *Cyanide, Metal processing industries.

The greatest source of cyanide bearing waste is the rinse water, spillage, and drippings from electroplating solutions. A process for destroying cyanide in such waste water comprises adding ordinary salt (NaCl) to the water, passing it through an electrolytic cell, where chlorine and caustic are generated from the salt, and passing the water into a wash tank where the chlorine reacts with the cyanide. The chlorine and caustic immediately react with the metal-cyanide compounds to produce metal hydroxide precipitates, while the cyanide is decomposed and liberated from the water in carbon dioxide and gaseous nitrogen. As part of this reaction, the sodium chloride is reformed, so that the same brine can be recycled and the process repeated without further additives. The optimum pH of between 7 and 8 may be maintained as needed by addition of small amounts of hydrochloric acid to the system. (Sinha-OEIS)
W78-01194

METHOD AND APPARATUS FOR PURIFYING WATER CONTAMINATED WITH ANODICALLY OXIDIZABLE ORGANIC MATTER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
A. Reis, K-E. Quentin, and L. Weil.
U.S. Patent No. 4,013,554, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1378-1379, March 22, 1977.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water quality control, *Electrolysis, Adsorption, Anodes, Cathodes, Membranes, Equipment.

This invention relates to the purification of water contaminated with organic matter particularly anodically oxidizable organic matter. Contaminated water is pumped through the anode compartment of an electrolytic cell which is separated from the cathode compartment by a diaphragm permeable to water and to inorganic ions. Particles of hydrophilic, electrically conductive, carbonaceous material capable of adsorbing the contaminants are retained in the anode compartment by the diaphragm and by screens in the water discharge conduit and are held in turbulent suspension by the flowing water so that they make intermittent conductive contact with the anode surface. (Sinha-OEIS)
W78-01195

FLUID TREATMENT METHOD,
Iconex Systems Inc., Stamford, CT. (Assignee).
E. L. Karlson.
U.S. Patent No. 4,013,553, 7 p, 6 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1378, March 22, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Sewage treatment, Water pollution treatment, Separation techniques, *Ion exchange, Equipment.
Identifiers: Continuous belts.

The invention comprises a continuous, ionically biasable foraminous belt moving along a path forming a number of transversals of the flow path which are sequentially counter-directional to the direction of the flow of the fluid. Associated with the apparatus is a means for removing solids collected on the belt and for re-establising the ion potential. These functions are achieved by means of a solid waste removal column containing an internal spray pipe having high pressure spray nozzles. Next in tandem along the line of travel of the belt is an ion re-charger of known design by which the ionized bias (i.e., either anionic or cationic, according to the ionization of the materials to be extracted) of the belt is re-established. This recharger is followed by a water rinse tank to remove any excess ion recharging material left on the belt. Various carrier rolls outside of the tank support the belt along its path of travel and provide directional changes. (Sinha-OEIS)
W78-01196

METHOD FOR THE RECYCLE TREATMENT OF WASTE WATER FROM CHROMIUM PLATING,
Kayabakoyo-Kabushiki-Kaisha, Tokyo (Japan). (Assignee).
T. Hayashi.
U.S. Patent No. 4,012,318, 13 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 956, No 3, p 957-958, March 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Ion exchange, Chemical reactions, Cation adsorption, Anion adsorption, Chromium, Resins, Water reuse.
Identifiers: Metal plating industry.

A method is described for the recycle treatment of chromium plating waste water. The process improves the rate of recovery of chromic acid, extends the life of the ion exchange resins, and prevents the formation of sludge. The process is characterized by the treatment, under neutral conditions, of the chromium plating waste water, from which the iron and other metallic components have been removed by the addition of sodium hydroxide or calcium hydroxide followed by precipitation, and by the subsequent adsorption of sodium or calcium with cation resins, before the adsorption of dichromic acid ions on the anion resins. Through such treatment, the exchange efficiency of the resins is improved, and the direct recycling of the dichromic acid solution is made possible because of its purity. Each of the resin beds is regenerated by the use of sulfuric acid, and the waste water from each of the beds is converted into the innocuous form of sodium sulfate solution which may be recycled for washing the plated products or discarded into rivers. (Sinha-OEIS)
W78-01201

METHOD FOR RECLAIMING VARIEGATED WASTES,
W. Josephs.
U.S. Patent No. 4,012,219, 4 p, 1 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 956, No 3, p 931, March 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Desalination, Sewage treatment, Domestic wastes, Suspended solids, Clays, Mixing, Adsorption, Settling basins, Water reuse.

Identifiers: Dredging spoils.

A method for reclaiming variegated wastes such as garbage, sewage and saline dredging spoils comprises the desalinization of clay-bearing dredging spoils by first dumping the spoils into corrals located on the shore of a saline body of water. The spoils are permitted to settle, and the salt water is drained or pumped away. The resulting mud is a low salinity, clay-bearing material. This material is then used to treat the sewage and garbage. The garbage is cleaned to remove useful materials, and the remaining, highly-organic material is shredded and mixed with water to form a slurry. It is then mixed with raw sewage from municipal sewage collection pipes, and with the desalinated dredging spoils. This mixture is then pumped through a pipe-line or other suitable means to a treatment and reclamation area. In transit, the movement of the mixture provides an agitating action, which exposes the clay particles of the spoils to the suspended solids and dissolved contaminates in the mixture. The clay particles act as a nucleating agent for the solids and contaminants, adsorbing as much as two and one-half times their weight of these substances. At the treatment site the mixture is further agitated if required, and placed in settling tanks. The organically rich solids are removed and composted to form a rich soil suitable for agriculture. The water is used for irrigation or is purified and used for industry or agriculture, or released. (Sinha-OEIS)
W78-01203

SKIMMER APPARATUS FOR SEWAGE SETTLING TANKS AND THE LIKE,
Sybron Corp., Rochester, NY. (Assignee).
R. F. McGivern.
U.S. Patent No. 4,011,164, 7 p, 8 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 569, March 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Settling basins, Water pollution treatment, Skimming, Scum, Oily water, Equipment.

A scum removal system for sewage settling tanks employs a floating skimmer system which is lowered onto the surface of the liquid at one end of the tank and then moved toward the opposite end where floating materials collected by the skimmer are passed into a scum through end of the tank, the skimmer is raised from the surface of the liquid and returned to the first end while being held above the liquid surface. Continuous flow into the scum trough is prevented by a floating beach hinged to the scum trough. The beach is submerged as the skimmer approaches so that flow over the submerged beach carries the collected by the depth as well as the length of time that the beach is held beneath the surface. (Sinha - OEIS)
W78-01206

TREATMENT OF WASTE WATER PRODUCED IN THE MANUFACTURE OF EXPANDABLE POLYSTYRENE,
Badische Anilin-und Soda-Fabrik A.G., Ludwigshafen am. Rhein (West Germany).
K. H. Popp, K. Hess, W. Simmler, R. Stickel, and L. Zuern.
U.S. Patent No. 4,011,161, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 568, March 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water purification, Biochemical oxygen demand, Foaming, Bubbles, Foam separation, Detergents, Separation techniques.
Identifiers: Expandable polystyrene.

Waste water produced in the manufacture of expandable polystyrene contains organic components consisting of unfoamed polystyrene in the form of beads of various sizes and also finely divided solid impurities in suspension (styrene emulsion polymers) and portions of the protective colloids in the bead polymerization. Such waste waters have a fairly high biochemical oxygen demand (BOD). The suspended solids give the waste water a milky appearance and are stabilized against coagulation or flocculation by the presence of residues of the suspension stabilizer used. The invention comprises passing a stream of fine gas bubbles through the waste water and removing the resulting foam containing a high concentration of suspended matter from the aqueous phase. If desired, detergents may be added to the waste water in order to increase the foaming effect and thus improve the clarifying activity. If necessary, the waste water remaining after removal of the foam may be subjected to an aftertreatment such as ultrafiltration, ozonization, treatment with activated charcoal and the like. (Sinha - OEIS)
W78-01208

PROCESS FOR PURIFYING WASTE WATER BY ELECTROLYSIS,
Nippon Risui Kagaku Kenkyusho (Japan). (Assignee).
T. Ito, and H. Yamazaki.
U.S. Patent No. 4,011,151, 4 p, 5 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 565, March 8, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, Water pollution treatment, Water quality control, *Electrolysis, Hydrogen ion concentration, Filtration, Cathodes, Anodes.
Identifiers: Dye stuffs.

A process for purifying waste water by electrolysis in two steps is disclosed. In the first step, the electrolysis is effected by dipping an iron anode and a carbon cathode in the waste water (pH of about 7) to be purified until a pH of 11 is reached. The water is filtered to remove the precipitate which has formed. In the second step, the pH of 11 of the filtrate is adjusted to about 4 by electrolysis with a carbon anode and an aluminum cathode or by adding an acid and then the electrolysis of the filtrate is effected by dipping an iron anode and an aluminum or aluminum base alloy cathode in the filtrate. (Sinha-OEIS)
W78-01212

LIQUID TREATMENT APPARATUS HAVING PARALLEL ROTATING BAFFLES,
N. G. Jarvstrat.
U.S. Patent No. 4,010,102, 7 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 956, No 1, p 214, March 1, 1977.

Descriptors: *Patents, Waste water treatment, *Water purification, *Water pollution treatment, *Water quality control, Biological treatment, Aeration, Equipment.

An apparatus for the biological treatment of water has disc elements aligned in an axial row which can be rotated. A housing rotatably journaled on a raft is provided with a pump to force air and water through it. The housing contains discs having central holes and other discs having peripherial apertures at the wall of the housing. Each disc forms a baffle for air and water flows through the housing, thereby imparting a tortuous path to the air and water. The discs are corrugated and are arranged in a stack with the corrugations of adjacent discs oriented at right angles. The corrugations strengthen the discs and form support points where the discs contact each other and define channels for water and air flow. A spiral pump rotating with the inlet end of the rotor forces metered volumes of water and air through the rotor. (Sinha-OEIS)
W78-01217

AERATING SYSTEM,
Zodar Corp., Warwick, RI. (Assignee).
R. L. Clough, Jr, and J. F. Snow.
U.S. Patent No. 4,029,581, 8 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 753, June 14, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Industrial wastes, *Aeration, Bubbles, Equipment.
Identifiers: Agitation.

This invention relates to the treatment of sewage, industrial wastes, stagnant ponds and pools, and more particularly to agitation and aeration of polluted bodies of water to enhance treatment through the medium of bacterial and chemical action. The apparatus comprises flexible, inflatable cells at or near the bottom of the liquid holder and means for supplying and withdrawing air to and from the cells so they periodically inflate and deflate. The surrounding liquid is agitated by the varying water displacement of the cells. In the preferred embodiment the cells are inflated sequentially to produce a wave of agitation in the surrounding liquid. Aeration and deflation are accomplished by providing the cell with pores, holes, or orifices that permit gas to escape from the cells into the surrounding liquid at restricted rates to form small bubbles that rise in the liquid and make intimate contact with suspended solids. (Sinha-OEIS)
W78-01218

WHITHER POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-01220

WATER RESOURCES - THE PRODUCTIVE CONTRIBUTION OF POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-01221

WASTEWATER LOANS READIED BY EPA.
For primary bibliographic entry see Field 5G.
W78-01223

POLLUTION CONTROL AND LEGISLATION IN THE FEDERAL REPUBLIC OF GERMANY,
For primary bibliographic entry see Field 5G.
W78-01224

POLLUTION CONTROL AND LEGISLATION--THE DUTCH APPROACH,
Public Health and Environmental Protection (Netherlands).
For primary bibliographic entry see Field 5G.
W78-01225

EPA INDEXES SHOW SHRINKING COST HIKES.
For primary bibliographic entry see Field 5G.
W78-01226

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE DELAWARE COUNTY, OHIO BOARD OF COMMISSIONERS, OLENTANGY ENVIRONMENTAL CONTROL CENTER AND INTERCEPTOR SYSTEM.
Environmental Protection Agency, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 280, Price codes: A22 in paper copy, A01 in microfiche. Technical Report EPA-5-OH-Delaware-XX-WWTP. July 1976. 501 p, 36 fig, 20 tab, 9 append.

Descriptors: *Environmental effects, *Ozone, *Ammonia, *Treatment facilities, *Interceptor sewers, On-site investigations, Sewage treatment, Municipal wastes, Public health, *Waste water treatment, *Ohio.
Identifiers: Olentangy River(OH), Delaware County(OH), *Environmental Impact Statements.

The final environmental impact statement for the proposed Olentangy Environmental Control Center and Interceptor System in Delaware County, Ohio, is presented. The project includes a 1.5-mgd sewage treatment facility with a peak capacity of 3.4 mgd. The treatment process includes a two-stage activated sludge facility, phosphate removal, tertiary rapid sand filtration, chlorination, post-aeration, disinfection with ozone, anaerobic digestion of sludge, and disposal of treated sludge to a state-approved sanitary landfill site. The proposed cost for the control center and interceptors was $11.05 million. A description of the environment without the proposed project is presented, including topography, geology, soils, groundwater, surface water, biology, air quality, land use, historic and archaeological sites, environmentally sensitive areas, population projections, economic forecasts, and aesthetics. Alternatives to various aspects of the proposed project are described, including flow reduction measures, interceptor alternatives, site location, treatment process approaches, discharge point selection, and methods of sludge disposal. The effects of the Olentangy project are evaluated with respect to water quality and quantity, air, land use, biology, and the general environment. (Schulz-FIRL)
W78-01230

ELASTICIZED POLYOLEFIN POND LINING HELPS MASONITE MEET NOVA SCOTIA STANDARDS.
Water and Pollution Control, Vol 115, No 7, p 23-24, July, 1977.

Descriptors: *Construction materials, *Linings, *Settling basins, *Oxidation lagoons, *Pulp and paper industry, Treatment facilities, Elastomers, Aeration, Equipment, Industrial wastes, *Waste water treatment.
Identifiers: *Polyolefin.

A $2.5 million water pollution control system has been designed by W. N. Horner and Associates Ltd for the Masonite Canada Ltd hardboard plant in East River, Nova Scotia. The plant must meet Canadian regulations which require that rainbow trout must have an 80% survival rate when immersed in 65% effluent for 96 hr. The facility includes a pollution monitoring system and an extended treatment plant with a total capacity of 6 million gal. A 175-ft by 175-ft, 1 million gal equalization pond and a 276-ft by 171-ft, 5 million gal treatment pond were lined with Du Pont's 3110 elasticized polyolefin pond and pit lining system. The sheeting was installed in 20-ft wide, 200-ft long rolls and the sheets were joined with a portable, hand-held electric welder. The lining was anchored at the edges of the basins with 18-in deep ditches which were backfilled after the lining was emplaced. Flexible rubber cord inserted into a dovetailed groove was used to anchor the sheeting into concrete reglets at the base of the concrete clarification chambers separating the two treatment ponds. (Schulz-FIRL)
W78-01231

A BETTER ENVIRONMENT, A BETTER ECONOMY.
Compressed Air, Vol 82, No 6, p 16-19, June, 1977.

Descriptors: *Oxidation, *Pulp wastes, *Pulp and paper industry, *Municipal wastes, *Industrial wastes, Treatment facilities, Incineration, Equipment, Sewage treatment, Multi-purpose projects, Activated sludge, Heat treatment, *Waste water treatment.
Identifiers: Ontonagon(MI).

The Zimpro wet air oxidation process, produced by Zimpro, Incorporated, of Rothschild, Wisconsin, is being used at the Hoerner Waldorf Corporation pulp and paper mill in Ontonagon, Michigan. Spent liquor from the papermaking process is fed into a 105-ft high, 342-ton pressure cylinder in which organic material is oxidized, resulting in a product which has 10% of its initial volume. The process also eliminates BOD and COD. Chemicals which survive the treatment process are reused and as much as 80% of the total energy input to the system is recovered as steam, hot water, and electricity. The Zimpro system at the Hoerner Waldorf plant also treats municipal sewage from the village of Ontonagon, eliminating the need for a separate municipal waste water treatment facility. At Ontonagon, spent liquor is combined with waste activated sludge, agitated, and heated before entering the reactor. (Schulz-FIRL)
W78-01232

PHYSICAL CHARACTERIZATION AND MICROBIOLOGICAL SETTLING-RATE MODIFICATION OF AQUEOUS SUSPENSIONS FROM HOT-WATER-PROCESS OIL-SANDS EXTRACTION,
Victoria Univ. (British Columbia). Dept. of Chemistry.
M. B. Hocking.
Fuel, Vol 56, No 3, p 334-339, July, 1977. 4 fig, 2 tab, 13 ref.

Descriptors: *Biodegradation, *Microorganisms, *Fuels, *Oil wastes, *Oil industry, Oily water, Organic wastes, Bacteria, Pilot plants, Separation techniques, Industrial wastes, Waste water treatment.
Identifiers: Bitumen, Oil sands.

Experiments were conducted to evaluate the use of indigenous microorganisms to degrade the organic fraction of the aqueous wastes resulting from the extraction of bitumen from oil sands by the hot-water process. Samples of Bird-centrifuge underflow, scavenger-cell underflow, and tailings pond sediment were obtained from the Great Canadian Oil Sands, Ltd. Urea was used as a nutrient in tests with aerobic and anaerobic cultures. Short term high-efficiency aeration was examined with a specially constructed borosilicate-glass aerator. Composite sludge samples were analyzed for inorganic solids, bitumen content, carbon, hydrogen, and nitrogen. A composite sample derived from a clear aqueous layer in the sample drums was enriched with ammonium-nitrate and used in experiments with long-term aeration and long-term nitrogen agitation. Long-term aeration was also studied with a sterile composite suspension sample. Results indicated that solids separation of tar-sands hot-water process wastes could be improved by the use of microorganisms, particularly with aerobic indigenous species, with the organic substrate of the tar sand. (Schulz-FIRL)
W78-01233

EFFECT OF CHEMICAL AGENTS ON SETTLING RATES OF SLUDGES FROM EFFLUENT OF HOT-WATER EXTRACTION OF ATHABASCA OIL SANDS,
Victoria Univ. (British Columbia). Dept. of Chemistry.
M. B. Hocking, and G. W. Lee.
Fuel, Vol 56, No 3, p 325-333, July, 1977. 8 fig, 35 ref.

Descriptors: *Sands, *Oily water, *Oil wastes, *Separation techniques, *Settling basins, Settling velocity, Suspended solids, Centrifugation, Industrial wastes, *Waste water treatment, Flocculation, Hydrogen ion concentration, Mining, Mine wastes.
Identifiers: Oil sands.

Hot water extraction has been used to extract bitumen from oil sands as a froth and separate out the siliceous material. The tailing pond sludges which are produced in the process consist largely of water, clay, and bitumen mixtures with a volume greater than the volume of the initial sands mined. A reduction in the water content of the tailings fines is one of the major goals of industrial waste treatment for oil sand sludges. Laboratory experiments with tailing pond sludges obtained at the Great Canadian Oil Sands operation in Fort Murray, Alberta, were used to investigate various methods of chemical treatment to decrease the settling times of hot-water process tailings fines. The zero point of discharge for the aqueous sludge suspension with a density of 1.126 mg/liter was at pH 2. The effect of surface-active agents on the extraction of residual bitumen was investigated with methylene chloride and anhydrous sodium sulfate. Studies on the effect of inorganic flocculations on settling rates indicated that the hydrogen ion as 0.1% HCL increased the settling rate by 11.6% and was more effective than calcium chloride, calcium carbonate, and barium chloride. The effects of pH modification and pressure digestion on the settling rate of the suspension were also examined. Treatment with isobutane to form solid clathrate hydrates did not significantly enhance settling. Proprietary polymeric flocculating agents were reported as more efficient at enhancing settling than packing. Additional tests were conducted to examine centrifuge settling rates produced by oxidizing and reducing agents, including O3, SO2, and H2O2. (Schulz-FIRL)
W78-01234

HOW TO HANDLE DIFFICULT EFFLUENT STREAMS.
Modern Power and Engineering, Vol 71, No 3, p 32-33, March, 1977.

Descriptors: *Oxidation, *Membrane processes, *Reverse osmosis, *Solvent extractions, *Separation techniques, Chemical wastes, Oil wastes, Electrodialysis, porous media, Ozone, Chlorination, Filtration, Industrial wastes, Waste water treatment.

Various processes for handling difficult industrial waste streams are discussed. Solvent extraction for the removal and recovery of organic chemicals in waste water is described. Membrane processes such as ultrafiltration, reverse osmosis, and electrodialysis are examined for removal of oils and ionized salts from waste water. Chemical oxidation with chlorine, ozone, hydrogen peroxide, and chlorine dioxide is discussed. The use of a rigid silica medium is suggested as eliminating the need for backwashing and forced aeration to maintain biological oxidation process efficiencies. (Schulz-FIRL)
W78-01235

SEWAGE SLUDGE,
For primary bibliographic entry see Field 5E.
W78-01236

REVERSE OSMOSIS AND ULTRAFILTRATION OF OILY AND PULPING EFFLUENTS,
Union Carbide Corp., Tuxedo, NY.
I. K. Bansal.
Industrial Wastes, Vol. 23, No. 3, p 32-37, May/June, 1977. 5 fig, 6 tab, 6 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Filtration, *Oily water, *Pulp wastes, Separation techniques, Emulsions, Industrial wastes, *Waste water treatment.
Identifiers: *Ultrafiltration.

Reverse osmosis (RO) and ultrafiltration (UF) are evaluated for industrial application in oil-water emulsion separation and in fractionation and concentration of kraft pulping effluents. Typical characteristics of carbon-support and sand-support reverse osmosis and ultrafiltration membranes are presented. Data on membrane performance with industrial effluents were collected at pilot-scale installations. An oil-concentrating system designed to produce clear water and recover concentrated oil allowed use of UF alone, RO alone, or purification of the UF permeate by RO. The three alternatives were evaluated in a

pilot-scale testing program to produce a clear permeate with less than 80 ppm of freon extractables from water-soluble oil coolant. Flow sheets and oil balances for each of the alternatives indicated that RO concentration of the UF permeate was the most feasible method considering the overall flux rate and module life. Costs for disposal of oily wastes are compared with those for treatment. UF and RO processes were also evaluated for treatment of screen room effluent from kraft pulping and for decolorization of kraft black liquor. (Schulz-FIRL)
W78-01237

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Metcalf and Eddy, Inc., Des Plaines, IL.
D. A. Baker.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1180-1182, June, 1977. 34 ref.

Descriptors: *Oil wastes, *Oil pollution, *Activated sludge, *Activated carbon, *Separation techniques, Bioassay, Costs, Energy, Filtration, Chemical wastes, Sludge treatment, *Waste water treatment, *Bibliographies, *Reviews, Organic wastes.
Identifiers: Petroleum processing wastes.

Literature pertaining to the processing of petroleum wastes is reviewed. The use of regenerated spent fluid catalytic cracking catalyst as an altenative to activated carbon treatment for enhancement of activated sludge treatment is discussed. Process variables in the use of the activated sludge process for refinery waste water treatment are presented. Biological treatment with rotating biological filters is described. The use of intermediate treatment facilities for contaminant reduction and equalization through hydraulic, chemical and physical designs is examined for the optimization of effluent processes. Methods of colloidal destabilization and filtration for make-up water clarification are described. Energy requirements and costs associated with refinery waste treatment are discussed. Bioassays used to test the effectiveness of refinery waste treatment are described. Results of studies on the use of activated carbon treatment to treat refinery waste waters are presented. (Schulz-FIRL)
W78-01238

INCONSISTENT WASTE OILS EFFICIENTLY RECLAIMED WITH CENTRIFUGES.
For primary bibliographic entry see Field 5G.
W78-01239

SCALE-UP OF GRANULAR MEDIA FILTERS,
Envirotech Corp., Salt Lake City, UT.
L. Lash.
Chemical Engineering Progress, Vol. 73, No. 4, p 67-73, April, 1977. 9 fig, 1 tab, 1 ref.

Descriptors: *Filtration, *Filters, *Oil wastes, *Design criteria, *Porous media, Pilot plants, Effluents, Operation and maintenance, Hydraulic design, Suspended solids, Industrial wastes, *Waste water treatment.
Identifiers: *Granular media filters.

Studies were conducted with parallel operation of semi-pilot and full-scale granular media filters to evaluate scale-up factors, the effects of feed variations and type of media, and the precision of experimental data. Granular media filter design factors were evaluated with respect to changes in the effluent solids level and pressure drop across the column with time during treatment of effluent from an API separator and a dissolved air flotation unit. The three plant-scale units were automatic, shallow bed, sand-filled filters equipped with a self-contained backwash operated in parallel with a full-scale filter. The refinery filter feed and effluent were analyzed for suspended solids, soluble total organic carbon, total COD, soluble COD, total oil, emulsified oil, pH, BOD, and temperature. Performance variables examined during the pilot-plant studies included: feed composition, pressure loss, total head loss buildup, effluent suspended solids and turbidity, effects of flow rate changes, and adequacy of backwash. Initial studies indicated that solids and fines were deposited as a dirty layer at the filter surface. Oil and suspended solids removal was considered effective but backwash was inadequate with both filter sizes. Media from the full-scale units were placed in the semi-pilot filters to evaluate effluent suspended solids as represented by turbidity and head loss distribution through the filter sections. (Schulz-FIRL)
W78-01240

NEW WASTE-WATER-TREATMENT UNIT INSTALLED.
Oil and Gas Journal, Vol. 75, No. 33, p 57, August, 1977.

Descriptors: *Filtration, *Oil wastes, *Separation techniques, *Suspended solids, Sands, Industrial wastes, Oil industry, Effluents, Porous media, Equipment, *Treatment facilities, Waste water treatment.
Identifiers: *Sand filters, Refinery wastes, Toledo(OH).

A $1.3 million sand filter is being used to provide waste water treatment for the Standard Oil Company of Ohio's refinery in Toledo. The waste water treatment facility was designed to bring refinery effluent into compliance with stricter Environmental Protection Agency regulations and should produce effluents with suspended solids concentrations well below the required levels. The system should meet all requirements for discharge into Otter Creek except those based on heat levels. The filtration system was produced by Hydro-Clear Corporation of Avon Lake, Ohio, and includes 1,750 sq ft of 12-in deep sand beds. The beds, which have a filtering capacity of 7,000 gal/min, are used to treat effluent and storm water which have been subjected to previous treatment in oil separators, dissolved air-flotation units, and an activated sludge-type biological treatment plant. Suspended solids levels in the treated effluent are lower than those found in raw water drawn from Maumee Bay for refinery use. (Scuhlz-FIRL)
W78-01241

A NEW METHOD OF DISPOSAL OF BY-PRODUCT ACID SLUDGE FROM A LUBE RE-REFINING PLANT,
Hindustan Petroleum Corp. Ltd., Bombay (India).
For primary bibliographic entry see Field 5E.
W78-01242

FORMATION OF STRIPPABLE METABOLIC PRODUCTS IN BIOLOGICAL WASTE TREATMENT,
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
A. F. Gaudy, S. R. Goswami, T. Manickam, and E. Gaudy.
Biotechnology and Bioengineering, Vol. 19, No. 8, p 1239-1244, August, 1977. 3 fig, 19 ref.

Descriptors: *Activated sludge, *Organic wastes, *Volatility, Microorganisms, Chemical oxygen demand, Aeration, Sludge treatment, Municipal wastes, *Waste water treatment, *Biological treatment.

The conversion of nonvolatile to volatile compounds by microorganisms was examined as a mechanism by which organic material may be removed from an aqueous waste by aeration. Experiments which attempted to determine whether stripping of organic material occurred during metabolism of a nonvolatile organic waste component employed glucose as a nonvolatile carbon source. A batch reactor was used to develop activated sludge from seed obtained from primary clarifier effluent from the municipal waste water treatment plant in Stillwater, Oklahoma. Sludge and glucose were fed to a sealed batch reactor in varying proportions. Compressed air was supplied to the reactor at a flow rate of 4000 cu m/min/liter. Data were taken on biological solids concentrations, glucose, and organic concentrations measured as COD in filtrate and absorbate obtained from periodic sampling of the reactor contents. The effect of pH of absorption efficiency was investigated in experiments with acetone, a neutral compound known to be readily strippable. In experiments with glucose at pH 10, glucose was removed rapidly from solution while the total COD in filtrates decreased and the biological solids increased. The accumulation and removal of organic metabolic intermediates from the original carbon source is discussed. (Schulz-FIRL)
W78-01243

CURRENT AND DEVELOPING APPLICATIONS FOR ULTRAFILTRATION,
Abcor, Inc., Wilmington, MA.
L. Mir, W. Eykamp, and R. L. Goldsmith.
Industrial Water Engineering, Vol 14, No 3, p 14-19, May/June, 1977. 6 fig, 5 tab.

Descriptors: *Membrane processes, *Filtration, *Separation techniques, *Oil wastes, *Chemical wastes, Textiles, Polymers, Industrial wastes, Filters, *Waste water treatment.
Identifiers: *Ultrafiltration, Latex, Polyvinyl alcohol, Oil-emulsion concentration.

The membrane process of ultrafiltration is discussed as a means of industrial waste treatment for electrocoat paint, whey protein recovery, oil emulsion concentration, and latex and polyvinyl concentration. Technical and economic characteristics of these uses of ultrafiltration are discussed, including separations, process conditions, flux, and fouling problems. Characteristics of oil-emulsion concentration systems are discussed. Waste cutting and grinding oils, waste rolling oils, and alkaline degreasing baths are the primary targets for oil-emulsion treatment in industry. Operating characteristics of oil-emulsion ultrafiltration units are presented for units operating in commercial installation. Research on the development of solvent-resistant membrane materials suitable for use in latex recovery is described. Applications of ultrafiltration for polyvinyl alcohol recovery in the manufacture of synthetic textiles are discussed. (Schulz-FIRL)
W78-01244

TEXAS WATERWAY PROVES CLEANUP TIDE IS TURNING,
For primary bibliographic entry see Field 5G.
W78-01245

OPTIMIZING GRANULAR MEDIA FILTRATION,
Standard Oil Co., Chicago, IL.
J. F. Grutsch, and R. C. Mallatt.
Chemical Engineering Progress, Vol 73, No 4, p 57-66, April, 1977. 11 fig, 5 tab, 11 ref.

Descriptors: *Filtration, *Colloids, *Zeta potential, *Electrical properties, *Polyelectrolytes, Electrochemistry, Chemical reactions, Porous media, Filters, Oily water, Oil wastes, Oil industry, Industrial wastes, *Waste water treatment.
Identifiers: *Granular media filtration.

The negative zeta potential or intrinsic surface charge associated with oil particles, silt, biocolloids, inorganic colloids, and other materials may affect granular media filtration efficiency. Mechanisms for retention of solids within the pores of granular media are described. Since previous studies have indicated that for effective filtration the filter media must have a surface charge

opposite to the charge possessed by the colloids, mechanisms of colloid destabilization are reviewed, including colloid entrapment or removal via the sweep floc mechanism, reduction in surface charge by double layer repression, bridging by polymers, and charge neutralization. The use of destabilization chemicals such as alum and polyelectrolytes is examined. Various aspects which might affect the applicability of chemical treatment of refinery wastes such as API separator effluent are discussed, including salinity, pH, zeta potential-cationic polyelectrolyte titration curves, and sulfide contents. Chemical destabilization with an effective cationic polyelectrolyte is recommended for API separator effluents. The hydraulic limitations on granular media filtration of the chemically treated effluent would then be related to the nature of the destabilized aggregates and the water temperature during filtration. (Schulz-FIRL)
W78-01246

REMOVING PHENOLS VIA ACTIVATED CARBON,
Louisville Univ., Ky.
J. S. Zogorski, and S. D. Faust.
Chemical Engineering Progress, Vol 73, No 5, p 65-66, May, 1977. 1 fig, 1 tab.

Descriptors: *Phenols, *Aromatic compounds, *Activated carbon, *Adsorption, *Chemical wastes, Organic wastes, Phenolic pesticides, Solids contact processes, Mass transfer, Industrial wastes, *Waste water treatment.
Identifiers: Granular activated carbon, 2-4-dichlorophenol, 4-methoxyphenol, 4-nitrophenol.

A total of 25 experiments were used to investigate the effects of various operational parameters on the removal of 2,4-dichlorophenol from water by fixed beds of activated carbon. Adsorbates measured in the effluent stream of a granular activated carbon column included phenol, 4-methoxyphenol, 4-nitrophenol, and 2,4-dichlorophenol. Breakthrough curves were determined at several hydronium ion concentrations. Three characteristics of the mass transfer zone were calculated for each column from breakthrough curves, including height of mass transfer zone, rate of movement of mass transfer zone, and fractional capacity of the absorbent with the mass transfer zone. The efficiency of the fixed bed contactor was evaluated with respect to size of adorbent, hydronium ion concentration, depth of adsorbent, and the type of adsorbate. The effects of these parameters on the characteristics of the mass transfer zone were measured. Studies indicated that the size of the mass transfer zone increased with the size of the adsorbent and the linear velocity, as well as when the acid dissociation constant of the adsorbate was less than the pH of the solution. Zone size was not affected by the type of adsorbate. The rate of movement was affected by the type of adsorbate, initial adsorbate concentration, linear velocity, and pH. The fractional capacity was influenced by the type of adsorbate, adsorbate concentration, and the adsorbent size. (Schulz-FIRL)
W78-01247

REMOVAL OF SOLUBLE MERCURY FROM WATER BY RUBBER,
Georgia Univ., Athens. Dept. of Food Science.
S. R. Wheeler, and M. K. Hamdy.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 2, p 150-158, February, 1977. 2 fig, 17 ref.

Descriptors: *Mercury, *Activated carbon, *Adsorption, *Rubber, *Chemical wastes, Metals, Analytical techniques, Filtration, Filters, Industrial wastes, *Waste water treatment.

Laboratory studies were used to evaluate the removal of soluble mercury from water by columns of ground rubber or activated carbon. Radioactive mercury nitrate was used as a tracer and a Beckman LS-100 C liquid scintillation spectrometer was used to detect mercury levels in the column eluates. Initial mercury concentrations in the effluents were 0.056, 50, and 500 ppm. Effluents were recirculated through the columns for 10 cycles. Cumulative decreases in mercury activity after 10 cycles through the activated carbon control column were 38.95% for 0.056 ppm, 9,40% for 50 ppm, and 1.10% for 500 ppm. With the rubber-filled column, cumulative decreases after 10 cycles were approximately 0.5 micrograms Hg/g of ground rubber for the 0.056 ppm solution, 250 micrograms/g for the 50 ppm solution, and 2000 micrograms/g for the 500 ppm solution. An equation relating the specific adsorption to the total radioactivity absorbed, the mercury concentration, the volume cycled, and the adsorbent weight is presented. (Schulz-FIRL)
W78-01248

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Water Pollution Control Directorate, Edmonton (Alberta).
D. W. Smith.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1172-1180, June, 1977. 82 ref.

Descriptors: *Steel, *Chemical wastes, *Iron, *Gases, *Metals, Water reuse, Air pollution, Fuels, Acidic water, Separation techniques, Metallurgy, Industrial wastes, *Waste water treatment, *Reviews, *Bibliographies.
Identifiers: Iron ore, Steel manufacture, Coke, Pickling waste water, Magnetic separation.

Literature pertaining to the treatment of waste resulting from various phases of steel production is reviewed. Effluent guidelines and standards proposed by the EPA for iron and steel manufacturing industries are described. Aspects of iron ore handling which are discussed include Canadian waste treatment practices, tailing disposal, process water conservation, and solids recovery. Methods for the treatment of gases and scrubbing solutions resulting from the production of coke are reviewed, including activated sludge, activated carbon, chemical treatment, clarification, and biological treatment. Analytical techniques for identifying waste products from coking operations are described. Studies on waste water characterization and treatment process evaluations for iron and steel production are reviewed, including magnetic separation and physical-chemical treatment. Methods for the recovery and treatment of spent HCL pickling liquor are described, including ion exchange, heat treatment, microflotation, chemical treatment, and sedimentation. (Schulz-FIRL)
W78-01249

SOLVING POLLUTION CONTROL PROBLEMS: A CASE HISTORY,
Brill Engineering Associates, Lancaster, PA.
F. W. Brill.
Industrial Wastes, Vol 23, No. 3, p 38-41, May/June, 1977. 3 fig, 3 tab.

Descriptors: *Zinc, *Metals, *Chrome, *Neutralization, *Chemical precipitation, Acidic water, Treatment facilities, Water conservation, Flow, Analytical techniques, Separation techniques, Industrial wastes, Effluents, Sewers, Municipal wastes, *Waste water treatment.
Identifiers: Chrome plating wastes, Zinc plating wastes.

A waste water pretreatment system was designed in response to excessive concentration of zinc in waste waters discharged to a municipal sewer by a plating company. The 3M Company, which provided equipment and proprietary chemicals for the plating process, presented information on the chemistry of its plating process and associated waste waters. Information on waste water flows and contaminants was collected for various phases of the zinc concentrations of 2 ppm, hexavalent and trivalent chromium concentration of 2 ppm, iron of 10 ppm, hexavalent and trivalent chromium concentrations of 2 ppm, iron of 10 ppm, and pH of 6-9. The proposed treatment scheme included mixing of plating waste which contained zinc in an acid medium with chromater rinse water to remove hexavalent chromium, as well as neutralization with sodium hydroxide to precipitate zinc, trivalent chromium, and heavy metals. Analyses of contaminants in waste water also indicated that water usage could be reduced during several phases of plating. A flow diagram for the batch pretreatment system which was produced with modifications to the plating process is presented. (Schulz-FIRL)
W78-01250

CANADIAN STEEL MILL MEETS EFFLUENT GUIDELINES.
Industrial Wastes, Vol. 23, No. 3, p 26-27, May/June, 1977.

Descriptors: *Steel, *Membrane processes, *Suspended solids, *Metals, *Treatment facilities, Filtration, Filters, Sludge treatment, Industrial wastes, *Waste water treatment, Water reuse, Sludge disposal, Water quality standards.
Identifiers: Rolling mill wastes, Steel manufacture, Ultrafiltration.

The $4.2 million water pollution control facility at Dominion Foundries and Steel Limited (DOFASCO) in Hamilton, Ontario, Canada, was constructed to comply with the Canadian Ministry of the Environment's 15 mg/liter suspended solids standard for process water effluents. The plant treats rolling mill water from the mill scale pits and primary settling basins. This waste water may contain as much as01W78-01253
W78-01252

U. S. STEEL'S SOUTH WORKS PROCESS WATER RECYCLE SYSTEM,
United States Steel Corp., Chicago, IL. Power Div.
H. W. Richardson.
Wire Journal, Vol. 10, No. 6, p 82-85, June, 1977. 1 fig.

Descriptors: *Steel, *Industrial water, *Water reuse, *Treatment facilities, *Clarification, *Recycling, Pollution abatement, Gases, Sewers, Suspended solids, Industrial wastes, *Waste water treatment.
Identifiers: *Gas washer water, Steel manufacture, Blast furnaces, Coding towers.

A three-step program to improve the quality of water discharged into Lake Michigan and the Calumet River by the United States Steel South Works in Chicago, Illinois, was initiated in 1965. The first phase of the project was to provide treatment for the gas washer water from the South Side blast furnace group. Two 33.5-m thickeners, vacuum filters, pumps, and necessary auxiliary equipment were used to provide primary treatment. The second phase of the system provided a recycle system for the gas washer water from the North Side blast furnace group, as well as a central treatment plant for primary treatment of all process water. Two 48-m thickeners provided primary treatment for gas washer water, a new sewer system was added to collect process water, and a new grit pit was installed for the collection of large particles. A cooling tower unit was installed to chill clarified effluent from the thickeners before it is recycled to the furnaces. Wet, high-energy, gas cleaning plants equipped with water recycling systems were installed to treat process water. The central water treatment plant includes two lift stations, three 38-m reactor clarifiers, a 19.8-m thickener, vacuum filters, and other necessary auxiliary equipment. In the third phase of the program, a recycle system was installed for gas washer water at the South Side blast furnace group. Complete recycling of all plant process

water was provided in the fourth phase of the program with gravity flow of effluent from reactor clarifiers to a surge tank. Three cooling towers receive water from the surge tank and discharge it through a 24.9-m tunnel to the process water pumping station. (Schulz-FIRL)
W78-01254

WASTE TREATMENT IN THE DANISH DAIRY INDUSTRY,
Statens Forsoegsmejeri, Hillerod (Denmark).
P. R. Poulsen.
Journal of Dairy Science, Vol. 60, No. 7, p 1187-1191, July, 1977. 1 fig, 4 tab.

Descriptors: *Dairy industry, *Milk, *Legal aspects, *Taxes, *Effluents, Biochemical oxygen demand, *Waste water treatment, Foreign countries, Food processing industry, Industrial wastes.
Identifiers: Denmark, Dairy wastes.

Characteristics, treatment, and disposal of dairy wastes in Denmark are discussed. Legislation pertaining to environmental protection and the apportionment of waste water treatment costs was passed in Denmark in 1975. Tariffs are imposed according to a base charge and a multiplication factor related to the amount of BOD in the industrial effluent. The Danish Government Research Institute for Dairy Industry conducted a study of effluents from 34 plants to examine wastes in terms of the total effluent produced, waste water characteristics, and the relationship between the amount of milk produced and the strength of the effluent. Comparisons between various dairy industry processes and the BOD content of the effluent revealed that cheese production resulted in 4 g BOD/kg milk, butter manufacture resulted in 2.0-2.5 g BOD/kg milk, and milk collecting and separating resulted in 0.5 g BOD/kg milk. (Schulz-FIRL)
W78-01255

TREATING WINERY WASTE USING AEROBIC LAGOONS,
Smith (S.) and Son Pty. Ltd., Angaston (Australia).
P. J. Wall, and G. R. Linton.
Food Technology in Australia, Vol. 29, No. 2, p 67-68, February, 1977. 2 fig, 1 ref.

Descriptors: *Food processing industry, *Biochemical oxygen demand, *Aeration, *Aerated lagoons, *Aerobic treatment, Treatment facilities, *Australia, Organic wastes, Industrial wastes, Effluents, Irrigation practices, Sprinkler irrigation, Waste water disposal, Waste water treatment.
Identifiers: *Winery wastes, Distillery wastes.

An aerobic lagoon waste water treatment system in use at the S. Smith and Son Proprietary Limited winery/distillery in Angaston, Australia, is described. The system includes a series of four interconnected lagoons and treats 20 million liters of rinse waste water, 3 million liters of distillery waste water, and 5 million liters of slightly alkaline bottle rinse water annually. As effluent flows by gravity through the earthen lagoon series, aerators maintain proper dissolved oxygen levels and mix waste in the first three lagoons. BOD in the effluent is reduced from 4000 mg/liter to 1500 mg/liter in the first lagoon, which has an aeration capacity of 350 kg BOD/day. The second lagoon with four aerators has an aeration capacity of 115 kg BOD/day. The third lagoon is a facultative aerobic system in which settled solids at the bottom of the lagoon undergo anaerobic digestion. The fourth lagoon, which also serves as a holding tank, provides additional oxygenation with surface absorption. Treated effluent from the $20,000 plant is used to provide spray irrigation for 3 hectares of pasture land. (Schulz-FIRL)
W78-01256

TREATMENT OF CONCENTRATED YEAST WASTE,
Taiwan Sugar Research Inst., Taiwan.
Y. T. Chuang, C. L. Lai, and S. L. Sang.
Taiwan Sugar, Vol. 24, No. 1, p 268-272, January-February, 1977. 12 fig, 5 ref.

Descriptors: *Fermentation, *Yeasts, *Cultures, *Activated sludge, *Methane, Food processing industry, Organic wastes, Biochemical oxygen demand, Industrial wastes, *Waste water treatment.
Identifiers: Yeast manufacturing wastes, *Taiwan.

Laboratory experiments were used to evaluate a method of waste treatment for use in the yeast manufacturing industry. Yeast wastes were obtained from the Hsinying Yeast Plant in Taiwan and anaerobic and activated sludges were obtained from facilities at the Taiwan Sugar Research Institute. The treatment process involved re-use of the yeast to reduce the waste volume by 50%, methane fermentation, and activated sludge treatment. Studies on the effects of initial pH, temperature, detention time, and sludge concentration on the anaerobic treatment of yeasts indicated that the optimum parameters were pH of 7.0, temperature of 37-39 C, a MLSS of 44 ppt, and a detention time of 10 days. For aerobic treatment the optimum operating parameters were MLSS of 10.8 ppt, pH of 7-8, temperature of 25-35 C, and a detention time of 6 hr. BOD of the Hsinying effluent was reduced with the process from an initial concentration of 3,000-6,000 ppm to approximately 140 ppm. (Schulz-FIRL)
W78-01257

ACTIVATED SLUDGE SYSTEM CLEANS CREAMERY EFFLUENT.
Environmental Protection Survey, p 5, 1977. 1 fig.

Descriptors: *Activated sludge, *Dairy industry, *Biological treatment, *Filtration, *Organic wastes, Sludge treatment, Effluents, Biochemical oxygen demand, Industrial wastes, *Waste water treatment.
Identifiers: Kantaurk(Ireland).

Local regulations in Kantaurk, County Cork, Ireland, required a 99.7% reduction of BOD in effluent produced by the North Cork Creamery, a casein plant which produces up to 5,000 gal/hr of effluent which contains caustic soda, nitric acid, traces of fats and oils, and as much as 6700 mg BOD/liter. A three-stage system which includes two biological treatment stages and activated sludge treatment was developed by Anderson and Martin in conjunction with Davenport Engineering. Effluent from the creamery travels through coarse and fine screens and a series of grease traps before flowing to a balance tank where nutrients are added to yield a BOD:N:P ratio of 100:5:1. BOD in the overflow from the mixing chamber is reduced by 55% in the first biofilter and further reduced by 60-65% in the second biofilter. An interstage settling tank removes excess bacteria, and sludge is periodically transferred to a sludge holding tank. Recycle pumps transfer clarified liquor from the first to the second biofilter. Two 7.5-hp surface units aerate the liquor in the activated sludge stage where the BOD is reduced to a final concentration of less than 20 mg/liter. Sludge from the final settling tank is returned to the aeration chamber by an airlift pump. Operation of the plant has indicated that the treatment process is capable of producing an effluent with BOD and suspended solids concentrations below the 20 and 30 mg/liter standards set by local authorities. (Schulz-FIRL)
W78-01259

USING CUSTOMIZED 'BUGS' FOR BIOLOGICAL WASTE TREATMENT,
Polybac Corp., New York.
T. G. Zitrides.
Plant Engineering, Vol. 31, No. 13, p 117-119, June, 1977. 1 fig, 4 tab.

Descriptors: *Bacteria, *Nutrient removal, Toxicity, *Sewage bacteria, *Organic wastes, Oil wastes, Pesticides, Textiles, Metals, *Biological treatment, Industrial wastes, *Waste water treatment.
Identifiers: Mutant bacteria.

The use of specially-bred bacteria for biological treatment of difficult-to process effluents is recommended for situations where toxic or thermal shock loads or toxic organic compounds such as chlorinated solvents, herbicides, and insecticides might otherwise inhibit the growth of naturally occurring bacteria. Customized bacteria have been developed through the mutation of individual strains for special characteristics such as the ability to thrive on petroleum products, grease, dyes, or other industrial waste products. The bacteria can be blended for a variety of wastes and are sold in a dried, packaged form which can be reactivated with hot water. Use of the bacteria may require the addition of nutrients or other substances to provide optimum conditions for growth. Results obtained with biological waste treatment with mutant bacteria additives are presented for several industries, including a steel mill, textile plant, oil refinery, and organic chemical plant. The dry mutant bacteria can also be used during startup to eliminate the need for municipal seed sludge and to minimize the effects of widely spaced, predictable shock loads. (Schulz-FIRL)
W78-01260

BREWSTER'S NEW PHOSPHATE WASHER PLANT.
Pit and Quarry, Vol. 69, No. 12, p 52-55, 58-60, June, 1977. 1 fig.

Descriptors: *Mining, *Phosphates, *Water reuse, *Settling basins, *Hydraulic mining water, Pumping, Overburden, Fertilizers, Mine wastes, Clays, Sands, Industrial wastes, *Waste water treatment, Return flow, Wells, Water utilization, *Florida.
Identifiers: Phosphate mines.

Lonesome Mine in Hillsborough County, Florida, is operated by Brewster Phosphates, a partnership between Cyanmid and Kerr-McGee Corporation, and is designed to yield 2.75 million tons per yr of marketable phosphate rock. Mining at the pit is by conventional processes with two 45-cu-yd capacity, electric draglines. The slurried material is screened, crushed by a mechanical impactor, and pumped to 48-in diameter hydrocyclones to produce a product which contains 70% solids. Details for processing to separate the tailings sand and the phosphate are described. The Lonesome Mine site is equipped to handle 6 million tons of phosphate rock per yr for wet storage, drying, and shipping. The principal wastes generated during phosphate mining include overburden, phosphate clays, and sand. The treatment technique employed by Brewster Phosphates for the phosphatic clay slurries with 3-5% solids includes storage to settle out the clays to 12-15% solids and sprinkling of tailings sand over the settled clay to produce a thick sand-clay mixture. After the excess water is drained off, overburden is spread over the surface and appropriate vegetation is planted. The use of recycled water and the return of water to the aquifer via connector wells reduces the net amount of water required for mining operations. (Schulz-FIRL)
W78-01261

ELECTROPLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Utah State Univ., Logan.
M. F. Torpy.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1182-1188, June, 1977. 70 ref.

Descriptors: *Metals, *Nitrogen compounds, Chemical precipitation, Toxicity, Separation techniques, Ion exchange, Reverse osmosis, Organic wastes, Industrial water, Analytical

techniques, Electrochemistry, *Industrial wastes, *Waste water treatment, Adsorption, Activated carbon, Filtration, *Reviews, *Bibliographies.
Identifiers: *Cyanide, *Electroplating wastes.

Literature pertaining to the characteristics and treatment of electroplating and cyanide wastes is reviewed. Studies on the effects of electroplating effluents on biota and receiving waters are described. Costs, operation, and performance of electroplating waste treatment plants are discussed. Settling with chemical precipitation, coagulation, or flocculation is reviewed as a means of treating metal and cyanide wastes. Adsorption with activated carbon and recycling methods to reduce effluent discharges and water usage are discussed. Reverse osmosis and ion exchange are evaluated for use with metal wastes. Mechanisms and treatment processes for cyanide removal are reviewed, including heating and ammonia stripping, ozonation, ultraviolet irradiation, electrochemical processes, electrolysis, activated sludge, and quarternary amine solvent extraction. Analytical methods for measuring cyanide levels in waste water are described. The use of cyanide-free baths in electroplating is discussed. (Schulz-FIRL)
W78-01262

RECOVERY OF ORGANIC POLLUTANTS VIA SOLVENT EXTRACTION,
California Univ., Berkeley. Dept. of Chemical Engineering.
J. P. Earhart, K. W. Won, H. Y. Wong, J. M. Prausnitz, and C. J. King.
Chemical Engineering Progress, Vol. 73, No. 5, p 67-73, May, 1977. 5 fig, 7 tab, 15 ref.

Descriptors: *Solvent extractions, *Separation techniques, *Solvents, *Solutes, Chemical wastes, Solubility, Organic compounds, Distillation, Oil wastes, Industrial wastes, *Waste water treatment.
Identifiers: Dual-solvent extraction, Styrene, Spent-caustic processing, Oxychlorination, Butyl acetate, Isobutylene, Volatile solvents.

Various applications of solvent extraction as a means for removal and recovery of organic compounds in industrial waste water are discussed. The use of volatile solvents such as isobutylene, isobutane, and toluene is suggested to result in greater solvent recovery and lower water contamination. Relative costs, boiling points, water solubilities, and losses are presented for a variety of solvents. The degree of extraction by a solvent is related to the equilibrium distribution coefficients for the solute-solvent pairs, with high degrees of extraction occurring when the values are greater than 1.0. A table of previously determined equilibrium distribution coefficients for solute-solvent pairs is presented. Dual-solvent processes, in which the first extraction removes some compound(s) and the second extraction removes the first solvent, are discussed. Results are presented for the use of a pilot-scale system for continuous flow extraction and solvent regeneration for several synthetic and real industrial waste waters, including: styrene manufacture waste water, ethylene quench water, extractor condensate from spent-caustic processing, waste water from lube-oil refining, oxychlorination waste water, hydrofiner condensate waste water, and a waste water from phenol-formaldehyde resin manufacture. (Schulz-FIRL)
W78-01263

BRINE SHRIMP IS ACOMING, CLEAR EFFLUENT'S IN SIGHT.
Environmental Protection Survey, p 21, February, 1977.

Descriptors: *Food chain, *Chemical wastes, *Brine shrimp, Aquiculture, *Organic wastes, Bacteria, Aquatic life, Algae, Biochemical oxygen demand, Suspended solids, Effluents, Pilot plants, Industrial wastes, *Waste water treatment, *Filtration.
Identifiers: *Biofiltration.

The Dow Chemical Company, which produces glycol, glycerine, light hydrocarbons, styrene, ethylbenzene, and epoxy, has been using a pilot-scale study to investigate biofiltration as a means of waste water treatment. A special euryhaline variety of bacteria was developed to remove organics from saline waste streams. EPA regulations which required additional reductions in effluent suspended solids and BOD resulted in a pilot-scale study in which wastes from biological treatment are treated in a shallow pond where surface-feeding algae consume effluent bacteria. Brine shrimp then consume the algae, leaving a clear effluent for discharge via baffles and a weir to the Brazos River. The one-acre pilot plant includes two algae ponds and one brine shrimp pond. Brine shrimp eggs, the only waste product from the process, will be harvested and sold for fish feed. Calculated energy requirements for the brine shrimp plant are projected at 825 KWh/day or 0.007% of conventional system energy requirements. The process produces no solid waste, which for conventional treatment processes was projected at 1500 lb/day. (Schulz-FIRL)
W78-01264

EFFLUENT PURIFICATION IN THE PURIFICATION PLANT OF THE BADISCHE ANILIN AND SODA FABRIK (BASF) IN LUDWIGSHAFEN (ABWASSERREINIGUNG IN DER KLAERANLAGE DES WERKES LUDWIGSHAFEN DER BASF AKTIENGESELLSCHAFT),
H. Engelhardt, W. Geiger, W. Haltrich, and W. Weisbrodt.
Vom Wasser, Vol 47, p 141-153, 1977. 4 fig, 4 tab, 7 ref.

Descriptors: *Chemical wastes, *Denitrification, *Municipal wastes, *Neutralization, *Settling basins, Aeration, Biochemical oxygen demand, Water pollution control, Industrial wastes, *Waste water treatment.
Identifiers: Ludwigshafen(Germany).

Waste water treatment processes used at the BASF chemical production complex in Ludwigshafen, Germany, are described. A mechanical/biological treatment plant has been used since 1974 to treat the 500,000 cu m/day of waste water from the city of Ludwigshafen. The quantity of BOD entering the plant daily is 350 tons from the industrial complex and 18 tons in the form of municipal waste. Influent waste waters are neutralized before coarse solids are removed in settling basins. Controlled denitrification is accomplished in 300,000-cu-m aeration basins. During 1975 treatment processing reduced influent BOD by 95%, organic carbon by 78%, and nitrate by 72%. (Schulz-FIRL)
W78-01265

CHEMICO-BIOLOGICAL INTERACTIONS IN BIOLOGICAL PURIFICATION SYSTEM, I. GROWTH INHIBITION EFFECT OF AZO COMPOUNDS ON ACTIVATED SLUDGE MICROORGANISMS,
National Research Inst. for Pollution and Resources, Tokyo (Japan).
Y. Yonezawa, and Y. Urushigawa.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 2, p 208-213, February, 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Activated sludge, *Microorganisms, *Nitrogen compounds, *Organic wastes, *Chemical wastes, Sewage bacteria, Biological treatment, Sludge treatment, Industrial wastes, *Waste water treatment.
Identifiers: *Azocompounds, Activated sludge microorganisms.

Azobenzene, 4-aminoazobenzene, o-, and p-methyl red, and other azocompounds were used in laboratory investigations of the inhibition of growth of activated sludge microorganisms by Azocompounds, the degree of growth inibition was evaluated with respect to the azocompound concentration required to reduce the logarithmic phase growth rate constant by 50%. The turbidity of the culture at 660 nm was used to quantify the growth rate constant. Concentrations for 50% growth inhibtion are listed for 19 azocompounds. Strong growth inhibtion was observed for aminobenzenes with the exception of 4,4'-diaminoazobenzene and m-methyl red, while azobenzenesulfonic acids did not greatly inhibit microorganism growth. The relation of the 50% growth inhibtion concentrations of azobenzenes with their partition coefficients between octanol and water indicated that the growth inhibtion of azocompounds on activated sludge micro-organisms is dependent on the degree of cell permeability by the compound. (See also W78-01267) (Schulz-FIRL)
W78-01266

CHEMICO-BIOLOGICAL INTERACTIONS IN BIOLOGICAL PURIFICATION SYSTEM, II. BIODEGRADATION OF AZOCOMPOUNDS BY ACTIVATED SLUDGE,
National Research Inst. for Pollution and Resources, Tokyo (Japan).
Y. Urishigawa, and Y. Yonezawa.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 2, p 214-218, February, 1977. 1 fig, 1 tab, 5 ref.

Descriptors: *Chemical reactions, *Activated sludge, *Biodegradation, *Nitrogen compounds, *Chemical properties, Analytical techniques, Chemical wastes, Kinetics, Chemical analysis, *Waste water treatment.
Identifiers: Azocompounds.

Laboratory experiments were used to examine the biodegradation of azocompounds by activated sludge and the relationship between the biodegradability and molecular structure. Azocompound concentrations were measured in terms of UV absorbance to indicate the degree of primary biodegradation by simple cleavage. The biodegradation was observed as a first-order reaction, and the biodegradability of each compound was assessed in terms of its rate constant. Parameters given for each of the 31 compounds include observed wave length, type of reaction curve, induced period, rate constant, and percentage of degradation. Reaction curves were categorized according to decolorization without induced period, decolorization after some induced period, and decolorization proceeding to a limited extent. (See also W78-01266) (Schulz-FIRL)
W78-01267

WASTE WATER NITRIFICATION,
Du Pont de Nemours (E. I.) and Co., Charleston, SC.
H. I. Shade.
Chemical Engineering Progress, Vol 73, No 5, p 45-49, May, 1977. 6 fig, 3 tab.

Descriptors: *Nitrification, *Ammonia, *Activated sludge, *Aeration, *Biological treatment, Nitrogen fixing bacteria, Treatment facilities, Clarification, Nutrient removal, Design data, Industrial wastes, *Waste water treatment.

A single-stage, carbonaceous-nitrogenous activated sludge plant was put into operation by the Du Pont Company at one of its manufacturing facilities to reduce the total Kjeldahl nitrogen level of 300 mg/liter of effluent to less than 1 mg/liter. The system is also designed to reduced influent BOD of 2000 mg/liter and COD of 3000 mg/ liter by 99% and 96%, respectively. Plant design parameters,, chosen to satisfy the requirements of autotrophic nitrifying bacteria, are presented. During

the treatment process chemical feeds and recycled sludges are combined with the influent waste flow and passed through a splitter box to two parallel 750,000-gal aeration tanks. Mixed liquor from the aeration tanks passes to two 34-ft diameter clarifiers, and clarifier overflow is chlorinated prior to discharge. Sludge from the two clarifiers is combined and passed from an influent mix box to an aerobic digester with solids retention time of 26 days and a design digestion time of 43 days. A basket-type centrifuge is used to dewater the digested sludge to a solids concentration of 6%. Hexamethylene diamine, the principal process waste, and sodium acetate were used to supply nitrogen nutrient and COD loading during start-up. Nitrification was observed after 6 days of operation. Actual process waste streams were added after 67 days of operation. Increases in ammonia during the initial period of acclimation were attributed to the presence of organics in the waste stream, phosphate deficiency, high pH, decreases in aeration tank temperature, variations in flow, and high solids retention times. (Schulz-FIRL)
W78-01268

WASTE CITRUS ACTIVATED SLUDGE AS A POULTRY FEED INGREDIENT,
For primary bibliographic entry see Field 5E.
W78-01269

INDUSTRIAL WASTE AND PRETREATMENT IN THE BUFFALO MUNICIPAL SYSTEM.
McPhee, Smith, Rosenstein Engineers, Buffalo, NY.
EPA-600/2-77-018, January 1977. 184 p, 20 fig, 31 tab, 22 ref, 3 append.

Descriptors: *Industrial wastes, *Municipal wastes, *On-site data collections, *Activated sludge, Sludge treatment, Sludge disposal, Costs, Sewerage, Surveys, Taxes, *Waste water treatment, *New York, *Biological treatment.
Identifiers: Buffalo(NY), Materials balance.

Since the Buffalo, New York, municipal waste water treatment system handles 170 mgd of combined municipal and industrial wastes, a program was initiated to establish an industrial waste control program, revise existing sewer use regulations, establish a cost recovery and user charge system, and examine the effects of regulations on industrial discharges to the Buffalo sewerage system. The study included an industrial waste survey to examine the nature, source, and quantity of waste water produced by the area's industries. A materials balance of wastes contributed by domestic and industrial sources, infiltration and river inflow, storm water, and the Scajaquada Creek was developed with respect to BOD, COD, TSS, As, Cd, Cr, Cu, CN, Pb, Hg, Ni, Zn, and flow. The data obtained in the survey were used to develop an industrial waste control program which included a permit system and a monitoring program. The cost recovery and user charges levied according to the waste strength and volume. A 95,000 liter/day pilot-scale activated sludge plant was used to examine the effects of industrial wastes on biological treatment processes. (Schulz-FIRL)
W78-01270

UTILIZATION OF PULP AND PAPER INDUSTRY WASTES (UTILIZATSIYA OTKHODOV TSELLYULOZNO-BUMAZHNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelskii Inst. Bumagi, Moscow USSR.
G. G. Bratchikov, M. D. Babushkina, L. A. Oni, and A. I. Gol'bert.
Promyshlennaya Energetika, No. 10, p 9-11, 1976. 1 fig.

Descriptors: *Pulp wastes, *Water pollution control, *Treatment facilities, Incineration, Wastes, Industrial wastes, Sulfite liquors, Foreign countries, Burning, Boilers, Air pollution, Pulp and paper mills, Effluents, *Waste water treatment, Pollution abatement.
Identifiers: *Sulfite pulp mills, Heat recovery, Chemical recovery, Spent sulfite liquor, USSR.

An installation for the recovery of heat and chemicals from magnesium-base spent sulfite liquor and for the consequent abatement of water and air pollution has been put into operation at the Krasnoyarsk (USSR) pulp and paper mill. The plant is equipped with two boilers in which a mixture of spent sulfite liquor from the production of semichemical and chemical magnesium-base pulp is burned at 1100-1300 C. Each boiler has a precombustion chamber in which mazout is burned, the flue gases being directed into the combustion chamber of the boiler. The flue gases from the boiler pass through an economizer, and MgO is separated in cyclones, while the gases are purified in venturi absorbers and scrubbers. The spent sulfite liquor recovery system is described and illustrated. Each recovery boiler burns 13-15 tons/hr evaporated liquor (55% solids) and 0.4-0.6 tons/hr mazout, producing 21-23 Gcal/hr and 70-90 cu m/hr bisulfite solution. The recovery of sulfur is 98%. (Stapinski-IPC)
W78-01271

PRELIMINARY RESULTS WITH A PILOT-PLANT WASTE RECYCLING-MARINE AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, MA.
J. H. Ryther.
In: Wastewater Renovation and Reuse, F.M. D'Itri (ed.), Marcel Dekker, Inc., New York, Chapter 4, p 89-132. 1976. 1 fig, 5 tab, 7 ref. Also as: Woods Hole Oceanographic Institution Contribution No. 3762. NOAA-SG-04-4-158-5, 04-5-158-8, NSF-GI-43884.

Descriptors: *Aquaculture, *Sewage treatment, *Nutrients, *Recycling, *Waste water treatment, *Tertiary treatment, Shellfish, Biological treatment.

A biological, tertiary sewage treatment-marine aquaculture system has been developed, tested, and evaluated over one year on a 'pilot-plant' scale at the Environmental Systems Laboratory (ESL) of the Woods Hole Oceanographic Institution. The effluent from secondary sewage treatment, mixed with seawater, is used as a source of nutrients to grow single-celled marine algae in mass, continuous flow-through cultures. Algal cultures diluted with seawater are fed into cement raceways containing stacked trays of shellfish. The trays were stocked with the American oyster (Crassostrea virginia) and the hard clam (Mercenaria mercenaria) as well as smaller numbers of other shellfish species. The phytoplankton remove the nutrients from sewage effluent which has varied experimentally from 10-50% of the effluent-seawater mixture. The shellfish remove the phytoplankton from the water. Prior to its discharge, the effluent from the shellfish cultures is passed through seaweeds grown in suspended culture to remove nutrients not initally assimilated by phytoplankton and excretion from the shellfish. (NOAA)
W78-01277

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, DES PLAINES, O'HARE CONVEYANCE SYSTEM.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 498, Price codes: A10 in paper copy, A01 in microfiche. 1975. 218 p, 17 ref, 19 fig, 5 tab, 7 append.

Descriptors: *Environmental effects, *Sewerage, *Construction, *Sewers, Geology, Soils, Biology, Water quality management, Combined sewers, Tunnels, *Sewage treatment, Benefits, *Waste water treatment.
Identifiers: Chicago(IL), *Environmental impact statement.

An environmental impact statement is presented for a proposed project to construct a system of conveyance tunnels or interceptor sewers and drop shafts to transport waste water from a 65.2-sq-mi area in the Metropolitan Sanitary District of Greater Chicago to the O'Hare Water Reclamation Plant. The report includes detailed descriptions of the present environment, covering such topics as climate, topography, geology, soils, hydrology, biology, air quality, land use, sensitive areas, population projections and economic forecasts, and other programs in the area. Project objectives, constraints, chronology of plans and studies, and alternatives to the proposed project are discussed. Aspects of the proposed project which are described include the main tunnel, branch tunnels, sequencing of tunnel construction, main shaft, drop shafts, and access manholes. The environmental effects of the proposed project are described. Federal/state agency comments and public participation are discussed. (Schulz-FIRL)
W78-01280

NEED TO CONTROL DISCHARGES FROM SEWERS CARRYING BOTH SEWAGE AND STORM RUNOFF (RPT. TO THE CONGRESS).
Comptroller General of the United States, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-01281

REPORT ON EVALUATION OF WASTE SOURCES IN THE MEMPHIS, TENNESSEE AREA.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5B.
W78-01282

REPORT ON WATER QUALITY AND WASTE-SOURCE INVESTIGATIONS-MISSOURI RIVER AND PAPILLION CREEK, OMAHA, NEBRASKA.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5B.
W78-01283

RUNOFF AND EROSION CHARACTERISTICS OF SURFACE-MINED SITES IN WESTERN NORTH DAKOTA,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W78-01298

SILICATE SCALE CONTROL IN GEOTHERMAL BRINES,
Occidental Research Corp., La Verne, CA.
For primary bibliographic entry see Field 3A.
W78-01316

EDGED AND FILL MATERIALS ARE ALSO COVERED. THE WATER RESOURCES RESEARCH SECTION PRESENTS OPTIONS FOR ALLEVIATING PROBLEMS CAUSED BY FRAGMENTED RESEARCH. THE FINAL SECTION PRESENTS OPTIONS FOR ESTABLISHING PROCEDURES TO QUANTIFY THE AMOUNT OF 'SURPLUS' WATER SUBJECT TO STATE APPROPRIATION UNDER THE FEDERAL RESERVED WATER RIGHTS DOCTRINE IN ORDER TO PREVENT USING COSTLY AND TIME-CONSUMING LITIGATION TO DETERMINE THE RESPECTIVE RIGHTS OF COMPETING SOVEREIGNS UNDER THE DOCTRINE. (SPECTOR-FLORIDA)
Federal Water Pollution Control Act of 1972. The EPA focus will be on controlling toxic pollutants and encouraging conservation, reuse and recycling of water and the elements currently being discharged in waste water. The strategy for meeting these objectives in both municipal and industri-

al areas are explained. The programs for control of non-point source pollution and regualtion of discharge of
For primary bibliographic entry see Field 5G.
ncil has published supplemental information on wa

APPLICATION OF OXYGEN TO TREAT WASTE FROM MILITARY FIELD INSTALLATIONS,
Texas Univ. at Austin. Dept. of Civil Engineering.
J. F. Malina, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 033, Price codes: A05 in paper copy, A01 in microfiche. Technical Report CRWR-99, EHE-73-02, 1973. 77 p, 9 fig, 14 tab, 45 ref, append. Prepared for Army Medical Research and Development Command, Washington, D.C.

Descriptors: *Aeration, *Oxygenation, *Oxidation lagoons, *Aerated lagoons, *Disinfection, Viruses, Bacteria, Biochemical oxygen demand, Sewage treatment, Sludge treatment, Model studies, *Waste water treatment.
Identifiers: Military installations.

Objectives of this program were to study the survival of enteric viruses and bacteria in stabilization ponds with high purity oxygen systems, and to examine the feasibility of using high purity oxygen in military installation field treatment facilities. The four laboratory-scale pond systems used in the study include a stabilization pond which was preceded by a mixed oxygenated lagoon, one which was preceded by an oxygen contact chamber, one in which oxygen was added to the first bay of the four-bay basin, and one to which oxygen was not introduced. Measurements of BOD, COD, total organic carbon (TOC), total oxygen demand (TOD), suspended solids, total coliform, fecal streptococcus, bacteriophage, and enteric animal viruses were used to evaluate pond performance. The system containing the oxygenated lagoon achieved the best results on the basis of virus and bacteria inactivation. Performance data for each of the systems is presented. At a loading rate of 250 lb BOD/acre per day, the simple stabilization pond was capable of removing 97.7% of BOD, 92.6% of COD, 84.2% of TOD, and 80% of TOC. Enteric virus and bacteria inactivation range from 88% to 94%, and bacteria reduction was in excess of 98%. When high purity oxygen was added, BOD, COD, TOD, and TOC removals were 98.6%, 94.6%, 89%, and 90%, respectively. (Schulz-FIRL)
W78-01402

UPGRADING EXISTING WASTEWATER TREATMENT PLANTS. PRE-PLANT CONSIDERATIONS,
Johnson and Anderson, Inc., Pontiac, MI.
J. G. Meenahan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 811, Price codes: A02 in paper copy, A01 in microfiche. Report to EPA, Cincinnati, Ohio, Office of Technology Transfer, November 1972. 11 p, 6 fig.

Descriptors: *Treatment facilities, *Evaluation, *Design, *Storage tanks, *Equalizing reservoirs, Sewage treatment, Water quality standards, *Waste water treatment.

Because changing federal and state water quality standards may require waste water treatment plant operators to modify facilities to produce higher quality effluents, a discussion of pre-plant options in upgrading a facility is presented. Topics examined include: reasons for upgrading, collection systems, waste water flow measurement, definitions of waste water flow, flow equalization as a means of extending plant capacity, and necessary steps in the evaluation of existing facilities. Appendices to the report include an illustration of diurnal flow variation, population and flow projections, and process diagrams for an existing and a proposed plant. (Schulz-FIRL)
W78-01403

ALASKAN INDUSTRY EXPERIENCE IN ARCTIC SEWAGE TREATMENT,
Corvallis Environmental Research Lab., College, AK. Arctic Environmental Research Station.
S. E. Clark, A. J. Alter, J. W. Scribner, H. J. Coutts, and C. D. Christianson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 585, Price codes: A03 in paper copy, A01 in microfiche. Working Paper-13, May, 1971. 32 p, 17 fig, 7 tab, 6 ref.

Descriptors: *Alaska, *Sewage treatment, *Aeration, *Construction, *Arctic, Oxidation, Lagoons, Treatment facilities, Biochemical oxygen demand, Sewage disposal, *Waste water treatment.
Identifiers: North Slope(AK), Prudhoe Bay(AK).

Limitations on water supply and waste disposal practices on Alaska's North Slope have prefaced this examination of two advanced physical-chemical treatment systems, extended aeration facilities, and other types of waste treatment facilities. Constructed to provide sewage treatment for Alaskan pipeline construction camps, the physical-chemical plants include alum flocculation, upflow clarifiction, first stage downflow carbon adsorption-filtration, second stage upflow carbon adsorption, and chlorination. Provisions are made for separation and treatment of waste water according to origin (toilet versus other sources). Raw sewage characteristics are provided for five North Slope facilities, and effluent characteristics are provided for seven North Slope facilities. Average water usage and household sewage distribution tables are presented. (Schulz-FIRL)
W78-01404

THE RECLAMATION OF DRINKING WATER FROM SEWAGE,
Asian Inst. of Tech., Bangkok (Thailand).
M. G. McGarry.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A008 453, Price codes: A04 in paper copy, A01 in microfiche. Technical Report FE-472-2, Army R&D Group (Far East), February 1975. 75 p, 20 ref, 16 fig, 5 tab.

Descriptors: *Return flow, *Potable water, *Tertiary treatment, *Filtration, *Activated carbon, Disinfection, Water treatment, Chlorination, Water resources development, Algae, Nutrient removal, Nitrogen, Chemical oxygen demand, *Water treatment.
Identifiers: *Thailand.

Various aspects related to the direcrt reclamation of waste water for drinking are discussed. Practices in Thailand which involve the photosynthetic recovery and harvest of nitrogen in the form of algal protein and the removal of low level organics by burnt rice husk media filtration are described. Varieties of roughing filtration are examined. Pilot studies on photosynthetic stripping of nitrogen from clarified high rate pond effluent are described. Experiments dealing with powdered activated carbon adsorption were conducted to examine starting material, chemical treatment methods, and particle size. Dual media and semi-rapid filtration are discussed for application to local filter media materials in Thailand. Results of experiments on organic and ammonia nitrogen removal by breakpoint chlorination are given. Design configurations to integrate unit processes into continuous flow systems for renovation of domestic waste water are evaluated. (Schulz-FIRL)
W78-01406

CENTRAL KITSAP COUNTY WASTEWATER FACILITIES, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 511, Price codes: A21 in paper copy, A01 in microfiche. Report EPA-910/9-75-012, May 1976. 466 p, 22 fig, 37 tab, 72 ref, 10 append.

Descriptors: *Environmental effects, *Sewerage, *Outfalls, *Treatment, *Hydrology, Erosion control, Watershed management, Sewers, *Waste water treatment, Waste water disposal, Sanitary landfills, Sewage treatment.
Identifiers: Kitsap County(WA).

The final environmental impact statement for a proposed $18 million project to construct interceptor sewer lines, a waste water treatment facility, and a waste water disposal facility in Kitsap County, Washington, is presented. Eleven alternatives developed for the facilities plan are described. Detailed descriptions of the environmental setting and of the environmental impacts of the proposed project are given. Adverse impacts and mitigative measures are described. Design flows and other data are presented for the project. Major recommendations for the project include: revegetation and tunnelling to prevent erosion of shoreline bluffs at outfall sites; porous backfilling for the sewerage system; and a comprehensive metering study for outfall diffuser design. (Schulz-FIRL)
W78-01407

DESIGNING TO REMOVE PHOSPHORUS BY USING METAL SALTS AND POLYMERS IN CONVENTIONAL PLANTS,
Shimek, Roming, Jacobs, and Finklea, Dallas, TX.
J. E. Laughlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 376, Price codes: A03 in paper copy, A01 in microfiche. EPA Report, Seattle, Washington, December 1971. 12 fig, 35 ref.

Descriptors: *Phosphorus, *Coagulation, *Flocculation, *Salts, *Polymers, Design criteria, Clarification, Sludge treatment, Sludge disposal, Chemical degradation, Nutrient removal, Chemical precipitation, Separation techniques, *Waste water treatment, Sewage treatment.
Identifiers: Phosphorus removal.

A report on treatment design to remove phosphorus from waste water was presented as part of the EPA-sponsored 'Design Seminar for Wastewater Treatment Facilities' which was held in Seattle, Washington, on December 1-2, 1971. Metal salts and polymers used in conventional waste water treatment plants, including FeC13, pickle liquor, alum, and sodium aluminate, are evaluated. Topics discussed include: phosphorus removal needs, process variations, pilot studies, chemicals, hardware, dosage selection and control, polymers, coagulants, sludge harvesting and disposal, supernatant characteristics, and costs. Flash mixing, flocculation, chemical injection, feeding equipment, piping, and storage tanks are discussed with respect to design data, use, and efficiency. Chemical and capital investment costs are presented. (Schulz-FIRL)
W78-01408

EVALUATION OF SEWAGE TREATMENT FACILITIES, SAN FRANCISCO, CALIFORNIA, SEPTEMBER 1975.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 401, Price codes: A07 in paper copy, A01 in microfiche. Report EPA/330/2-75/008, October, 1975. 135 p, 18 fig, 28 fig, 13 ref, 3 append.

Descriptors: *Environmental effects, *Bioassay, *Treatment facilities, *Toxicity, *Environmental

sanitation, Outfalls, Waste water disposal, Saline water fish, Benthic fauna, Oysters, Operation and maintenance, On-site data collections, Surveys, *Sewage treatment, *Waste water treatment, California.
Identifiers: *San Francisco(CA), Threespine stickleback.

Sewage treatment facilities in San Francisco, California, were evaluated in 1975 to determine discharge limitations of the North Point, Richmond-Sunset, and Southeast waste water treatment plants. Additional objectives were to determine whether waste discharges posed hazards to San Francisco Bay and the Pacific Ocean, and to evaluate interim water pollution control measures. The studies included in-plant and receiving-water surveys at each of the facilities. Design data for each of the three facilities is presented. Physical-chemical characteristics, bacteriological characteristics, and toxicity response of the threespine stickleback were measured for plant effluent and receiving waters. Operation and efficiency of each plant was examined. Studies were conducted at outfall locations to determine the effect of effluents on oyster survival and propagation and to examine benthic conditions. Appendices to the report include presentations of survey results, methods used in the survey, and chain of custody procedures. (Schulz-FIRL)
W78-01409

ADVANCED TECHNIQUES FOR INCINERATION OF MUNICIPAL SOLID WASTES,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5E.
W78-01410

ECONOMIC OPTIMIZATION OF RELIEF SEWER DESIGN,
Florida Univ., Gainesville, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-01411

INNOVATIVE SOLUTION TO STORM WATER MANAGEMENT PROBLEM.
For primary bibliographic entry see Field 5G.
W78-01413

SEWER PROBLEM BECOMES ASSET.
For primary bibliographic entry see Field 5G.
W78-01414

SEAMLESS PIPE FOR SANITARY, STORM SEWERS.
For primary bibliographic entry see Field 8B.
W78-01415

SLAG AND QUARRY WASTE AS PIPE BEDDING MATERIAL,
Bokaro Steel Ltd. (India).
For primary bibliographic entry see Field 8D.
W78-01416

SWAMPY SEWER JOB MOVES WITH BIG BACKHOES.
For primary bibliographic entry see Field 8C.
W78-01417

FLOWMETER MOUNTINGS SOLVE PROBLEMS IN MUNICIPAL I AND I STUDY,
For primary bibliographic entry see Field 7B.
W78-01419

CITY FIGHTS GREASE AND ODOR PROBLEMS IN SEWER SYSTEM.
For primary bibliographic entry see Field 5G.
W78-01420

PIPEWORK IN RIVER OR SEA ENVIRONMENTS.
For primary bibliographic entry see Field 8B.
W78-01422

ECONOMY IN CONSTRUCTION OF SEWERAGE SYSTEM,
Bokaro Steel Ltd. (India).
For primary bibliographic entry see Field 8B.
W78-01423

DIGGING BEFORE PILE DRIVING SPEEDS HULL SEWER JOB.
For primary bibliographic entry see Field 8D.
W78-01424

'PIGGY-BACK' SEWER SOLVES OVERLOAD PROBLEM,
Shafer, Kline and Warren, Kansas City, Mo.
For primary bibliographic entry see Field 8B.
W78-01425

ACTIVATED SLUDGE TREATMENT OF PHOSPHATE-CONTAINING AQUEOUS EFFLUENT - WITH PRIMARY ANAEROBIC STAGE AND SECONDARY AEROBIC STAGE TO PREVENT FORMATION OF THREAD-LIKE MICROORGANISMS.
Belgian Patent BE-853-318. Issued August 1, 1977.
Derwent Belgian Patents Abstracts, Vol. Y, No. 32, p 97, September, 1977.

Descriptors: *Microorganisms, *Activated sludge, *Oxygenation, *Biochemical oxygen demand, *Patents, Aeration, Settling basins, Sludge treatment, Aerobic treatment, Anaerobic conditions, Phosphates, *Waste water treatment.
Identifiers: Filamentous microorganisms.

A process for inhibiting the growth of filamentous microorganisms during the activated sludge process has been patented. The circulating activated sludge is mixed with a BOD-containing aqueous effluent. Anaerobic conditions with less than 0.7 ppm dissolved oxygen and virtually no nitrogen oxides are maintained to promote absorption of BOD by non-filamentous microorganisms. The mixed liquor is then aerated in an oxygenation zone with a dissolved oxygen concentration of greater than 1 ppm to remove the BOD. A settling zone is employed to separate the purified supernatant from the oxygenated mixed liquor. Part of the settled sludge is returned to the mixing zone for further treatment. The treatment process is reported to result in improved sludge settling characteristics and the elimination of bound phosphates in the effluent water. (Schulz-FIRL)
W78-01426

SEWAGE PURIFICATION PROCESS.
German Patent DS 1642-509. Issued August 11, 1977. Derwent German Patents Abstracts, Vol. Y, No. 33, p 47, September, 1977.

Descriptors: *Sludge treatment, *Ammonia, *Anaerobic conditions, *Patents, *Chemical oxygen demand, Effluents, Heat transfer, Heat treatment, Equipment, *Waste water treatment.

A waste water purification process to reduce the COD of sludge by wet oxidation has been patented. Partial wet oxidation with excess gaseous oxygen reduces the COD by 10-45%. The solids are separated from the mixed liquor, which contains ammonia nitrogen, and cooled to 75-108C. A portion of the effluent is then returned to sludge tank to create temperature conditions of 30-60C and an ammonia nitrogen content of less than 1.0 g/liter. The treatment equipment should be arranged so that the sludge tank is connected to a settling tank and to a heat exchanger-wet combustion reactor unit. Provisions should be made to maintain anaerobic conditions in the sludge tank in spite of the influent waste water characteristics. (Schulz-FIRL)
W78-01427

SUSPENSIONS SLUDGE GRAVITY SEPARATOR-WITH STABILITY INCREASED BY VERTICAL MOVEMENT MECHANISM OF FILTER ELEMENTS.
Soviet Patent SU-391-837. Issued November 14, 1973. Soviet Inventions Illustrated, Vol. Y, No. 3, p D1, August, 1977.

Descriptors: *Dewatering, *Separation techniques, *Sludge treatment, *Patents, *Suspended solids, Flocculation, Coagulation, Equipment, *Waste water treatment.
Identifiers: *Gravity sludge separators.

A cylindrical-control device for the gravity separation of suspensions, including sludge, has been patented. The gravity separator, with pipes and filter elements on top of its casing, is vertically moveable by means of a pair of screw elements. The casing is filled with a mixture of coagulant, flocculator, and waste water and is equipped with a filtration pipe, a turbidity gauge, and a sludge level control device. The sludge level is maintained so that the optimum high suspension zone is in the region of the filter elements. The turbidity gauge activates the reversing drive of the vertical movement mechanism via a signal amplifier. (Schulz-FIRL)
W78-01428

ANAEROBIC PROCESSING OF BIOCHEMICAL WASTE - FORMING LOW MOLECULAR WEIGHT MATERIAL AND VOLATILE ACIDS, THEN DIGESTING RESIDUE FORMING METHANE.
French Patent FR 2324-581. Issued May 20, 1977.
Derwent French Patents Abstracts, Vol Y, No 25, p D6, August, 1977.

Descriptors: *Anaerobic digestion, *Chemical wastes, *Organic wastes, *Patents, *Methane, Organic compounds, Sludge treatment, Organic acids, Separation techniques, Carbon dioxide, *Waste water treatment.
Identifiers: Biochemical wastes.

An anaerobic treatment process which breaks down high molecular weight organic compounds into low molecular weight compounds, and low molecular weight organic compounds into volatile organic acids, has been patented. Biochemical wastes are initially processed in the presence of acid. After treatment and separation, methane and carbon dioxide are produced in a digester from the non-decomposed sludge fraction. The remainder is recycled through the initial treatment stage. Processing, separation, and digestion are then repeated. (Schulz-FIRL)
W78-01429

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ional beneficial side effects of the grease removal program included easier servicing of submersible pumps and reduction of odors. (Schulz-FIRL)
or the plant. McIntyre and Associates, consultin

HIGH PURITY WATER TREATMENT PERFORMS WELL AT EUROPE'S FIRST PLANT.
Materials Handling News, No. 236, p. 3, July, 1977.

Descriptors: *Oxygenation, *Aeration, *Organic wastes, *Oxidation, Equipment, Sewage treatment, Industrial wastes, Biochemical oxygen demand, Waste water treatment, *Treatment facilities.
Identifiers: Palmersford(UK).

A high purity oxygenation system, the Union Carbide Wimpey UNOX Pressure Swing Adsorption Unit, has been installed at a waste water treatment plant in Palmersford, England. The system is being used to treat sewage and organic industrial sludges for a population of up to 24,000 while taking up only half the space of a conventional filtration plant. Pure oxygen is fed to the system at the first stage. Compressed, cooled, dewatered air is passed to molecular sieves. BOD is reduced to 20 ppm in the first stage and to a final concentration of 10 ppm after ammonia is removed in the second stage. Constant pressure monitoring and a standby liquid oxygen supply are provided for the aeration tanks. The 90% oxygen supplied to the tank results in higher treatment efficiency and shorter required retention times. The UNOX system is suggested for use in any facility in which organic wastes are treated. (Schulz-FIRL)
W78-01431

SEWAGE WORKS FOR TEL AVIV.
Water and Waste Treatment, Vol. 20, No. 7, p 11, July, 1977.

Descriptors: *Aeration, *Treatment facilities, *Sewage treatment, *Return flow, *Waste water disposal, Water utilization, Waste water treatment.
Identifiers: *Tel Aviv(Israel), Rishon le Zion(Israel).

An IL 1,042, million sewage treatment plant has been planned for the greater Tel Aviv area in Israel as an alternative to the current practice of ocean dumping. Cooperative settlements in the southern desert area will use the effluent produced by th proposed facility, located at Rishon le Zion, for agricultural purposes. Mechanical aeration will be used at the facility to provide an effluent which will be applied to non-food crops. The facility will serve a population of 1 million, and will treat 100 million cu m of water per year, or about 10% of Israel's annual water consumption. (Schulz-FIRL)
W78-01432

SAFER, CLEANER HANDLING OF SEWAGE PUMPS.
For primary bibliographic entry see Field 8C.
W78-01433

A TURN FOR THE BETTER.
For primary bibliographic entry see Field 5G.
W78-01434

NEW DEVELOPMENTS IN FILTRATION,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
G. T. Fox, and T. D. Lekkas.
Water Services, Vol 81, No 978, p 460, 462, August, 1977. 1 fig.

Descriptors: *Filtration, *Filters, Porous media, Sands, *Sediment transport, *Settling basins, Particle size, Suspended solids, Flow friction, *Separation techniques, *Waste water treatment.
Identifiers: *Rapid sand filters, Multi-layer filters.

Recent research on the dynamics of rapid sand filtration is described. Studies were initiated to develop filtration technology which would allow waste water facilities to eliminate sedimentation before filtration. In order to provide efficient filtration, sand grains in the filter must be arranged so that larger particles are positioned at the top of the filter to remove large debris and smaller particles are at the bottom of the filter to remove smaller debris. However, when the filter bed is fluidized in operation, smaller grains migrate to the top and the efficiency of the filter is reduced. The mechanics of size grading in a sand filter are described and related to surface friction and particle size. Upflow filtration was developed to eliminate problems associated with gravity settling of larger particles. The multi-layer filter, containing anthracite/sand in a two-layer filter and polystyrene/anthracite/sand in a three-layer filter, incorporates the use of larger media which have a lower specific gravity than the smaller media. Head loss profiles are compared for the two types of filters. Proper orientations of the media in a multi-layer filter are maintained because of the density differences. Although more costly than sand filters, multi-layer filters can run up to 10 times longer than rapid sand filters. Research on the use of flexible plastic baffles or plastic sponge mesh for filtration is described. (Schulz-FIRL)
W78-01435

CENTRIFUGES CONCENTRATE SLUDGES.
Public Works, Vol 108, No 10, p 110, October, 1977.

Descriptors: *Dewatering, *Sludge treatment, *Centrifugation, *Activated sludge, *Lime, Tertiary treatment, Incineration, Calcium carbonate, Waste water treatment.
Identifiers: Durham(OR).

The United Sewerage Agency has installed three Dorr-Oliver Merco centrifuges at its waste water treatment facilities in Durham, Oregon. The centrifuges are used to thicken waste activated sludge and lime sludge. Centrifuge-thickened waste activated sludge and gravity-thickened primary sludge are combined prior to heat treating, dewatering, and incineration. The lime sludge which contains about 80% calcium carbonate is thickened before it is recalcined for recovery of the lime for reuse in the treatment process. In the operation of the disc-nozzle centrifuges, sludge enters the feedwell of a high speed rotor and passes to the impeller where it is brought up to rotor speed. Heavier particles are discharged to the underflow collector through nozzles at the periphery of the rotor. Clarified liquid travels up through the unit and is collected through an overflow discharge. (Schulz-FIRL)
W78-01436

WET AIR OXIDATION WORKS IN LOUISVILLE, KY.
Water and Wastes Engineering, Vol 14, No 9, p 54, September, 1977.

Descriptors: *Oxidation, *Incineration, *Organic wastes, *Industrial wastes, *Dewatering, Treatment facilities, Sewage treatment, *Waste water treatment.
Identifiers: Louisville(KY), Hexachlorocyclopentadiene, Octachlorocyclopentadiene, Hexachlorobenzene.

Four 250-gpm sludge oxidation units have been installed at the Morris Forman waste water treatment plant in Louisville, Kentucky. Tests conducted at Zimpro, Inc., in Rothschild, Wisconsin, for the EPA and Louisville Metropolitan Sewer District officials showed that low pressure wet air oxidation was capable of reducing concentrations of hexachlorocyclopentadiene and octachlorocyclopentadiene by 93%. Dewatering and incineration of the oxidized sludge in a multiple hearth furnace substantially reduced concentrations of hexachlorobenzene, another toxic chemical. Results of the studies were verified with 3500 gal of sludge shipped to Zimpro. Temperature, pressure, and aeration conditions employed in wet air oxidation destroy the two pentadienes in the first stage of treatment. A vacuum filter is then used to dewater the oxidized sludge to a solids content of 40%. Analyses of ash and stack gas produced during incineration of the dewatered sludge indicated that all three toxic chemicals were effectively destroyed during the processes. (Schulz-FIRL)
W78-01437

MICROSCREEN INNOVATION.
Filtration and Separation, Vol 14, No 4, p 412, July/August, 1977. 1 fig.

Descriptors: *Screens, *Filters, *Filtration, Equipment, *Tertiary treatment, Storm runoff, Sewage treatment, Water treatment, Waste water treatment.
Identifiers: *Microscreens, Rotary drum microscreens.

A series of rotary drum microscreens for water and sewage tertiary treatment is being produced by Paterson Candy International Ltd. of London, England. The microscreens may be used for storm water overflow treatment, final effluent polishing, BOD and turbidity removal, algae and plankton removal, and raw water straining. Available in standard diameter sizes of 1800, 2500, 3000, and 3700 mm and in lengths up to 5000 mm, the microscreen consists of a rotating open-ended horizontal drum supported on an A-frame. Raw waste water entering the drum's open end is filtered by the replaceable filter panels which are covered with screen mesh. Continuous spray, times-sequenced, and headloss monitoring systems optimize water usage for backwashing. (Schulz-FIRL)
W78-01438

PRODUCES HIGH SOLIDS CAKE FROM DILUTE SLUDGE.
Chemical Processing, Vol 40, No 10, p 53, September, 1977.

Descriptors: *Dewatering, Equipment, *Sludge treatment, *Filtration, *Flocculation, *Sewage treatment, High pressure, *Waste water treatment.
Identifiers: Sludge dewatering.

The Magnum dewatering press, which is produced by Parkson Corporation of Fort Lauderdale, Florida, is used to reduce the water content of sludges from waste water treatment. The dewatering process includes a draining stage, a low pressure stage, and a high pressure stage. Sludge which has been preflocculated with a polyelectrolyte is drained on a screen by light rolling and plowing. In the second stage, drained sludge on the screen is forced against a pressing screen by a series of decreasing diameter rollers, which gradually increase the pressure on the sludge. Very high pressure, created by 1 inch wide flat belts which press the sludge against a perforated roller, is used in the final stage of dewatering. The press is available in four widths, from 20 to 40 inches, and produces a filter cake with a much lower water content than that in cakes from a conventional belt filter press. (Schulz-FIRL)
W78-01439

ADVANCED WASTEWATER TREATMENT INCLUDES REVERSE OSMOSIS.
Public Works, Vol. 108, No. 9, p 166, September, 1977.

Descriptors: *Reverse osmosis, *Tertiary treatment, *Groundwater recharge, *Saline water intrusion, *Injection, Waste disposal wells, Water resources development, Return flow, Activated carbon, Filtration, Sewage treatment, *Waste water treatment.
Identifiers: Orange County(CA).

A water reclamation and groundwater injection project of the Orange County Water District in California is described. Water Factory 21, an advanced waste water treatment plant, provides injection water to prevent intrusion of sea water into the area's groundwater supply. The facility includes chemical clarification, ammonia stripping, recarbonation, multi-media filtration, carbon adsorption, chlorination, and a reverse-osmosis demineralization plant. The reverse osmosis system treats effluent from either the activated carbon columns of the mixed-media filters beds, to provide 85 gal of permeate for underground injection of every 100 gal of effluent treated. Treated effluent is pumped to a series of 23 multi-casing injection wells to prevent seawater intrusion and

augment Organge County's groundwater supply. (Schulz-FIRL)
W78-01440

SELF-CLEANING FILTER/SCREEN.
For primary bibliographic entry see Field 8G.
W78-01441

SYSTEM CONTROLS TREATMENT PLANT.
For primary bibliographic entry see Field 5G.
W78-01442

RETIRED MAYOR SPARKPLUGS SEWAGE TREATMENT CHANGE.
For primary bibliographic entry see Field 5E.
W78-01443

LAB TO TEST BULRUSHES AS FILTERS FOR SEWAGE.
For primary bibliographic entry see Field 5E.
W78-01444

EFFECTS OF SEVERAL OPERATIONAL PARAMETERS ON THE REMOVAL EFFICIENCY OF THE TOWER-TYPE PACKED BIOFILTER (JUTEN TOSHIKIRO SHO HO NI OKERU SEKKEI, UNTEN PARAMETA NO JOKA KORITSU NI OYOBOSU EIKYO),
Kyushu Univ., Fukuoka (Japan). Dept. of Food Science and Technology.
K. Yoshihara, M. Sambuichi, Y. Fujio, and S. Ueda.
Hakko Kogaku, Vol 55, No 3, p 122-128, 1977. 8 fig, 1 tab, 25 ref.

Descriptors: *Filters, *Trickling filters, *Chemical oxygen demand, *Packed beds, Separation techniques, Organic wastes, Model studies, Chemical wastes, *Waste water treatment.
Identifiers: *Biological filters.

The tower-type packed biofilter, a modified trickling filter filled with small rounded stones, was evaluated for COD removal in the treatment of organic waste water. The 1.5-m high biofilter was used to treat synthetic waste water which contained 0.17 kg COD/cu m/day. Waste water was recirculated through the filter at a rate of 600 ml/min to insure adequate maintenance of the biological film on the filter media. The tower-type filter was capable of removing 1.2-1.4 kg COD/cu m/day. Factors affecting COD removal efficiency for the tower-type filter were quantitatively similar to those affecting conventional trickling filters, including hydraulic loading, organic loading, filter depth, and forced ventilation of some gases. COD removal was inadequate at high hydraulic loading rates (36 cu m/sq m/day). Odor problems, attributed to inadequate aeration by natural-draft ventilation during the use of the filter, were alleviated when air or oxygen was supplied to the biofilter at 90 cu m/sq m/day. COD removal was not influenced by the dissolved oxygen concentration in the filter. (Schulz-FIRL)
W78-01445

STUDIES ON NITROGEN REMOVAL IN SEWAGE TREATMENT PLANTS (GESUISHORI SHISETSU NI OKERU CHISSOJOKYO NI KANSURU KENKYU),
K. Saito, K. Kobori, S. Ochi, and I. Yagihashi.
Kankocho Kogai Senmon Shiryo, (Report of Public Nuisance, Govt. and Public Office), Vol 12, No 3, p 49-61, 1977. 21 fig, 6 tab, 8 ref.

Descriptors: *Activated sludge, *Nitrification, *Nutrient removal, *Nitrogen fixing bacteria, Sea water, Organic wastes, Denitrification, Treatment facilities, Sewage treatment, *Waste water treatment.

Laboratory and field investigations examined the operating conditions for nitrification in the activated sluuge process, defined operating parameters for effective nitrification and organic removal with existing treatment facilities, and evaluated recovery of organic carbon from anaerobic digester supernatant for use in denitrification. Laboratory-scale plug flow aerators were used to examine the effects of pH on nitrification with different substrates. The effects of salinity on nitrifying bacteria were examined at activated sludge plants. Field studies were conducted to examine seasonal variations of nitrifiers and to evaluate general performance of sewage treatment plants in Japan. The studies indicated that the optimum operating parameters for nitrification were a pH of 7-9 and an SRT of more than 10 days. Organic loadings less than 0.24 kg BOD/kg SS/day did not affect nitrification. The addition of alkalinity was necessary to oxidize TKN completely to nitrite or nitrate nitrogen. Growth of fresh water nitrifiers was inhibited under conditions of more than 40% seawater and was maximum when no seawater was added. With combined cultures of freshwater and seawater nitrifiers, maximum growth was observed with a total seawater media. It was suggested that seawater acted as a buffering agent. Field studies on Japanese sewage treatment plants indicated that nitrifiers were present at an average concentration of 1000-10,000 N/ml with Nitrobacter being more abundant than Nitrosomonas. Effective nitrification was observed at temperatures of 18-23C and at dissolved oxygen levels greater than 28% of saturation. (Schulz-FIRL)
W78-01446

CARBON-CHLORINE-CARBON SEWAGE TREATMENT,
Jet Propulsion Lab., Pasadena, CA.
R. H. Green, R. G. Howland, and C. J. Wallace.
NASA Tech Briefs, Vol 2, No 2, p 200, Summer, 1977. 1 fig.

Descriptors: *Activated carbon, *Chlorination, *Toxicity, *Adsorption, *Phenols, Organic compounds, Chemical wastes, Sewage treatment, *Waste water treatment.

Potential hazards posed by toxic and carcinogenic compounds produced by the reaction of chlorine with organics and other chemicals present in waste water treated by chlorination have led to the reevaluation of the use of chlorine as a disinfectant. An activated carbon treatment system was developed by Caltech/JPE and NASA with the cooperation of Orange County, California, to reduce potentially hazardous chlorinated substances in a combination carbon-chlorine-carbon treatment scheme. Activated carbon is generated at the treatment site through processing of sewage solids. Carbon is added to the primary sedimentation basin before chlorination and to the secondary clarifier after chlorination. The initial contact with carbon reduces the concentration of potentially hazardous substances which might react with chlorine, and the second carbon contact removes residual chlorine and chlorinated substances. Laboratory experiments were used to examine the ability of the proposed treatment scheme to remove phenols, aliphatic amines, aromatic amines, and polychlorinated biphenyls. Studies with final effluent from the waste water treatment plant in Orange County were used to verify the results. (Schulz-FIRL)
W78-01447

DESIGNING MORE ENERGY-EFFICIENT WASTEWATER TREATMENT PLANTS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
S. K. Banerji, and J. T. O'Conner.
Civil Engineering-ASCE, Vol 47, No 7, p. 76-81, September, 1977. 4 fig, 6 tab, 19 ref.

Descriptors: *Treatment facilities, *Design criteria, Energy, *Pumps, *Sewage treatment, *Costs, *Fuels, Incineration, Filtration, Aerobic treatment, Anaerobic digestion, Return flow, Tertiary treatment, Electric power demand, Trickling filters, Separation techniques, Sludge treatment, Sludge disposal, *Waste water treatment.

Rising energy costs have made designs for energy-efficient waste water treatment systems attractive to plant operators and design engineers. Energy costs and typical energy requirements for waste water treatment processes are described. Power requirements are compared for secondary waste water treatment processes, including conventional activated sludge, rotating biological contractor, activated bio-filtration, and high rate trickling filtration. Energy consumption for tertiary and advanced waste water treatment processes is described. Energy requirements of land treatment of waste water with irrigation, infiltration/percolation, or overland flow are compared with those of advanced waste water treatment. Gravity thickening and anerobic digestion, which use less energy than flotation thickening and aerobic digestion, are suggested as means of sludge treatment. Performance data for various modes of sludge dewatering are compared. Refuse-derived fuel is discussed as an alternate fuel for sludge-incineration. Waste water pump type and operating parameters are discussed with respect to power requirements. (Schulz-FIRL)
W78-01448

GRAIN SIZE DISTRIBUTION WITH DEPTH IN MULTILAYER GRANULAR BED WATER FILTERS,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
T. D. Lekkas, and G. T. J. Fox.
Filtration and Separation, Vol 14, No 5, p 461-462, 464, 466, 470, September-October, 1977. 10 fig, 11 tab, 6 ref.

Descriptors: *Filtration, *Stratification, *Particle size, *Particle shape, *Filters, Porous media, Coals, Settling velocity, Sediment sorting, Head loss, Hydraulic design, Model studies, Mathematical models, Separation techniques, *Waste water treatment.
Identifiers: Multi-layer filters, Anthracite, polystyrene.

Stratification during backwashing of granular filter beds reduces filter efficiency by producing beds with a smaller grain size at the top and a larger grain size at the bottom of the filter. The use of upflow filters and the use of larger but lighter grains have partially alleviated the problem of stratification. Pilot studies using a two-layer filter (anthracite and sand) and a three-layer filter (polystyrene, anthracite, and sand) were conducted to determine the distribution in grain size with depth. Stratification was not significant for sand, but was significant for anthracite in the two-layer filter and for polystyrene and anthracite in the three-layer filter. For the anthracite layer the grain size distribution is mathematically derived as a function of depth. Grain sphericity was measured according to mean sieve size, and according to count and weight equivalent grain size, to determine if shape stratification occurred within the anthracite layer in the two-layer filter. The studies indicated that some stratification did occur since sphericity increased with depth. Increasing the number of layers in a multilayer filter reduced the effects of size stratification on filter performance. (Schulz-FIRL)
W78-01450

PUTTING POWDERED CARBON IN WASTEWATER TREATMENT.
Environmental Science and Technology, Vol 11, No 9, p 854-855, September, 1977. 1 fig, 1 tab.

Descriptors: *Activated carbon, *Oxidation, *Tertiary treatment, Adsorption, Sewage treatment, Municipal wastes, Industrial wastes, Treatment facilities, Waste disposal, Costs, *Waste water treatment.
Identifiers: *Powdered activated carbon, Wet-air oxidation, Liverpool(OH), Vernon(CT).

A carbon/wet oxidation system, produced by Zimpro Inc. of Rothschild, Wisconsin, is described. Treatment with the Zimpro system includes adsorption on powdered activated carbon, conventional biological treatment, and regeneration of the spent carbon by wet air oxidation. The system is being used to upgrade the Liverpool Sewage Treatment Plant in Medina County, Ohio, from a conventional activated sludge facility to a 10-mgd advanced waste water treatment facility. The treatment is suggested as highly effective for industrial wastes or combined municipal-industrial wastes. Results of pilot studies to compare performance of the carbon/wet oxidation system with the conventional two-stage activated sludge system and to determine system nitrification, denitrification, oxygen transfer, and sludge characteristics are presented. Advantages of the system include: simultaneous adsorption of biodegradable and non-biodegradable wastes, high levels of nitrification due to long sludge age, and simultaneous destruction of biological solids and regeneration of spent carbon during wet air oxidation. Municipal and industrial waste treatment facilities currently using the Zimpro system of carbon/wet oxidation are listed. (Schulz-FIRL)
W78-01451

NEW 'PHILADELPHIA STORY' BEING WRITTEN BY POLLUTION CONTROL DIVISION,
Water Pollution Control Div., Philadelphia, PA.
M. D. Nelson, and C. F. Guarino.
Water and Wastes Engineering, Vol 14, No 9, p 22-26, 28, 38, September, 1977. 4 fig, 1 tab.

Descriptors: *Treatment facilities, *Activated sludge, *Combined sewers, *Storm runoff, *Monitoring, Pilot plants, Filters, Biological membranes, Sewage treatment, Sewerage, Automation, Sludge treatment, Waste water treatment.
Identifiers: Philadelphia(PA).

Additions in 1977 to the Southwest Water Pollution Control Plant, one of three which service Philadelphia, Pennsylvania, are described. The plant had been providing primary treatment for a waste water flow of 136 mgd with bar screens, grit channels, flocculation tanks, primary sedimentation tanks, and separate sludge treatment facilities. The expanded facility will provide treatment for an average flow of 210 mgd with provisions for expansion to 285 mgd. Additions to the plant include expanded and remodeled primary treatment facilities, oxygen activated sludge process facilities, and separate sludge treatment facilities to provide screening, grit removal, settling, biological treatment, and disinfection before treated effluent is discharged to the Delaware River. SURFACT, a rotating biological contractor which is submerged in a diffused air aeration tank, is being examined as a means of improving operating efficiency. Advantages of the fixed film contractor include process flexibility, lower susceptibility to upset, potential for both carbonaceous and nitrogenous removals in the same tank, the ability to use energy derived from the activated sludge system, and low capital and operating costs. Design criteria and costs for the prototype, a 20-mgd pilot-scale SURFACT system in operation at Philadelphia's Northeast treatment plant, are presented. (Schulz-FIRL)
W78-01452

REMOVAL OF ESCHERICHIA COLI IN WASTEWATER BY ACTIVATED SLUDGE,
Nijmegen Univ. (Netherlands). Dept. of Microbiology.
C. Van Der Drift, E. Van Seggelen, C. Stumm, W. Hol, and J. Tuinte.
Applied and Environmental Microbiology, Vol. 34, No. 3, p 315-319, September, 1977. 3 fig, 10 ref.

Descriptors: *Activated sludge, *E. coli, *Coliforms, *Sewage bacteria, *Microorganisms, Adsorption, Protozoa, Disinfection, Sludge treatment, Sewage treatment, *Waste water treatment.

A streptomycin-resistant strain of Escherichia coli was used in laboratory studies on the removal mechanisms of bacteria from waste water treated with activated sludge obtained at a municipal waste water treatment plant in Valburg, The Netherlands. The removal of E. coli by activated sludge is reported as a two-phase process with initial rapid removal and subsequent slower removal. The rapid decrease during the first hour after the addition of E. coli cells to mixed liquor was observed as following a Langmuir adsorption isotherm. Although the number of free E. coli decreased rapidly in the first hour, the total number of E. coli decreased at a much slower rate. Subsequent slower removal of E. coli was attributed to predation by ciliated protozoa as evidenced by the presence of fluorescent food vacuoles of ciliates when fluorescent E. coli cells were added to mixed liquor, by the inhibition of predation in the presence of cycloheximide or under anaerobic conditions, and by the absence of predation in bulking and washed sludge. (Schulz-FIRL)
W78-01454

MAKE PURE WATER OUT OF WASTE.
The American City and County, Vol. 92, No. 9, p 50, September, 1977.

Descriptors: *Water reuse, *Domestic wastes, *Treatment facilities, *Activated carbon, Equipment, Disinfection, Organic wastes, Ultraviolet radiation, Anaerobic digestion, Computers, Biological treatment, Water treatment, Waste water treatment.
Identifiers: *Domestic waste water recycling.

PureCycle, a computer-controlled module to recycle household waste water, is described. The system does not require water and sewer hookups and is composed of two 440-gal tanks and the processing system. The average treatment capacity of the system is 440 gpd with peak loading capacities of 800-1000 gpd. The processing system includes a biological reactor which uses disc rotation and a combination of aerobic and anaerobic digestion to oxidize organics. A pressurized filtration stage removes bacteria, viruses, and suspended particulates. Color, odors, and organic contaminants are removed by a carbon adsorption bed. Demineralization removes heavy metals and inorganic salts. Ultraviolet radiation is used to sterilize the recycled water. Processing is continuously monitored by a microcomputer. PureCycle of Boulder, Colorado, provides a service center to periodically remove solid organics and provide the initial 500 gal of water to start up the system. At current costs the break-even point is 200 PureCycle units per service center. Use of the system is suggested for areas with limited natural water supplies. (Schulz-FIRL)
W78-01455

COMPOST LATRINES IN TANZANIA: A PRELIMINARY REPORT,
Tanzania National Scientific Research Council, Dar es Salaam.
For primary bibliographic entry see Field 5E.
W78-01457

SLUDGE EXTRACTION WITH PNEUMATIC ASSISTANCE.
For primary bibliographic entry see Field 8C.
W78-01458

WHY NOT INCINERATE YOUR SCREENINGS,
For primary bibliographic entry see Field 5E.
W78-01459

A FUTURE FOR AUTOMATIC SLUDGE WITHDRAWAL,
C. W. Ching.
Water Services, Vol 81, No 978, p 505-506, August, 1977. 3 fig.

Descriptors: *Settling basins, *Sludge treatment, *Automation, *Viscosity, *Pumping, *Flow control, Valves, Equipment, Waste water treatment.
Identifiers: *Sludge withdrawal(Automatic), Sludge viscosity.

Ham, Baker, and Company Ltd., in conjunction with the Thames Water Authority of England, has produced a system for automatic sludge withdrawal from primary sedimentation tanks. The system can be automatically adjusted to initiate the desludging cycle at a preset time and to terminate sludge removal when the moisture content of the sludge being removed increases to a preset level. Sludge is removed from the sedimentation tank to an adjacent operating chamber. The viscosity of the sludge controls the velocity and level at which the sludge enters the operating chamber. Since the level in the control chamber will be related to the sludge moisture content, the inlet valve can be readily adjusted to close at a predetermined level. The automatic system eliminates the need for manual control and operator decisions. (Schulz-FIRL)
W78-01460

FLOW EQUALIZATION IS ON THE LEVEL,
Johnson and Anderson, Inc., Pontiac, MI.
G. W. Foess, J. G. Meenahan, and J. M. Harju.
Water and Wastes Engineering, Vol 14, No 9, p 96, 98, 100, 105-107, 134-135, September, 1977. 1 fig, 1 tab.

Descriptors: *Storage tanks, *Flow control, *Flow profiles, *Equalizing reservoirs, *Diurnal distribution, Treatment facilities, Tertiary treatment, Sewage treatment, Filtration, Effluents, Aeration, Design data, Municipal wastes, *Waste water treatment.
Identifiers: *Flow equalization, Walled Lake/Novi(MI).

Flow equalization as a means o leveling influent flow and concentration variations was evaluated at the 2.1-mgd Walled Lake/Novi waste water treatment plant in Michigan. Treatment at the tertiary facility uses the activated sludge process followed by multi-media tertiary filtration. Parameters measured during the 12-month evaluation period included BOD, total suspended solids, and total phosphorus under conditions of equalized and non-equalized flow. Influent waste water, primarily of domestic origin, is bar screened and then pumped from a wet well to the plant. The equalization basin used in the of municipal waste water treatment facilities. Photosynthetic ponds, aerated ponds, and complete retention ponds are the types of waste water ponds emphasized in this publication. Background information on the ability of flow-through photosynthetic ponds to meet secondary treatment requirements is presented. Various aspects of controlled discharge ponds which are designed to retain waste water on a long-term basis are discussed, including design criteria for ponds in operation and the selection of the optimum day and hour for the release of effluents. Criteria for the operation of complete-mix and partial-mix aerated ponds are given. General requirements are listed for positive disinfection, prevention of short circuiting, and protection of groundwater from pond seepage. Supplemental treatment methods for flow-through photosynthetic ponds are described, including conversion to controlled discharge, intermittent sand filtration, land treatment of pond effluents, addition of supplemental aeration, and chemical coagulation. (Schulz-FIRL)
W78-01465

HIGH-PRESSURE, THIN-CAKE, STAGED FILTRATION,
Artisan Industries Inc., Waltham, MA.
A. Bagdasarian, F. M. Tiller, and J. Donovan.
Filtration and Separation, Vol 14, No 5, p 455-458, 460, September-October, 1977. 8 fig, 16 ref.

Descriptors: *Filtration, *Dewatering, *Sludge treatment, *Sewage treatment, Equipment, Operation and maintenance, Turbines, Separation techniques, *Waste water treatment.
Identifiers: Sludge dewatering, Thin cake filtration, Continuous staged filtration.

Continuous, high pressure, thin-cake, staged filtration can be used in the post-treatment phase to dewater sludge. Alternate rotating and stationary filter elements are included in staged filters with rotating turbines. Sludge cake formation is inhibited by an induced drag on the stationary elements while the slurry is dewatered. Torque on the rotating turbine shaft during the last stage of filtration produces a shearing action which maintains the fluidity of the filtered solids. The final cake is continuously extruded. Higher filtration rates and lower porosites (higher sludge solids content) are produced with continuous staged filtration than with conventional pressure or vacuum filtration. The mechanism of thin cake filtration, the effects of flow rate per unit area, and washing methods are described. (Schulz-FIRL)
W78-01466

WASTEWATER REUSE BY THE TRUCKLOAD.
The American City and County, Vol 92, No 9, p 40, September, 1977.

Descriptors: *Water reuse, *Return flow, *Costs, *Water resources, *Sewage treatment, Irrigation practices, Water utilization, Treatment facilities, Water conservation, Waste water treatment.
Identifiers: Oakland(CA).

The East Bay Municipal Utility District (EBMUD) of Oakland, California, has implemented a waste water reclamation project in an effort to preserve existing water supplies. Secondary treated waste water is trucked to approved customers and designated for limited use in non-residential irrigation, sewer flushing, compaction of building sites, and dust control at landfills. Waste water reclamation is currently being practiced by the San Pablo Sanitary District, Central Contra Costa Sanitary District, Ora Loma Sanitary District, and the city of San Leandro. Costs for transportation, administration, and construction will eventually be apportioned to users. Initial costs to install pumps, hook up lines or hoses to the effluent pond, and discharge effluent to trucks are $2000-3000. Current costs for reclaimed waste water are about $20/1000 gal, as compared to $0.50/1000 gal for water from conventional sources. (Schulz-FIRL)
W78-01467

OXYGEN TRANSFER TESTS PROVE EFFICIENCY OF FINE BUBBLE DIFFUSER,
Wisconsin Univ.-Milwaukee. Dept. of Civil Engineering.
V. W. Bacon, R. T. Balmer, and R. G. Griskey.
Water and Sewage Works, Vol 124, No 9, p 121-124, September, 1977. 10 fig, 1 tab, 18 ref.

Descriptors: *Oxygenation, *Aeration, *Dissolved oxygen, *Oxygen requirements, *Gases, Air-water interfaces, Boundary processes, Equipment, Pilot plants, Energy, Mathematical models, Design criteria, *Waste water treatment.
Identifiers: Oxygen transfer, Fine bubble diffusers.

A 31,000-gal test facility in Glendale, Wisconsin, was used to evaluate the Air-Aqua fine bubble diffuser system manufactured by Hinde Engineering Company. Design data for the oxygenation tank, which contained seven lengths of Air-Aqua tubing and 11 samplers, are presented. Data were collected on dissolved oxygen saturation of the tank with coarse bubble diffusers and deoxygenation. An equation to represent mass transfer in a gas-liquid contacting process is presented. The overall oxygen mass transfer coefficient is related to the oxygen deficit, temperature, and depth. Data collected at the Glendale facility indicate that the overall oxygen mass transfer coefficient increases with decreasing depth at constant aeration rates and with increasing aeration at constant depth. The effects were attributed to increased aeration which resulted in greater mixing and gas throughput, and greater mixing at lower depths caused by a concentration gradient. A quotient for the amount of oxygen transferred to the test water at standard conditions is derived. The efficiency of the aeration system is calculated on the basis of the transfer coefficient and the amount of oxygen added to the system. Efficiencies at the test site ranged from 16.2% to 25%. Oxygen transfer efficiency is related to blower horsepower. The effects of depths, air flow rate, and aeration time on the oxygen deficit, oxygen transfer rate, and oxygenation efficiency are illustrated. Tests at the Glendale facility suggested that the Air Aqua system was competitive in terms of efficiency and oxygen transfer rates. (Schulz-FIRL)
W78-01468

CONVERSION OF SLUDGES INTO 'TOPSOILS' BY EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5E.
W78-01469

SIGNIFICANCE OF DIURNAL VARIATIONS IN FECAL COLIFORM DIE-OFF RATES IN THE DESIGN OF OCEAN OUTFALLS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5E.
W78-01471

CHLORINATED WASTEWATER OUTFIT IS PORTABLE.
For primary bibliographic entry see Field 5A.
W78-01473

OPTIMAL USE OF INSTRUMENTAL NEUTRON AND PHOTON ACTIVATION ANALYSES FOR MULTIELEMENT DETERMINATIONS IN SEWAGE SLUDGES,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-01476

ANALYSIS FOR TOXIC SUBSTANCES PRESENT IN WASTE WATER FOR BIOLOGICAL PURIFICATION PURPOSES (PRUEFUNG VON ABWASSERINHALTSSTOFFEN AUF GIFTWIRKUNG FUER DIE BIOLOGISCHE KLAERSTUIE),
Eidgenoessische Materialpruefungs- und Versuchsanstalt, Sankt Gallen (Switzerland). Vorsteher der Abt. Chemie.
For primary bibliographic entry see Field 5A.
W78-01480

A SEMICONTINUOUS EXPERIMENTAL TECHNIQUE FOR THE STUDY OF THE INFLUENCE OF MIXING CONDITIONS ON THE HOMOGENEITY OF SEWAGE SLUDGE,
Companhia Estadual de Technologia de Sameamento Basico e de Defesa do Meio Ambiente, Sao Paulo (Brazil). Superintendencia de Pesquisa.
G. Taralli, M. D. Eduardo, E. D. Honorio, and M. B. Filgueira.
Biotechnology and Bioengineering, Vol. XIX, No. 7, p 1087-1090, July, 1977. 2 fig, 2 ref.

Descriptors: *Anaerobic digestion, *Mixing, *Sludge treatment, *Homogeneity, *Analytical techniques, Physical properties, Sampling, Digestion tanks, Sludge digestion, Equipment, Measurement, Equations, *Waste water treatment.
Identifiers: Sludge homogeneity, Anaerobic digester performance, Sludge mixing, Sao Paulo(Brazil).

A semicontinuous experimental technique for defining correlations between mixing and sludge homogeneity with anaerobic digestion is presented. Small volumes of sludge are periodically removed from the digester and the same volume of water is added. A series of equations relating the amount of sludge removed, the effective dilution, and the sludge concentration are presented. The system can be considered homogeneous if the final sludge concentration follows a prescribed function. Possible experimental errors are indicated when the volume of sludge periodically removed from the digester is large with respect to the total volume of sludge in the digester. However, the dilution factor and the time interval between sample removal must be sufficiently large for proper equilibration of the system. An example of the semicontinuous technique in an experiment with sewage sludge from a primary settling tank at the Pinheiros sewage treatment plant in Sao Paulo, Brazil, is presented. (Schulz-FIRL)
W78-01481

KINETICS AND STOICHIOMETRY OF COMPLETELY MIXED ACTIVATED SLUDGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard.
Journal Water Pollution Control Federation, Vol. 49, No. 9, p 1968-1975, September, 1977. 6 fig, 1 tab, 24 ref.

Descriptors: *Kinetics, *Mathematical models, *Activated sludge, Equations, *Microbial degradation, Sludge digestion, Microorganisms, Biochemical oxygen demand, Nitrogen, Sewage treatment, Biological treatment, *Waste water treatment.
Identifiers: Activated sludge stoichiometry, Mean cell residence time, Materials balance, Waste water stoichiometry.

Microbiological principles, materials balance equations, and the stoichiometric composition of waste water are examined with respect to the completely mixed activated sludge process. Mathematical equations for microbial growth kinetics are derived. Mathematical relationships which describe bacterial growth and substrate utilization are developed from a series of materials balance equations. Parameters defined include: the yield coefficient, the mean cell residence time, the rate of substrate utilization per unit weight of microorganisms, and the food:microorganism ratio. An example problem is calculated according to the described relationships for industrial waste water with a flow rate of 1 mgd and a temperature of 20C which is treated in a completely mixed activated sludge process. Effluent waste concentration, treatment efficiency, aeration basin volatile suspended solids, waste sludge production, and the food:microorganism ratio are plotted against the mean cell residence time. (Schulz-FIRL)
W78-01482

FUNCTIONAL DESIGN OF ACTIVATED SLUDGE PROCESSES,
Oklahoma State Univ., Stillwater. Dept. of Bioenvironmental Engineering.
A. F. Gaudy, Jr., and D. F. Kincannon.
Water and Sewage Works, Vol. 124, No. 9, p 76-81, September, 1977. 4 fig, 2 tab, 9 ref.

Descriptors: *Activated sludge, *Mathematical models, *Aeration, *Design criteria, *Equations,

LIBRARY OF THE URBANA-CHAMPAIGN

Microorganisms, Sludge treatment, Biochemical oxygen demand, *Waste water treatment.
Identifiers: Materials balance, Aeration tank volume.

Mathematical models for the functional design of activated sludge processes which include design equations based on simultaneous solution of mass balances and equations for direct solution of tank volume are examined. Equations for the mass rate of change in biomass concentration and the effluent substrate concentration are presented. The reaction tank volume is derived as a function of net specific growth rate. Expressions are presented for the recycle flow ratio and the biological solids concentration in the aeration tank. A materials balance for biological solids around the clarifier at steady state conditions is used to provide an expression for excess sludge production The model is illustrated with a numerical example at the following design conditions: BOD of primary effluent (275 mg/liter), flow rate (10 mgd), required effluent BOD (30 mg/liter), and required suspended solids (30 mg/liter). Use of the model entails: collection of data to characterize the concentration of soluble substrate in the influent; characterization of biomass by determining the saturation constant, maximum specific growth rate, true sludge or cell yield, and the maintenance energy; the determination of the required net growth rate, the selection of recycle flow ratios to give the required concentration of soluble substrate in effluent; calculation of biological solids in the aeration tank; and determination of aeration tank volume, excess sludge production, and metabolic oxygen requirements. (Schulz-FIRL)
W78-01483

CHEMICAL WASTE WATER TREATMENT METHOD,
Carvalho (Rocky), Salem, OR. (Assignee).
P. J. Horvath.
United States Patent 4,049,545. Issued September 20, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 3, p 1235-1236, September, 1977. 1 fig.

Descriptors: *Suspended solids, *Chemical precipitation, *Patents, *Hydrogen ion concentration, *Separation techniques, Flocculation, Acids, Oxidation, Disinfection, Filtration, Municipal wastes, Industrial wastes, Organic wastes, *Waste water treatment.
Identifiers: Chemical waste water treatment.

A chemical method of treating waste water which has a pH below 9.0, contains nitrifying bacteria, and has in excess of 200 mg total solids per liter has been patented. The process is suggested for use with municipal, industrial, commercial, and agricultural waste waters which contain organic wastes. The pH of the waste water is first raised to 9-11 to kill any nitrifying bacteria. This is accomplished with the addition of an alkaline coagulant such as portland cement, lime, or sodium silicate. An acidifying agent such as copper sulfate, sulfuric acid, hydrochloric acid, aluminum salts, or ferric iron salts is then added to lower the pH by one unit and cause the precipitation of suspended solids. After the aggregated suspended solids are removed from the mixture, the pH is lowered again to 6-8.5 to further precipitate any suspended solids. Once these solids are removed, an oxidizing and disinfecting agent is added to render the remaining solids filterable. After the mixture is filtered, a second oxidizing and disinfecting agent is added to lower the BOD level to less than 20 mg/liter. (Schulz-FIRL)
W78-01484

WATER TREATMENT SYSTEM,
Environmental Filtration Products, Inc., Orlando, FL. (Assignee).
J. A. Borchardt.
United States Patent 4,051,032. Issued September 27, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 4, p 1723, September, 1977. 1 fig.

Descriptors: *Filters, *Patents, *Effluents, *Porous media, *Filtration, Particle size, Operation and maintenance, Equipment, Waste water treatment.

A patent has been issued for a waste water treatment system composed of a closed tank with an effluent inlet and outlet at opposite ends of the tank to provide a horizontal flow of waste water through the system. A number of septa are provided to divide the tank serially into subchambers along the effluent flow path. The septa are filled with a particulate media so that effluent first passes through a coarse particulate medium and then through a fine particulate medium. The coarse medium can be horizontally backwashed, and the chamber containing the fine medium can be expanded and vertically backwashed. (Schulz-FIRL)
W78-01485

ORGANIC WASTE TREATING AND CONVERSION SYSTEM,
G. H. Brimball.
United States Patent 4,050,907. Issued September 27, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 4, p 1686, September, 1977. 1 fig.

Descriptors: *Heat treatment, *Patents, *Organic wastes, *Fuels, *Equipment, Heat exchangers, Design data, Heating, Gases, *Waste water treatment.

A system for the treatment and conversion of organic wastes has been patented. The system includes a waste treatment tank equipped with a heating fluid conduit circuit. The portion of the heating conduit which passes through the waste treatment tank can be vibrated, and a pump is provided to circulate the fluid within the circuit. The fluid is heated by a furnace outside of the tank and supplemental heating in the external portion of the conduit circuit. Gas generated in the waste treatment tank is used for combustion in the furnace. The tank itself is a vertical well which has a depth substantially greater than its width. Radiation diffusers are located at the top of the well and means for the recovery of waste-generated gases are provided. (Schulz-FIRL)
W78-01486

TREATMENT OF SEWAGE,
BOC Ltd., London (England). (Assignee).
K. C. Smith, and M. E. Garrett.
United States Patent 4,039,437. Issued August 2, 1977. Official Gazette of the United States Patent Office, Vol. 961, No. 1, p 253, August, 1977.

Descriptors: *Sewerage, *Sewage treatment, *Biological treatment, *Packed beds, *Oxygenation, *Patents, Aerobic treatment, Aeration, Microorganisms, Sewers, Conveyance structures, Sewage bacteria, Design data, Biodegradation, Pipes, Microbial degradation, *Waste water treatment.

A sewage treatment process which reduces the biochemical oxygen demand of sewage while it is entrained in a sewer has been patented. Pressurized oxygenated gas is injected into the sewer to provide aerobic conditions suitable for the growth of microorganisms. A longitudinal biological contactor which is attached to the upper surface of the sewer pipe is designed to provide a suitable matrix for microorganism growth without obstructing sewage flow. The matrix, which contains a bed of solid material to increase surface area available for microorganism growth, extends longitudinally for a significant distance through the sewer but does not extend below the central axis. Sewage flows through the matrix via a series of longitudinal passages created by separated pieces of sheet material. (Schulz-FIRL)
W78-01487

SYSTEM FOR POLLUTION SUPPRESSION,
TII Corp., Lindenhurst, NY. (Assignee).
E. T. Armstrong.
United States Patent 4,045,347. Issued August 30, 1977. Official Gazette of the United States Patent Office, Vol. 961, No. 5, p 2227, August, 1977.

Descriptors: *Disinfection, *Effluents, Equipment, *Patents, *Water pollution control, Pipes, *Waste water treatment.

A disinfectant mixing system for use with influent in waste water treatment has been patented. The system uses a contact tank which includes: an influent inlet port which feeds a manifold; a pipe bundle with flat-plate orifice, high momentum exchange mixing members; and influent and effluent wells. A disinfecting fluid is injected into each pipe of the bundle at the point of highest momentum exchange. Effluent from the pipe bundle is delivered to a contact tank via a hyperbolic transformed diffuser. After the effluent is contacted with the disinfectant, it flows to an effluent trough. (Schulz-FIRL)
W78-01488

WASTE TREATMENT SYSTEM,
BDH, Inc., Rome, GA. (Assignee).
J. H. Bowen.
United States Patent 4,042,509. Issued August 16, 1977. Official Gazette of the United States Patent Office, Vol. 961, No. 3, p 1278-1279. August, 1977.

Descriptors: *Oxidation, *Ozone, *Disinfection, *Organic wastes, *Patents, Effluents, Filters, Equipment, Ultrasonics, *Waste water treatment.

A waste water treatment system which employs ozone for oxidation of effluent has been patented. The system includes: a conduit to supply effluent, a self-cleaning filter assembly to remove solids from the effluent, and an ozone and oxidation assembly for treating effluent. Filtered effluent which has been subjected to oxidation and ozonation passes through an ultrasonic sound-generating assembly to break down particles in the effluent. The effluent then passes through a casing in which ozone is generated with an electric arc. A germicidal chamber and a chlorinator are provided for disinfection of the effluent. (Schulz-FIRL)
W78-01489

SEWAGE SYSTEM,
W. Shenk.
United States Patent 4,049,013. Issued September 20, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 3, p 1063-1064, September, 1977. 1 fig.

Descriptors: *Sewerage, *Pumping plants, *Pumping, *Patents, *Equipment, Wells, Sewage treatment, Sewers, *Waste water treatment.

An improved design for a sewage pumping station has been patented. The station is circular and has a drywall which is surrounded by an annular series of wells. Sewage can be distributed sequentially among portions of the series of wells without the need for an additional power source. Sewage can also be delivered selectively to the pumping system in a predetermined sequence. (Schulz-FIRL)
W78-01490

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, DES PLAINES, O'HARE WATER RECLAMATION PLANT AND SOLIDS PIPELINE, VOLUME II. APPENDICES.
Environmental Protection Agency, Chicago, IL. Region V.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 497

Price codes: A15 in paper copy, A01 in microfiche.
EPA Report, May 1975. 339 p, 22 append.

Descriptors: *Sewerage, *Environmental effects, *Treatment facilities, *Construction, Combined sewers, Sewage treatment, Benefits, Waste water treatment, Tunnels, Hydrology, Sewers, Organoleptic properties, Tertiary treatment, Solid wastes.
Identifiers: Chicago(IL).

Appendices to the final environmental impact statement for the O'Hare Water Reclamation plant and a solids pipeline in Chicago, Illinois, are presented. Topics discussed in the 22 appendices include: O'Hare area flood control activities, MSDGC TARP Program, O'Hare service area determination, health questionnaire and responses, geology, regional water resources, water conservation and reuse measures, justification of ultimate size, health aspects, odor control, process alternatives, solids handling alternatives, design criteria, HUD guidelines, flow projections, additional site information, a density graph and matrix for the city of Des Plaines, an aerosol literature survey, water quality data, ten state standards, and EPA correspondence. (Schulz-FIRL)
W78-01509

THE ACTIVATED SLUDGE PROCESS, PART II--DYNAMIC BEHAVIOUR,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. A. Ekama, and G. V. R. Marais.
Water S. A., Vol. 3, No. 1, p 17-50, January, 1977. 48 fig, 10 tab, 10 ref, 1 append.

Descriptors: *Activated sludge, *Nitrogen, *Chemical oxygen demand, *Mathematical models, *Nitrification, Kinetics, Nutrient removal, Computer models, Equations, Biodegradation, Oxygen requirements, Sludge treatment, *Waste water treatment.
Identifiers: Completely-mixed activated sludge process, Carbonaceous degradation.

A model to describe the behavior of the activated sludge process under dynamic conditions for both carbonaceous and nitrogen degradation is presented. Aspects of carbonaceous degradation include influent COD fractions, biodegradable COD removal, synthesis of cell mass, endogenous respiration, and carbonaceous oxygen demand. Various aspects of nitrogen removal are discussed, including influent TKN fractions, nitrogen requirements for sludge, and the storage of nitrogen. The mathematical model includes basic differential equations for sludge generation, COD utilization, and nitrification. Equations are presented for the general form of the mass balance equation, the biodegradable COD in the reactor liquid, unbiodegradable COD in the reactor, active mass concentration in the reactor, the stored COD (as VSS) accumulated in the sludge, inert material accumulating through endogenous residue, inert material accumulating from the influent, rate of change of total mass (MLVSS), slowly biodegradable TKN, unbiodegradable nitrogen, immediately available nitrogen, nitrates in the reactor liquid, and oxygen utilization. The predictive abilities of the mathematical model were tested against experimental data. Activated sludge process performance is evaluated with respect to sinusoidal and square-varying loading conditions. A design example is presented for a completely-mixed activated sludge plant with a flow of 10 M liters/day, sludge age of 20 days, peak COD mass flow of 1.8 times the average COD mass flow, and sinusoidal loading conditions. (Schulz-FIRL)
W78-01511

STUDY ON SLUDGE TREATMENT--2ND REPORT,
For primary bibliographic entry see Field 5E.
W78-01512

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT, APPENDIX F: SELECTED COMPUTER INPUT AND OUTPUT,
Battelle Pacific Northwest Labs., Richland, WA.
Water and Land Resource Dept.
For primary bibliographic entry see Field 5B.
W78-01514

SIMULATION OF NUTRIENT LOADINGS IN SURFACE RUNOFF WITH THE NPS MODEL,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-01515

PERFORMANCE INVESTIGATION OF THE MANNING MODEL S-4000 PORTABLE WASTEWATER SAMPLER AND THE MODEL F-3000 DIPPER FLOWMETER,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-01516

CHEMICAL/BIOLOGICAL IMPLICATIONS OF USING CHLORINE AND OZONE FOR DISINFECTION,
Minnesota Univ., Duluth. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-01517

EFFECTS OF ADVANCED WASTE TREATMENT AND FLOW AUGMENTATION ON WATER QUALITY DURING LOW STREAM FLOWS,
Heidelberg Coll., Tiffin, OH. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-01522

NEW ASPECTS OF CLOSED PROCESSING CIRCUITS IN THE PAPER AND PAPERBOARD INDUSTRY,
Sulzer Bros. Ltd., Winterthur (Switzerland).
B. Morgeli.
Paper, Vol 187, No 2, p 65-68, January 24, 1977. 7 fig, 9 ref.

Descriptors: *Pulp and paper industry, *Water conservation, Water pollution control, Pollution abatement, Recycling, Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Filtration, Filters, Colloids, Fibers(Plant), Salinity, Steel, Corrosion.
Identifiers: *Closed systems, White water(Paper machines).

All of the waste water in paper and paperboard mills cannot be returned to the pulp furnish, because rapid separators are not able to remove all fibers, fillers, and additives. If white water is to be used for feeding foam nozzles, edge sprayers, or high-pressure spray pipes, an additional treatment operation is necessary. Strategies to offset the increases in salinity and biological activity which result in clogged nozzles and severe corrosion of steel are discussed. Tests at a Swiss paper mill suggest that volumetric filtration using granular media is a reliable treatment. Besides removing coarser solids, it also eliminates colloids at the same time. To prevent the formation of lumps in the filter medium by long fibers, a microstrainer is placed before the filtration unit. Sludge water from the filtration unit enters a cyclone where any residual granules are removed. (Swichtenberg-IPC)
W78-01565

MECHANICAL AND BIOLOGICAL TREATMENT OF WASTE WATER FROM AN INTEGRATED PAPER AND PULP INDUSTRY. PART I. BENCH SCALE STUDIES AND EVALUATION OF POTENTIALLY SUITABLE TREATMENT METHODS,
Ahlstrom (A.) Osakeyhtio, Varkaus (Findland). Paper and Pulp Div.
R. Panula, A.-M. Kuvaja, and P. Hynninen.
Paperi ja Puu, Vol 59, Special issue No 4a, p 185-186, 188-190, April, 1977. 3 fig, 7 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Biological treatment, Water pollution sources, Foreign countries, Europe, Water purification, Aerated lagoons, Activated sludge, Biochemical oxygen demand, Nitrogen compounds, Phosphorus compounds, Temperature, Sludge, Dewatering, Sludge treatment, Pulp and paper industry, Effluents, Waste treatment.
Identifiers: Finland, Sulfite pulp mills, Newsprint mills, Chemimechanical pulp mills.

Typical pulp and paper mill effluents (from the sulfite pulp, chemimechanical pulp, and newsprint plants of Varkaus Forest Industry, subsidiary of A. Ahlstrom Oy., Finland) were treated by mechanical clarification, lagoon aeration, and activated sludge process. The aerated lagoon gave good BOD removal, even with low N addition and without P addition. A detention time of 5-6 days, temperature of 12-18C, plus N addition gave a BOD removal of 60-70%. Sludge from biological treatment was more difficult to dewater than sludge from primary clarification. (Brown-IPC)
W78-01566

INDUSTRIAL WASTE WATERS: NOVEL TREATMENT OF WASTE WATERS IN CORRUGATED BOARD PRODUCTION (FABRIKATIONS-ABWAESSER: NEUARTIGE AUFBEREITUNG DER ABWAESSER IN DER WELLPAPPEN-PRODUKTION).
Papier Kunststoff Verarbeiter, Vol 12, No 6, p 89-90, June, 1977. 1 tab.

Descriptors: *Waste water treatment, *Flotation, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Lubricants, Adhesives, Waste treatment, Sludge, Effluents, Water purification, Pulp and paper industry.
Identifiers: *Paper converting industry, Corrugated board, Printing inks, Aluminum sulfate.

A new flotation type of effluent clarifier is described in which the total effluent of a corrugated-board plant containing printing ink, adhesive, and lubricating oil is run into a surge tank. Gelatinized clumps and board fragments are filtered off, and the liquid is pumped into a reaction chamber and treated with alum, alkali, and a flocculant. The flotation sludge is skimmed from the clarification chamber and stored in a dewatering chest, from which it may be removed once a week. (Ward-IPC)
W78-01568

CONTROL OF THE RIVER SLANA POLLUTION CAUSED BY THE GEMERSKA HORKA PULP MILL (MOZNOSTI OBMEDZENIA ZNECISTOVANIA RIEKY SLANEJ CELULOZKOU V GEMERSKEJ HORKE),
Celprojekt Ruzomberok (Czechoslovakia).
J. Marek.
Papir a celuloza, Vol 32, No 4, p 117-118, 123, April, 1977.

Descriptors: *Water pollution control, *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Waste treatment, Foreign countries, Europe, Pulp and paper industry, Effluents, Biochemical oxygen demand, Fermentation, Bleaching wastes, Sludge, Water pollution treatment, Water pollution sources, Sulfite liquors.
Identifiers: Sulfite pulp mills, Czechoslovakia, Slana River(Czechoslovakia).

The Gemerska Horka pulp mill (Czechoslovakia) has a capacity of 33,000 tons/year of calcium

bisulfite pulp. The mill is located on the Slana River with a 355-day flow of 1.28 cu m/sec. With the exception of 3 spent liquor storage basins, the mill does not have any pollution control facilities. The Czechoslovakian law requires a reduction in 5-day BOD discharges from the current 3,711 to 123 tons/year. To accomplish this, the mill will install 3 brown stock washers allowing for 98% liquor recovery, an ethyl alcohol plant, and spent liquor evaporator. The liquor after fermentation will be evaporated to 55% and sold as cattle feed binder, and converted into other lignin-based products. Bleachery effluents are going to be used for transport of ash and still sludge in storage ponds. Because of long retention and some sorption, a 60% BOD reduction is expected. (Trubacek-IPC)
W78-01569

COLOR REMOVAL TESTED AT PRINCE ALBERT (PULP CO. LTD.).
Pulp and Paper Canada, Vol 78, No 5, p 83, May, 1977.

Descriptors: *Bleaching wastes, *Color, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Canada, Pulp wastes, Pulp and paper industry, Effluents, Fly ash, Water pollution control.

A small pilot plant has been installed at Prince Albert Pulp Co. in Saskatoon, Saskatchewan (Canada), to test a method for removing color from the caustic effluent of the bleach plant. The effluent is treated with fly ash and acid (viz., an acid-containing effluent from the chlorination stage). The acid releases chemicals in the fly ash which react with the coloring material, causing it to settle. (Swichtenberg-IPC)
W78-01570

DISPOSAL OF PAPER PULP MILL SLUDGE,
Consolidated-Bathurst Ltd., Montreal (Quebec). (Assignee).
For primary bibliographic entry see Field 5E.
W78-01573

PURIFICATION OF EFFLUENTS BY RADIATION POLYMERIZATION (RADIATSIONNO-POLIMERIZATSIONNAYA OCHISTKA STOCHNYKH VOD),
G. K. Nikonorova, V. N. Shubin, S. A. Brusentseva, and P. I. Dolin.
Vodnye Resursy, No. 3, p 149-155, 1976. 7 fig, 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Radiation, Foreign countries, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Hydrogen ion concentration, Water purification, Sulfite liquors, Phenols, Ureas, Color, Irradiation, Waste treatment, Water pollution treatment, Polymers.
Identifiers: Soviet Union(USSR), Black liquors, Spent sulfite liquors, Acrolein, Methyl methacrylate, Acrylonitrile.

Results are described of studies on radiation polymerization of industrial effluents, conducted at the Institute of Electrochemistry of the Soviet Academy of Sciences. Studied were the effects of the nature of the monomer added to the effluent, of the purification of effluents, such as black liquor, spent sulfite liquor, and solutions of phenol, urea, and colored substances. The process appears to be universal, i.e., capable of purifying effluents from a variety of pollutants, using a number of different monomers (acrolein, methyl methacrylate, and acrylonitrile). The yield of the process (amount of particles formed upon absorption of 100 electron volts of energy) is generally high and increases with monomer concentration and with decreasing irradiation rate. The degree of purification increases with decreasing pH of the effluent (from 10 to 4.5). The irradiation after-effect, observed at acidic pH, makes it possible to reduce the irradiation dose. A 75-90% purification was achieved with spent pulping liquors. (Stapinski-IPC)
W78-01574

PROSPECTS FOR THE USE OF WATER EXTRACTION WITH ORGANIC SOLVENTS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS (PERSPEKTIVI ZASTOSUVANNYA PROTSESU EKSTRAKTSII ORGANICHNIMI ROZCHINNIKAMI DLYA OCHISHCHENNYA PROMISLOVIKH STOKIV),
T. V. Knyaz'kova, and L. A. Kul'skii.
Dopovidi Akademiia Nauk Ukrains'koi RSR, Seriya B, No 5, p 429-432, 1976. English summary.

Descriptors: *Separation techniques, *Pulp wastes, *Organic compounds, *Solvents, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Aqueous solutions, Chlorides, Nitrates, Sulfates, Pulp and paper industry, Effluents, Temperature.
Identifiers: Black liquors, Viscose rayon, Diisopropylamine, Triethylamine, Diethylmethylamine.

An extraction process for water recovery from industrial effluents consists in selective separation of water from solution with organic solvents. When highly selective solvents are used, such as diisopropylamine, triethylamine (TEA), or mixtures of the latter with diethylmethylamine, the ionic impurities and a large part of molecularly dissolved compounds are concentrated in the raffinate, while pure water passes into the organic phase in the form of a complex with the extractant. This complex can be decomposed into water and the extractant by raising the temperature. Studies showed that TEA is a good selective solvent for solutions of chlorides, nitrates, and sulfates. TEA is even more selective for solutions of alkali, as alkaline media reduce the hydrolysis of the amine. Experimental data are presented showing the efficiency of extraction applied to mineral salt solutions, to alkaline effluent from the production of viscose rayon fibers, to black liquor, and to overall effluent from the Kherson pulp and paper mill. In all cases extraction was conducted under conditions of 90% water recovery. Organic compounds contained in effluents of the pulp and paper mill, especially black liquor, are separated to a large extent along with mineral component. (Stapinski-IPC)
W78-01578

PROCESS FOR PURIFICATION OF LIGNIN-CONTAINING WASTE WATERS (VERFAREN ZUR REINIGUNG VON LIGNINHALTIGEN ABWARSSERN),
L. Muller.
German Patent (Offenlegungsschrift) No 2,517,665. November 11, 1976. 10 p, 1 tab, 12 claims.

Descriptors: *Pulp wastes, *Waste water treatment, *Lignins, *Chemical precipitation, *Patents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Calcium compounds, Sulfite liquors, Pulp and paper industry, Effluents, Water purification.
Identifiers: Calcium aluminate, Calcium aluminate-ferrite.

A process for purifying lignin-containing effluents (e.g., sulfite pulping effluents) is based on addition, to the effluents, of hydraulically setting calcium aluminate and/or calcium aluminate-ferrite and separation of the precipitated materials in known manner. (Speckhard-IPC)
W78-01579

PROCESS FOR OXIDATIVE TREATMENT OF SULFIDE-, SULFITE-, AND THIOSULFATE-CONTAINING WASTE WATERS (VERFAHREN ZUR OXYDATIVEN BEHANDLUNG SULFID-, SULFIT-, UND THIOSULFATHALTIGER ABWAESSER),
O. Horak, P. Wegner, R. Muders, P. Schultz, and R. Enders.
German Patent (Offenlegungsschrift) No. 2,534,892. February 17, 1977. 11 p, 1 fig, 9 claims.

Descriptors: *Pulp wastes, *Sulfur compounds, *Waste water treatment, *Patents, Wastes, Industrial wastes, Lignins, Waste treatment, Water pollution treatment, Oxidation, Water pollution sources, Pulp and paper industry, Effluents, Dyes, Oxygen, Hydrogen ion concentration, Temperature, Pressure, Sulfur, Sulfates, Sulfides.
Identifiers: Sulfites, Thiosulfates.

A process for oxidizing waste water containing sulfide, sulfate, and/or thiosulfate (e.g., waste water from paper or dye manufacture) involves first contacting the waste waters, in the case where they contain sulfide, with technically pure oxygen at pH greater than 7, temperatures of 20-200C, and pressures up to 20 bars until substantially all of the sulfide is converted to thiosulfate, and then reacting the waste waters with technically pure oxygen at pressures up to 20 bars, optionally in the presence of catalysts, to practically complete formation of sulfate (temperature, 20-200C; pH 0-5 or 0-8 in the case of waste waters containing only sulfite). In the case of waste waters originally containing sulfide and/or thiosulfate, sulfur is obtained in addition to the sulfate. (Speckhard-IPC)
W78-01580

PROCESS FOR PURIFYING TURBID WATER (VERFAHREN ZUR REINIGUNG VON TRUEBEM WASSER),
K. Saitoh, and N. Nishijima.
German Patent (Offenlegungsschrift) No. 2,623,748. December 9, 1976. 13 p, 8 claims.

Descriptors: *Patents, *Waste water treatment, *Pulp wastes, *Turbidity, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water purification, Metals, Ions, Hydrogen ion concentration, Aeration, Pulp and paper industry, Effluents, Clays, Aeration.
Identifiers: Aluminum sulfate, Iron compounds, Iron sulfate, Aluminum chloride, Zinc chloride, Dimethylaminoethyl methacrylate, Polyacrylics(Acrylic polymers).

A process for purifying turbid water containing clay or other foreign materials (e.g., paper manufacturing or mining effluents) is characterized by addition of polyvalent metal ions and a poly(aminomethacrylate) and introduction of bubbles into the resulting suspension at a pH of about 6-10. The polyvalent metal ions can be added in the form of aluminum sulfate, ferric sulfate, aluminum chloride, and/or zinc chloride. The poly(aminomethacrylate) can be a polymer of dimethylaminoethyl methacrylate. (Speckhard-IPC)
W78-01581

CONTROL OF ENVIRONMENTAL POLLUTION BY PULP AND PAPER INDUSTRY. I. WATER QUALITY PARAMETERS (SOBRE EL CONTROL DE LA CONTAMINACION AMBIENTAL POR VERTIDOS DE LAS INDUSTRIAS DE CELULOSA Y PAPEL. I. PARAMETROS MAS EMPLEADOS DE CALIDAD DE LAS AGUAS),
Instituto Nacional de Investigaciones Agrarias, Madrid (Spain). Dept. de Celulosa e Industrias de Extraccion.
For primary bibliographic entry see Field 5G.
W78-01582

WATER CONSERVATION PROBLEMS IN NORTHERN ITALY,
Bologna Environmental Agency, (Italy).
R. Cenerini.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2118-2128, October 1977. 8 fig, 1 tab, 8 ref.

Descriptors: *Water conservation, *Regional analysis, *Water resources, *Water pollution control, *Water supply, *Activated sludge, Waste water treatment, Planning, Capital costs, Operating costs, Farm wastes, Water reuse.
Identifiers: *Italy, Bologna(Italy).

In Italy, as in most industrialized countries, heavy urbanization and expansion of industry in addition to changing technological processes have had a strong negative impact on aquatic ecosystems in the past 30 years. This article dealt with the main characteristics of regional water supplies and the impact of pollution on water resources in the Emilia-Romagna region, which has a population of 3.9 million. Emphasis of water conservation has been demonstrated by public authorities and industries in new programs, which include a new municipal waste water treatment plant for the region's largest city, Bologna. Benefits of the new plant, its main features, and data on investment and operating costs were presented. (Visocky-ISWS)
W78-01630

QUALITY OF EFFLUENTS FROM MECHANICAL PULPING PROCESSES,
Pulp and Paper Research Inst., Point Claire (Quebec).
A. Wong.
Pulp and Paper Canada, Vol. 78, No. 6, p 103-107, June, 1977. 3 fig, 6 tab, 33 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Biochemical oxygen demand, *Environmental effects, Toxicity, Suspended solids, Water reuse, Fibers(Plant), Waste water management(Applied), Filtration, Activated carbon, Biological treatment, Industrial wastes, Waste water treatment.
Identifiers: Thermomechanical pulping, Stone groundwood, Refiner groundwood, Sulfite pulping.

Thermomechanical pulping (TMP) has been considered as an alternative to stone grinding or refining processes for the production of paper pulp. Effluent characteristics are described for thermomechanical pulping and compared with those produced in conventional groundwood processes. TMP effluents are usually transferred to the mill whitewater system during the pulp screening and deckering operations. Secondary effluents from TMP include chip washing effluent, plug screw feeder effluent, and condensates from the primary refiner stage. Studies on potential BOD loadings from the TMP are reviewed and indicate that TMP may produce greater amounts of BOD/ton of pulp than conventional mechanical pulping. Studies on the toxicities of TMP effluents indicated that the general degree of toxicity would be similar to that of conventional groundwood effluents unless additives such as Na2S03 are incorporated into the TMP process. Suspended solids loadings for TMP effluents should be somewhat lower due to the absence of fines. Adverse effects of metal ions could be increased during extensive recycling of whitewater since the equilibrium levels of the ions would increase. Various aspects of TMP effluent management are discussed and illustrated with three hypothetical examples. Investigations into the treatment of mechanical pulping effluents are reviewed for chemical treatment, biological filtration, and activated carbon adsorption. (Schulz-FIRL)
W78-01659

PAPER AND ALLIED PRODUCT, (LITERATURE REVIEW),
National Council of the Paper Industry for Air and Stream Improvement Inc., New York.
G. W. Gove, and I. Gellman.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1127-1152, June, 1977. 194 ref.

Descriptors: *Reviews, *Bibliographies, Environmental effects, *Recycling, *Toxicity, *Bioassay, *Pulp and paper industry, Pulp wastes, Effluents, Chemical wastes, Bleaching wastes, Water reuse, Coagulation, Clarification, Activated sludge, Biological treatment, Adsorption, Membrane processes, Oxidation, Sludge treatment, Sludge disposal, Pilot plants, Industrial wastes, *Waste water treatment.

Literature pertaining to the characteristics, treatment, and disposal of wastes resulting from the manufacture of paper and allied products is reviewed. Various aspects of national policies, economics, and effluent sources and treatment are discussed. Studies of the effects of pulp and paper mill effluent on receiving waters are discussed with respect to water quality, indicator organisms, biodegradability, analytical techniques, and biological studies. Various aspects of the effects of pulp and paper mill effluents on aquatic organisms are reviewed, including toxicity and bioassays, analytical techniques, fish toxicity studies, crustacean toxicity studies, and toxic effluent constituents. Effluent characteristics are discussed with respect to bleaching wastes, whitewaters, phenols, color and lignins, fiber, and various other waste water constituents. Topics discussed in relation to pulping liquor disposal and recovery include chemical recovery for sulfite liquors, the closed cycle bleached kraft mill, by-product processing, fermentation, and treatment processes. Various methods of physiocochemical treatment are reviewed, including waste water renovation, reuse, and solids recovery; chemical coagulation and clarification; color reduction; adsorption and membrane processes; oxidation; and sludge handling and disposal. Aspects of secondary treatment which are discussed include mill facilities, activated sludge, aerated stabilization, joint municipal-industrial treatment, and pilot plant and laboratory studies. (Schulz-FIRL)
W78-01660

SOME INITIAL AQUACULTURE EXPERIMENTS IN RECIRCULATING WATER SYSTEMS,
Bayerische Landesanstalt fuer Wasserforschung, Wielen (West Germany). Aussenstelle.
For primary bibliographic entry see Field 5G.
W78-01669

DISPOSAL OF LIQUID EFFLUENT FROM SEWAGE TREATMENT PLANTS,
Hanna Enterprises, Inc., Kailua, HI. (Assignee).
B. N. Hanna.
U.S. Patent No. 4,013,087, 8 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1223, March 22, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Sewage effluents, Waste water disposal, Waste disposal wells.

One of the methods of disposing of the effluent of sewage treatment plants is to use sewage disposal wells. This method is applicable particularly in environments where the earth is porous and capable of carrying off large quantities of liquids. In recent years, this method of effluent disposal has been widely used in the State of Hawaii. In accordance with the invention a feed system is provided for these disposal wells comprising a first or normal input, where the effluent is injected into the well by simple gravity feed. A second input is also provided, which is a pressurized feed, adapted to force the effluent into the well when the normal gravity injection is inadequate. The inadequacy of normal gravity injection may result either from the treatment plant, or from a malfunctioning of the normal feed as may result from the presence of solids in the effluent. In addition, the invention provides for the pressurized reverse purging of the wells, when necessary, to remove accumulated solids that may be blocking or slowing the feed of effluent into the well and its dispersion into the surrounding earth. (Sinha-OEIS)
W78-01684

PROCESS FOR REDUCING BOD IN FOOD PROCESSING PLANT WASTES,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
W. R. Davis.
U.S. Patent No. 4,013,555, 3 p, 8 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1379, March 22, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Biochemical oxygen demand, Water pollution treatment, Flocculation, Hydrogen ion concentration, Separation techniques, Food processing industry.

The invention provides a series of treating steps which not only removes existing suspended matter, but also removes large quantities of the dissolved BOD from food processing operations by converting the soluble proteinaceous material combined in these wastes into an insoluble form which is capable of being acted upon by conventional water-treating coagulating and flocculating agents. The process for reducing BOD in aqueous food processing plant wastes comprises the following series of sequential steps: adjusting the pH of the waste to 3 or less to form finely divided suspended particles; readjusting the pH of the waste with sodium aluminate to a value within the range of 6-7.5; flocculating the particles with an anionic acrylamide polymer; and then removing and collecting the flocculated particles from the food processing plant wastes. (Sinha-OEIS)
W78-01688

SYSTEM FOR PURIFYING LIQUIDS,
H. C. Rosenberg.
U.S. Patent No. 4,013,558, 9 p, 7 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1380, March 22, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, *Water pollution control, Waste water treatment, Industrial wastes, Microwaves, Radiation, Flow control, Flow rates, Separation techniques.

The treatment of liquids or semi-liquids such as water, wastewater, oils, foods, pharmaceuticals, and any other material with a liquid component which can be made to flow through a conduit, is accomplished by improved methods for handling the material during the treatment cycle; and controlling the flow improves the efficiency ratio of energy input versus level of treatment. The system includes a purifier which treates the material by exposing it to microwave radiation while maintaining the material in a complex flow pattern such that the radiated energy is caused to impinge on all of the material during the treatment. This is accomplished by a device designated, an Inspirator, which creates a rotational fluid flow during the exposure cycle. The level of treatment is constantly sensed and rate of flow increased or decreased accordingly to maintain prescribed treatment for the type of material under treatment. This invention also provides an improved separation method to capture the contaminents in an easily removable container. The device is particularly appropriate for transport since it is relatively small and light, can be used to process small amounts of liquids on an intermittent cycle; can be secured for long periods without effecting its processing capability; or can be used in a continuous round-the-clock mode. (Sinha-OEIS)
W78-01690

SEPARATORS,
For primary bibliographic entry see Field 5G.
W78-01692

REMOVING OF BARK FINES FROM AQUEOUS SUSPENSIONS,
Johns-Manville Corp., Denver, CO. (Assignee).
G. R. Bell, and R. S. Lamar.
U.S. Patent No 4,014,788, 4 p, 7 ref; Official Gazette of the United States Patent Office, Vol 956, NO 5, p 1795, March 29, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Industrial wastes, *Wood wastes, Bark, Filtration, Separation techniques, Pulp and paper industry.
Identifiers: Talc.

In the manufacture of wood pulp for use in making paper and other wood fiber products, it is first necessary to remove the bark from the logs. While this can be done using a dry process, a wet process offers many advantages. However, one big disadvantage of the wet process has been the inability to economically remove the bark fines from the water used in the wet process. This invention provides an economical manner of solving this problem by using a rotary vacuum precoat filter equipped with a rotating knife to remove the bark fines from at least a portion of the recirculating water in a wet debarking process and to avoid long range problems with such a process by adding a small amount of finely divided talc to the bark fines suspension prior to filtration. Not only does the talc addition control the pitch and resin contained in the bark fines so that it is no longer sticky without apparent adverse effect on filtration rates, but the talc also appears to agglomerate the finest bark particles so that less cake penetration results. (Sinha-OEIS)
W78-01696

WASTEWATER TREATMENT,
Systems Engineering and Mfg., Corp., Stoughton, MA. (Assignee).
J. Shorr.
U.S. Patent No 4,014,787, 11 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1795, March 29, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Industrial wastes, *Heavy metals, Bonding, Particle size, Filtration, Separation techniques, Water reuse.
Identifiers: Metal plating industry.

Small particle size material such as heavy metal ions and/or other contaminant materials are removed from wastewater by combining the small particle size materials with a combining agent to form a soluble and/or insoluble bound material having a particle size sufficiently large to permit filtration of the wastewater with removal of the bound materials. The wastewater is wastewater from a commercial metal finishing operation such as metal plating and the combining agent is a metal in its oxide and/or hydroxide form and preferably oxides or hydroxides of iron and/or aluminum. The filtering step is carried out through an untrafiltration anisotropic or skinned membrane which permits high filtering rates with small membrane area and relatively low pressure. The method can be carried out in a batch operation or in a continuous operation which continuously produces filtered usable water and permits drawing off of the concentrate resulting from the filtration to an area where it can be treated for discharge to the environment or permits recovery of the metal ions. (Sinha-OEIS)
W78-01698

SEPARATION OF LIQUID PHASES,
Union Carbide Corp., New York. (Assignee).
W. R. Marshall, R. A. Gregory, Jr., and R. H. Handwerk.
U.S. Patent No 4,014,789, 7 p, 7 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1795-1796, March 29, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, Polymers, Immiscibility, Viscosity, *Separation techniques.
Identifiers: Phase separation.

The invention relates to the separation of immiscible liquid phases. Such separations arises in the production of synthetic organic polymers. Undesirable ingredients are washed out with an appropriate solvent or water. In accordance with the process phase separation of relatively high and low viscosity immiscible liquids is effected by providing and maintaining, between inner means in relative rotational movement within an outer sleeve or housing means, at least one zone of increased pressure constriction and of decreased pressure constriction; feeding a multi-phase mixture of relatively high viscosity and relatively low viscosity liquids to the interior of the sleeve between the zones of increased and decreased pressure constriction; and withdrawing the high viscosity liquid and the low viscosity liquid from the vicinities of the zones of increased and decreased pressure constriction, respectively. (Sinha-OEIS)
W78-01699

5E. Ultimate Disposal Of Wastes

TIME SERIES ANALYSIS ON AMMONIA CONCENTRATION AND LOAD VALUES OF THE RIVER RHINE,
Nijmegen Univ. (Netherlands). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-01219

CHARACTERISTICS OF THE RUN-OFF RATE OF POLLUTION LOAD IN AN UNSEWERAGED AREA,
Kansai Univ., Osaka (Japan). Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W78-01222

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE DELAWARE COUNTY, OHIO BOARD OF COMMISSIONERS, OLENTANGY ENVIRONMENTAL CONTROL CENTER AND INTERCEPTOR SYSTEM.
Environmental Protection Agency, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-01230

SEWAGE SLUDGE,
A. Michaels.
Public Works, Vol. 108, No. 10, p 60, October, 1977.

Descriptors: *Incineration, *Sludge treatment, *Sludge disposal, *Heat treatment, *Dewatering, Equipment, Energy, Gases, Sewage treatment, Sewage disposal, Waste water treatment.
Identifiers: Multiple-hearth incinerators, Scrubbers, Scrubbing fluids.

A combination sewage treatment and disposal system has been produced by the J. L. Winther Company, Incorporated, of Orinda, California. In the system, waste heat generated during multiple-hearth incineration is used to dewater the sludge. A schematic flow diagram is presented for the Winther Incinerator-Sludge Disposal System. The system includes a primary combustion zone, primary scrubbing fluid in the form of sewage sludge, a secondary combustion zone, and secondary scrubbing fluid in the form of primary clarifier overflow. Space is provided above the secondary combustion zone for an optional waste heat boiler. Advantages of the system are the elimination of the need for sludge treatment operations or supernatant recycling, and the use of surplus steam for other phases of the sewage treatment process. (Schulz-FIRL)
W78-01236

A NEW METHOD OF DISPOSAL OF BY-PRODUCT ACID SLUDGE FROM A LUBE REFINING PLANT,
Hindustan Petroleum Corp. Ltd., Bombay (India).
A. K. Mukhopadhyay, and V. Y. Desai.
Chemical Age of India, Vol. 28, No. 3, p 215-217, March, 1977. 4 tab, 5 ref.

Descriptors: *Chemical wastes, *Acids, *Oil industry, *Asphalt, *Construction materials, Bituminous materials, Sulfur compounds, Industrial wastes, Sludge disposal, Ultimate disposal, Waste water treatment.
Identifiers: Acid sludge, Sulfuric acid.

Conventional disposal methods for acid sludges from petroleum refineries which reclaim crankcase lubricating oils include incineration, acid recovery, landfilling, and neutralization with spent lime or caustic. Experiments were conducted to examine the feasibility of incorporating acid sludge into other refinery products such as industrial roofing asphalt. Results of elemental analyses of the acid sludge used in the study and a comparison of acid sludge and industrial asphalt properties are presented. Several varieties and concentrations of industrial asphalt and acid sludge were blended, and the properties of these modified mixtures were compared to those of industrial asphalt. A mixture of 1% acid sludge and 99% asphalt produced the most acceptable asphalt. Experiments with acid sludge concentrations greater than 1% indicated that althouth rheological properties of the asphalt were not affected by the additional sludge, increased concentrations of sulfuric acid and water-soluble sulfonates in the asphalt might pose environmental hazards. (Schulz-FIRL)
W78-01242

TEXAS WATERWAY PROVES CLEANUP TIDE IS TURNING,
For primary bibliographic entry see Field 5G.
W78-01245

TREATING WINERY WASTE USING AEROBIC LAGOONS,
Smith (S.) and Son Pty. Ltd., Angaston (Australia).
For primary bibliographic entry see Field 5D.
W78-01256

ISRAELI COWS ENJOY DISTILLERY WASTE.
Water and Waste Treatment, Vol. 20, No. 3, p 23, March, 1977.

Descriptors: *Nutrient removal, Food processing industry, *Organic wastes, *Cattle, *Feeds, Farm management, Distillation, Alcohols, Industrial wastes, Food chains, Effluents, *Waste water disposal.
Identifiers: *Distillery waste, *Israel.

Waste water generated by alcohol distilleries is usually rich in organic matter and can place heavy burdens on municipal sewage systems and oxidation ponds. Distilleries in Assis, Israel, use sugar beet molasses, juice extracted from citrus peels, imported cane sugar molasses, and yeast in the production of alcohol. Organic solids, ranging from 3-4% during citrus peel production and 10% during molasses use, were investigated as a possible source of nutrients for cattle. Treatment to yield a dehydrated powder which could be used as a supplemental feed was considered uneconomical. In light of the success achieved with the use of whey from cheese production for watering cattle, a program was initiated by the Israeli Agricultural Research Administration to investigate the use of

distillery effluent for similar purposes. The effluent was readily accepted, with daily consumption ranging from 10 to 25 liters per head. Available nutrients in the effluent allowed a reduction of 25% in the solid rations allotted to each cow. Weight gains for cattle fed 3 kg of grain and 3 kg of fodder averaged about 1.035 grams per day. Examinations and laboratory tests revealed no adverse effects in distillery effluent-consuming cattle. (Schulz-FIRL)
W78-01258

WASTE CITRUS ACTIVATED SLUDGE AS A POULTRY FEED INGREDIENT,
R. H. Jones, J. T. White, and B. L. Damron.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 672, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-660/2-75-001, February 1975. 64 p, 5 fig, 24 tab, 14 ref.

Descriptors: *Feed, Citrus fruits, Poultry, *Farm management, *Sludge disposal, Centrifugation, Productivity, Organic wastes, Recycling, Industrial wastes, *Waste water treatment, Sludge treatment, Separation techniques.
Identifiers: *Citrus wastes, *Poultry feeds.

The use of waste activated sludge from a system treating concentrated citrus processing waste free from sanitary waste as a chicken feed supplement was investigated in pilot-scale studies in Winter Garden, Florida. The program included testing of two types of centrifuges, a solid bowl basket type and a disc type, for sludge handling. In the study, gravity-thickened centrifuged sludge was further dewatered with rotary kiln drying and sand bed drying before addition to poultry feed. Sludge at concentrations of 2.5%, 5.9%, 10.0%, and 20.0% was added to poultry feed during two short-term chick trials, an 8-wk broiler study, and a 6-month feeding period with laying hens. The study concluded that 5-10% sludge could be included in the diet of starting broiler chicks without adverse effects. Diets for broilers which contained 5-10% sludge also produced the best results with no reduction in palatability. In an evaluation of eggs produced by hens fed a diet consisting of 20% sludge, yolk color was considerably darker than that of the control, but yolk and albumen flavor were not significantly affected. (Schulz-FIRL)
W78-01269

EXXON CORP. V. TRAIN (EPA DENIED AUTHORITY TO REGULATE SUBSURFACE DISPOSAL OF WASTES).
For primary bibliographic entry see Field 6E.
W78-01396

CENTRAL KITSAP COUNTY WASTEWATER FACILITIES, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 5D.
W78-01407

ADVANCED TECHNIQUES FOR INCINERATION OF MUNICIPAL SOLID WASTES,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
J. DeMarco.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 355, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-SW-38d. of, 1972. 15 p, 3 fig.

Descriptors: *Incineration, *Oxidation, *Waste disposal, *Design data, *Operation and maintenance, Municipal wastes, Treatment facilities, Environmental effects, On-site data collections, Solid wastes.
Identifiers: *Solid waste incineration.

A three-phase pyrolysis project in New York State is described. Sponsored by Erie County (New York, Torrax Corporation, Carborundum Company, A. E. Anderson Construction Corporation, America Gas Association, and other state and federal agencies, the project was designed to demonstrate the use of a 75-tpd pyrolysis system to convert municipal waste into an inert residue. Major subsystem components were designed, installed, and operated as a part of the first phase. System testing and installation of the remaining equipment for exhaust control comprised the second phase. Economic and technical data will be gathered during 24-hr operation of the system during the third phase. Major subsystems in the system include a super blast heater, a gasifier, a secondary combustion chamber, a gas cooler, and an air pollution control device. (Schulz-FIRL)
W78-01410

SEWAGE WORKS FOR TEL AVIV.
For primary bibliographic entry see Field 5D.
W78-01432

ADVANCED WASTEWATER TREATMENT INCLUDES REVERSE OSMOSIS.
Public Works, Vol. 108, No. 9, p 166, September, 1977.

Descriptors: *Reverse osmosis, *Tertiary treatment, *Groundwater recharge, *Saline water intrusion, *Injection, Waste disposal wells, Water resources development, Return flow, Activated carbon, Filtration, Sewage treatment, *Waste water treatment.
Identifiers: Orange County(CA).

A water reclamation and groundwater injection project of the Orange County Water District in California is described. Water Factory 21, an advanced waste water treatment plant, provides injection water to prevent intrusion of sea water into the area's groundwater supply. The facility includes chemical clarification, ammonia stripping, recarbonation, multi-media filtration, carbon adsorption, chlorination, an01W78-01443
W78-01440

LAB TO TEST BULRUSHES AS FILTERS FOR SEWAGE.
Water and Wastes Engineering, Vol. 14, No. 9, p 16, September, 1977.

Descriptors: *Return flow, *Tertiary treatment, *Nitrogen, *Phosphorus, *Bulrushes, Aquatic plants, Marsh plants, Marsh management, Irrigation practices, Nutrient removal, Filtration, Absorption, Fertilizers, Waste water treatment.
Identifiers: Port Charlotte(FL).

Environmental Quality Laboratory, Inc., a subsidiary of General Development Corporation, is investigating the use of bulrushes to create a low-cost, natural means of tertiary sewage treatment. In experiments at Port Charlotte, Florida, 6 inche bulrush plants were planted in plastic-lined troughs which were filled with water to create a half-acre artificial marsh. A 12-month testing program is being used to evaluate phosphorus and nitrogen removal from primary and secondary treated effluents by bulrushes in the waste water flooded artificial marsh. Since advanced waste water treatment is required for the future, the marshland filtration system may provide tertiary treatment at lower construction and maintenance costs than conventional systems would. (Schulz-FIRL)
W78-01444

SEWAGE SLUDGE ANSWERS ARE STILL NEEDED.
For primary bibliographic entry see Field 5C.
W78-01449

PUTTING POWDERED CARBON IN WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W78-01451

COMPOSTING INDUSTRIAL AND MUNICIPAL WASTES PAPER MILL AND CITY TREATMENT PLANT,
Montachusett Regional Planning Commission, Fitchburg, Ma. 208 Water Quality Planning Program.
D. R. Weir, Jr.
Compost Science, Vol. 18, No. 4, p 27, July-August, 1977. 1 tab, 1 ref.

Descriptors: *Sludge disposal, *Sludge treatment, *Fertilizers, *Incineration, *Costs, Energy, Pulp wastes, Municipal wastes, Treatment facilities, Landfills, Industrial wastes, Waste water treatment, Activated sludge, Activated carbon.
Identifiers: Fitchburg(MA), *Composting.

Environmental Research and Technology and the Montachusett Regional Planning Commission were called upon to develop a proposal for the production of compost from a combination of paper mill and municipal waste water treatment sludges. The project was initiated as an energy and cost conservation measure and for compliance with objectives set out in the 1972 amendments to the Federal Water Pollution Control Act. Existing advanced waste water treatment plants in Fitchburg, Massachusetts, included an activated carbon absorption plant for the paper industry and a two-stage activated sludge and chemical precipitation plant for municipal wastes. Analyses of the sludges indicated that except for high cadmium levels, the 3 ton/day of sludge produced by the activated sludge plant and the 10 ton/day produced by the activated carbon plant would be safe for use as a fertilizer and humus soil conditioner. Previous annual expenses for sludge disposal included $50,000 in fuel costs for incineration of the municipal sludge and $25,000 for landfilling of the paper mill sludge. The proposed composting operation is expected to cost $20,000/yr or about $20/ton with a land requirement of about 3 acres for the full-scale operation. The project is also expected to eliminate possible nonpoint water pollution from land filling and air pollution from incineration. (Schulz-FIRL)
W78-01456

COMPOST LATRINES IN TANZANIA: A PRELIMINARY REPORT,
Tanzania National Scientific Research Council, Dar es Salaam.
R. Gurak, W. Kilama, and U. Winblad.
Compost Science, Vol. 18, No. 4, p 20-23, July-August, 1977. 3 fig, 17 ref.

Descriptors: *Public health, *Domestic wastes, *Environmental sanitation, *Diseases, *Foreign countries, Cesspools, Sewage treatment, Sewage disposal, Waste water treatment.
Identifiers: *Compost latrines, *Tanzania.

Diseases and parasites with the disposal of human wastes in Tanzania include enteric fevers such a typhoid and paratyphoid, bacillary dysentery, poliomyelitis, cholera, intestinal parasites, hookworm, ascaris lumbricoides, intestinal schistosomiasis, urinary schistosomiasis, and amoebiasis. A program for research and development of latrines for villages and low-income residential areas was initiated in 1975 to outline performance criteria for domestic waste disposal systems, to examine shortcomings of existing waste disposal systems, and to evaluate and recommend various methods of domestic waste treatment. General performance criteria were based on ecological, health, nuisance, operational, and cost considerations. Categories of compost latrine systems which were examined include discontinuous, alternating, continuous, and compact with heating systems. Results of a pilot pro-

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gram with the construction of latrines in three villages in eastern Tanzania and in one squatter area on the outskirts of Dar es Salaam are presented. Problems associated with use of the latrines were related to the addition of excess liquid to the essentially dry systems. (Schulz-FIRL)
W78-01457

WHY NOT INCINERATE YOUR SCREENINGS,
A. P. Aldridge, and D. C. Day.
Water Services, Vol 81, No 978, p 486-488, August, 1977. 1 tab.

Descriptors: *Incineration, *Screens, *Sewage treatment, *Heat treatment, *Dewatering, *Sludge disposal, Equipment, Automation, Municipal wastes, Waste water treatment.
Identifiers: Screenings incineration, Screenings disposal.

Screenings at a sewage treatment plant are normally pulverized to a pumpable size or removed completely by screens before sewage enters the main treatment system. Conventional methods of screenings disposal include on-site landfills, on-site sludge incineration, private hauling, local refuse dumping, and local refuse incineration. The use of specially designed, on-site sludge incinerators is suggested as the most cost-effective, least objectionable method of screenings disposal. The Nichols Screenings Incinerator has a positive raking system to insure constant agitation of the screenings and a specially designed combustion system. The Nichols incinerator operates autothermally if the screenings are previously dewatered to a water content of approximately 65%, with supplemental fuel required only for incinerator warm-up and periods of low dewatering performance. Automatic controls for start-up and operation regulate the incinerator with monitoring of the temperature and amount of excess air in the combustion chamber. The Nichols incinerator produces a sterile, low volume ash residue which can be collected for disposal at a local dump or discharged to the sewage works for removal with the primary sludge. (Schulz-FIRL)
W78-01459

WASTEWATER REUSE BY THE TRUCKLOAD.
For primary bibliographic entry see Field 5D.
W78-01467

CONVERSION OF SLUDGES INTO 'TOPSOILS' BY EARTHWORMS,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
M. J. Mitchell, R. M. Mulligan, R. Hartenstein, and E. F. Neuhauser.
Compost Science, Vol 18, No 4, p 28-32, July/August, 1977. 2 fig, 4 tab, 9 ref.

Descriptors: *Worms, *Sludge digestion, *Soil chemistry, *Humic acids, *Decomposing organic matter, Organic soils, Bioassay, Annelids, Topsoil, Fertilizers, Organic wastes, Sludge treatment, Waste water treatment.
Identifiers: Eisenia foetida, Lumbricus terrestris, Onondaga County(NY).

Laboratory studies were used to evaluate the potential role of two varieties of earthworms, the redworm Eisenia foetida and the nightcrawler Lumbricus terrestris, in the conversion of odorous, chemically unstable sludges into rich organic soils. Chemical characteristics of the anaerobically and aerobically digested secondary sludges used in the study are presented. The sludges, obtained from four waste water treatment plants in Onondaga County, New York, contained appreciably larger amounts of organic matter and nitrogenous compounds than those in mineral soils. The anaerobic sludges collected at the Metropolitan and Morgan Road plants were extremely toxic to the earthworms and sowbugs, and the Ley Creek anaerobic sludge was moderately toxic. Aerobic sludges were avidly consumed and did not cause earthworm mortality. The rate at which sludge passes through the gut of redworms was examined as a function of sludge type, moisture, and temperature. Data on the bioacceleration of sludge decomposition in earthworm and terrestrial isopod excreta are presented. Changes in humic acid content of sludges as a function of worm activity were examined. Studies on the rate of total combustion of organic matter in sludges indicated that the ash content of the Meadowbrook sludge increases from 2.15% to 3.52% over a 4-wk period in the presence of nightcrawlers and redworms at concentrations of 24.1 and 14.5 g worm/100 g sludge, respectively. (Schulz-FIRL)
W78-01469

ECONOMICS OF TRANSPORTING WASTEWATER SLUDGE,
Environmental Protection Agency, Denver, CO. Region VIII.
T. J. Hillmer Jr.
Public Works, Vol 108, No 9, p 110-111, September, 1977. 2 fig, 1 tab.

Descriptors: *Sludge disposal, *Fertilizers, *Costs, *Ultimate disposal, *Estimated costs, Transportation, Operation and maintenance, Sewage disposal, Waste water disposal, Waste water treatment.

Land application of treated domestic sludge as a means of soil conditioning and waste disposal has prefaced this article on the economics of transporting waste water. Costs incurred in sewage sludge utilization systems at 15 sites in various parts of the United States are discussed. Cost factors for separate sectors of the process were used to develop a 'model' community for use in estimating costs and determining economic feasibility of land application. The model community is based on a system that treats an average flow of 10 mgd and produces 800 tons/yr of stabilized sludge as dry solids. Annual costs for land application in such a system are estimated at $27,400 or $35/ton. The total annual operating cost is divided according to labor, fringe benefits, vehicle operation and maintenance, and miscellaneous expenses. The total annual cost of land disposal of sludge is also plotted against average daily raw waste water flow from a linear regression of data obtained during the survey. (Schulz-FIRL)
W78-01470

SIGNIFICANCE OF DIURNAL VARIATIONS IN FECAL COLIFORM DIE-OFF RATES IN THE DESIGN OF OCEAN OUTFALLS,
Caldwell Connell Engineers, Melbourne (Australia).
J. T. Bellair, G. A. Parr-Smith, and I. G. Wallis.
Journal Water Pollution Control Federation, Vol 49, No 9, p 2022-2030, September, 1977. 5 fig, 3 tab, 10 ref.

Descriptors: *Coliforms, *Sewage bacteria, *Outfalls, *Disinfection, *Solar radiation, Waste dilution, Design criteria, Waste disposal, Water pollution control, Microorganisms, Bacteria, Sea water, Analytical techniques, On-site data collections, Waste water treatment.

The rate of die-off of fecal coliform bacteria was investigated as part of the design study for three deepwater ocean outfalls near Sydney, Australia. Plastic bags at the water surface and clear glass bottles suspended at various depths were used to examine the effects of initial dilution, ambient water conditions, and light attenuation on die-off rates. T-90 values for both types of sample containers were similar during hours of darkness. Largest die-off rates during hours of greatest light intensity were attributed to the effects of solar radiation. T-90 values exhibited strong diurnal variations ranging from a maximum of 40 hrs during the night to a minimum of 1.9 hrs just before noon. A strong inverse relationship between T-90 values and depth was attributed to decreasing solar radiation with depth by light attenuation. The diurnal variation in T-90 values was also reflected in fecal coliform densities on beaches adjacent to ocean outfalls. Equations representing the resultant fecal coliform density in bathing waters, the initial dilution, a diffusion factor, and a die-off for ocean outfalls are discussed. The location of outfalls in areas of high turbulence to create high initial dilutions is suggested, since fecal coliform densities may not be sufficiently reduced by other factors during the night. (Schulz-FIRL)
W78-01471

ENERGY USES AND RECOVERY IN SLUDGE DISPOSAL, PART 3,
SRI International, Menlo Park, CA.
J. L. Jones, D. C. Bomberger, Jr., and F. M. Lewis.
Water and Sewage Works, Vol. 124, No. 9, p 106-108, September, 1977. 3 fig, 2 tab, 3 ref.

Descriptors: *Incineration, *Costs, *Energy, *Sludge disposal, *Air pollution, *Sludge treatment, Electric power costs, Cost comparisons, Municipal wastes, Waste water treatment.
Identifiers: Sludge disposal costs, Air pollution control costs.

Sludge disposal and treatment options, relative energy requirements, and process cost sensitivities to recovered energy value are discussed with regard to municipal waste water treatment. Land application costs are controlled by land costs, application rates, and the quantity of sludge produced. Sludge handling costs for incinerating a 40% solids cake produced by chemical conditioning and dewatering by filter press are compared to the total operating costs for 10-, 100- and 500-mdg plants. Specific components of the direct operating cost for sludge disposal are represented as a percentage of total plant operating cost, including electric power, fuel, chemicals, and hauling and disposal. The control of air pollution resulting from sludge incineration is discussed. Relative flue gas volumes are compared for multiple hearth and fluidized bed incinerators, and are used to calculate electric power requirements for scrubber operations on the basis of feed solids, excess air, sludge solids content, and exhaust gas temperature. (Schulz-FIRL)
W78-01510

STUDY ON SLUDGE TREATMENT--2ND REPORT,
H. Kawahara, M. Tsuchida, Y. Koido, I. Endo, and M. Sago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 673-T, Price codes: A02 in paper copy, A01 in microfiche. 1973. 67 p, 17 fig, 9 tab, 3 ref. Technical Report EPA TR74-38D. (Translated from Japanese).

Descriptors: *Cements, *Concrete technology, *Construction materials, *Strength of materials, *Concrete additives, Sludge treatment, Sludge disposal, Organic matter, Drying, Mechanical properties, Strength, Organic matter, Heavy metals, Waste water treatment.
Identifiers: Sludge solidification, Sludge-cement composites.

An English translation of the Japanese Annual Report of the Tokyo Metropolitan Research Institute for Environmental Protection, March, 1973, is presented. A method of sludge treatment and disposal which involves combining sewage sludge with cement for solidification is described. Results of investigations on the relationship between sludge-cement strength and the amount of organic substances in the sludge are presented. Various proportions of digested sludge and Portland cement were mixed and then hardened in molds. Results indicated that the effects of the amount of

organic substances were much greater at low cement:sludge ratios. Relationships between composite strength, sludge organic content, composite water content, and cement:sludge ratio are illustrated. The leaching of heavy metals from solidified sludge composites was also examined. The studies indicated that heavy metals were leached and exuded from sludge ash and cement blocks which contained sludge ash, but were not appreciably leached or exuded from conventional sewage sludge or sewage sludge-containing blocks. This was attributed to the fact that sludge ash generally contains higher concentrations of heavy metals than other sludge types. The recommended quantity of cement to produce sludge solidification was 5-7.5 kg cement/kg dried sludge. (Schulz-FIRL)
W78-01512

APPLICATION OF SEWAGE SLUDGE TO CROPLAND: APPRAISAL OF POTENTIAL HAZARDS OF THE HEAVY METALS TO PLANTS AND ANIMALS.
Council for Agricultural Science and Technology, Ames, IA.
For primary bibliographic entry see Field 5C.
W78-01513

REMOTELY SENSED AND LABORATORY SPECTRAL SIGNATURES OF AN OCEAN-DUMPED ACID WASTE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-01545

WATER SUPPLY AND TREATMENT: STATE-OF-THE-ART.
Stanley Consultants, Inc., Muscatine, IA.
For primary bibliographic entry see Field 5F.
W78-01572

DISPOSAL OF PAPER PULP MILL SLUDGE,
Consolidated-Bathurst Ltd., Montreal (Quebec). (Assignee).
K. N. Goel, and O. J. Walker.
United States Patent No. 4,030,968. June 21, 1977. 8 p.

Descriptors: *Sludge disposal, *Pulp and paper industry, *Waste treatment, *Patents, Sludge treatment, Wastes, Industrial wastes, Sludge, Solid wastes, Recycling, Nutrients, Pulp waste.

A process for disposing of surplus sludge from a system which microbiologically purifies spent pulping liquor effluent comprises injecting the surplus sludge into the digestion step of the pulping process whereby the sludge is digested and a wood pulp is formed which retains a part of the digested sludge. A second part of the sludge is discharged as a ventable gas, and a third portion is recycled to serve as a nutrient for the microbiological purification of the spent pulping liquor. (Lynch-IPC)
W78-01573

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-01627

SHORT-TERM WATER COLUMN PERTURBATIONS CAUSED BY WASTEWATER SLUDGE DUMPING IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-01628

5F. Water Treatment and Quality Alteration

CATALYTIC PROCESS FOR OZONATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Environmental Research and Application, Inc., Briarcliff Manor, NY. (Assignee).
For primary bibliographic entry see Field 5D.
W78-01189

POLYMERS FOR USE IN WATER TREATMENT,
Betz Labs., Inc., Trevose, PA. (Assignee).
I. T. Godlewski, J. J. Schuck, and B. L. Libutti.
U.S. Patent No. 4,029,577, 8 p, 6 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 751-752, June 14, 1977.

Descriptors: *Patents, *Water treatment, *Scaling, *Cooling water, Organic compounds, Corrosion, Polymers, Recirculated water, Industrial water, Chemical reactions.

The invention relates to processes for controlling the formation and deposition of scale and/or suspended solid matter which otherwise would occur in aqueous mediums containing scale imparting ions and dispersed particles. It relates to the control of the formation of, the reduction and/or the prevention of the deposition of calcium phosphate, magnesium silicate and/or iron oxide, clay and mixtures thereof in cooling water, scrubber and steam generating systems, evaporators, and economisers by the introduction of an effective amount of a water soluble polymer to the water. The polymer is composed primarily of moieties derived from acrylic acid or its water soluble salt and hydroxy lower alkyl acrylate moieties or its water soluble salt. The polymers effective for the purpose are those preferably having a mole ratio of from about 34:1 to about 1:4 of acrylic acid to hydroxylated lower alkyl acrylate moieties. The lower alkyl is an alkyl of from 2 to 6 carbon atoms. (Sinha-OEIS)
W78-01190

SYSTEM FOR SOFTENING WATER,
Goodyear Tire and Rubber Co., Akron, OH. (Assignee).
R. E. Shivers.
U.S. Patent No. 4,029,576, 5 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 2, p 751, June 14, 1977.

Descriptors: *Patents, *Water softening, *Water treatment, *Water purification, *Hardness, Zeolites, Resins, Filtration, Coals, Calcium carbonate, Separation techniques.

The system reduces the hardness of raw water to a level where it is suitable for circulation to a boiler for converting steam for generating power. The system employs a sedimentation tank in which a mixture of raw water, lime and soda ash is heated to cause the precipitation of calcium carbonate from the water as sludge. A filter has a bed of coal for removing sludge which escapes with the water removed from the sedimentation tank. A softener with a resinous bed of sodium zeolite resin further reduces the hardness of the water to a desired or tolerable level. A special filter or trap between the coal filter and zeolite softener removes particles of coal carried along by the water as it flows through the coal filter, since the particles of coal eventually destroy the capacity and effectiveness of the zeolite softener. (Sinha-OEIS)
W78-01191

ELECTROSTATIC WATER TREATMENT SYSTEM,
Progressive Equipment Corp., Erie, PA. (Assignee).
D. C. Clark, and J. K. Barnard.
U.S. Patent No. 4,012,310, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 3, p 955, March 15, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Electrodes, *Electrolysis, Electrochemistry, Equipment, Separation techniques.
Identifiers: *Electrostatics.

In an electrostatic water treatment system the high voltage d.c. supply for the charging electrode is alternately turned on and off at lower and upper voltage limits and is turned off whenever the current exceeds the desired value. The alternating voltage produced by the on-off operation of the high voltage supply is utilized to check the control circuit and provide an indication whenever the circuit is operating improperly. The electrode is at the center of an externally grounded shell. While the annular stream of water flows past the electrode, the positive charge on the electrode attracts free electrons from the water and minerals and causes electron collisions with mineral and biological material in the water. As a result, the mineral and biological material settle out and may be periodically flushed down a drain. (Sinha-OEIS)
W78-01202

PHOTO-INDUCED PURIFICATION OF WATER (I)- ULTRA-VIOLET ACCELERATION OF SEDIMENTATION OF METAL HYDROXIDE SUSPENSION IN WATER (HIKARI NI YORU MIZU NO JOKAHO (I)- HIKARI NIYORU GYOSHU CHINDEN NO SOKUSHIN),
Kyoto Univ. (Japan). Dept. of Hydrocarbon Chemistry.
For primary bibliographic entry see Field 5D.
W78-01253

THE RECLAMATION OF DRINKING WATER FROM SEWAGE,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W78-01406

EXPERIMENTAL STUDY OF SOME PROBLEMS OF THE BIOLOGICAL EFFECT OF WATER TREATED BY A CONSTANT MAGNETIC FIELD, (IN RUSSIAN),
Medical Academy, Varna (Bulgaria).
B. Stefanov, and S. Solakova.
Gig Sanit 8, p 70-72. 1975.

Descriptors: *Water treatment, *Magnetic studies, Biology, Rodents, Cholesterol, Ions, *Magnetic field, Potassium, Sodium.

The biological activity of H2O treated by a magnetic field with an induction of 0.1 tesla was more pronounced than that of H2O treated by a field of 0.6 tesla in albino rats. The animals that received H2O treated by a magnetic field for 45 days, there was a significant decrease of the absolute weight gain, content of total protein, Na+ and K+ content of blood serum and rectal temperature and a significant increase of the number of reticulocytes. A trend toward total blood cholesterol decrease was observed.--Copyright 1977 Biological Abstracts, Inc.
W78-01561

WATER SUPPLY AND TREATMENT: STATE-OF-THE-ART.
Stanley Consultants, Inc., Muscatine, IA.
Technical Association of the Pulp and Paper Industry (Atlanta, Georgia) Press Report TPR 68/3-77, 87 p. 1977. Fritchie, R. G. (Editor).

Descriptors: *Water treatment, *Water supply, *Publications, Filtration, Flotation, Water purification, Ion exchange, Cooling, Cooling water, Sludge treatment, Pumps, Solid wastes, Waste treatment.

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This manual has been compiled from contributions of numerous scientists and engineers in chemical and consulting companies. It is organized into 9 chapters (the last 2 not yet completed) dealing with raw water treatment, microscreening, filtration, dissolved-air flotation systems, the function of clarification, ion-exchange, cooling systems and cooling water treatment, and (in preparation) pumping systems and alternatives for sludge handling. (Brown-IPC)
W78-01572

BACTERIAL RELATIONSHIPS IN STORMWATERS,
Texas Univ. Health Science Center at Houston. School of Public Health.
For primary bibliographic entry see Field 5B.
W78-01640

SYSTEM FOR PURIFYING LIQUIDS,
For primary bibliographic entry see Field 5D.
W78-01690

5G. Water Quality Control

SYSTEM FOR SOFTENING WATER,
Goodyear Tire and Rubber Co., Akron, OH. (Assignee).
For primary bibliographic entry see Field 5F.
W78-01191

METHOD AND APPARATUS FOR PURIFYING WATER CONTAMINATED WITH ANODICALLY OXIDIZABLE ORGANIC MATTER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
For primary bibliographic entry see Field 5D.
W78-01195

COMPOSITION FOR SEPARATING HYDROCARBONS FROM WATER,
P. Preus.
U.S. Patent No. 4,011,175, 3 p, 8 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 572, March 8, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, Absorption, Separation techniques, Cellulose, Perlite, Clays.
Identifiers: Hydrocarbons, Fibrous material.

Means are provided for controlling and eliminating hydrocarbons and other organic materials from water by selectively absorbing and stabilizing the material for subsequent mechanical separation. A loose fibrous material which is oleophilic, hydrophobic and floatable on water for selective absorption and stabilization of hydrocarbons in a hydrocarbon-water system is provided. It is of a particle size suitable for mechanical separation. A process is provided for producing such a material by compounding an expanded perlite with asphalt and a fibrous filler and comminuting the compound to provide a mass of an average particle size such that the mass can be filtered out of a liquid system by mechanical means pervious to flow of liquid through it. In a preferred embodiment a loose mass consists of expanded perlite, clays and a fibrous filler formed by demoisturizing an aqueous suspension of the compound. (Sinha - OEIS)
W78-01205

METHOD OF REMOVAL OF PETROLEUM PRODUCTS FROM SOLID OR LIQUID SURFACES,
Societe Chimique des Charbonnages, Paris (France). (Assignee).
C. Stein, and A. Marbach.
U.S. Patent No. 4,011,159, 3 p, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 567-568, March 8, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, Water pollution treatment, Organic compounds, Resins, Polymers, *Separation techniques.
Identifiers: Petroleum hydrocarbons.

A method of removal and recovery of hydrocarbons, especialy petroleum hydrocarbons such as crude petroleum or petroleum fractions from liquid or solid surfaces is described. The petroleum product is covered with a finely-divided solid polymer selected from the group consisting of poly(-bicyclo (2.2.1)heptene-2) and poly (methyl-5 bicyclo (2.2.1)heptene-2) mainly obtained by opening the cycle of bicyclo (2.2.1)heptene-2 and its methyl derivative. After the finely-divided polymer is applied to the petroleum a strong solid rubbery film results which can be removed by mechanical means. (Sinha-OEIS)
W78-01209

OIL-WATER SEPARATION PROCESS AND APPARATUS,
Liquid Processing Systems, Inc., San Leandro, CA. (Assignee).
D. G. Cook.
U.S. Patent No. 4,011,158, 12 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 956, No 2, p 567, March 8, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water quality control, *Water pollution treatment, *Separation techniques, Coalescence, Dispersion, Equipment.
Identifiers: Bilge water.

A system removes oil from an oil-water dispersion such as in bilge water to form an effluent of high purity. At lease one container for a coalescing medium (e.g., resin particles) is positioned in the interior of an upright reservoir wall and includes a liquid permeable lower wall in a frusto-conical shape in contact with water in the reservoir. The dispersion is directed through the coalescing medium where small oil droplets coalesce into larger ones which float to the surface of the aqueous reservoir to form a floating oil layer on the water. Purified water flows out from the lower portion of the reservoir in a radially outward direction. Prior to flow through the coalescing medium, the dispersion is optionally passed into a holding tank wherein material heavier than water is settled for periodic removal of heavy contaminants. Pitch accommodating means is provided to adapt the system to shipboard use. With a floating open bottomed reservoir wall and coalescing medium container, the system can be floated on a body of water with the purified water flowing out the bottom of the reservoir. (Sinha-OEIS)
W78-01210

WHITHER POLLUTION CONTROL,
W. F. Lester.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 3, p 327-331, 1977. 1 fig, 2 tab, 3 ref.

Descriptors: *Water pollution control, *Legislation, *Water quality standards, *Effluents, River basin commissions, River regulation, Foreign countries, On-site data collections, Waste water disposal, Waste water treatment.
Identifiers: United Kingdom, Wales.

Various aspects of water pollution and water quality management in the United Kingdom are discussed. The organization of pollution control by the 10 regional water authorities in England and Wales is described. Standards imposed by the Control of Pollution Act of 1974, the main body of water pollution control legislation in England, are discussed. The Act grants new powers to the state
f01W78-01221
W78-01220

WASTEWATER LOANS READIED BY EPA.
The American City and County, Vol. 92, No. 9, p 28, September, 1977.

Descriptors: *Financing, *Government finance, *Capital, *Loans, *Cost repayment, Interest, Credit, Economics, Waste water treatment.
Identifiers: Loan guarantees.

The U.S. Environmental Protection Agency's interim regulations on loan guarantees for waste water treatment works construction are discussed. The purpose of EPA loan guarantees is to provide a source of funding for municipalities that can not sell bonds or other maturities at reasonable rates on the open market. Financing can be used to cover all or part of a project. Applicants must prove that credit at reasonable rates from other sources was unavailable by furnishing the results of public bidding, certification from a municipal bond underwriter, certification from two or more local banks, and certification from the Farmers Home Administration. Proof of ability to repay the loan must also be furnished. The application fee is $1,000 or one-eight of 1% of the loan amount, whichever is greater but not to exceed $25,000. Repayment must be made within a period set by the EPA. (Schulz-FIRL)
W78-01223

POLLUTION CONTROL AND LEGISLATION IN THE FEDERAL REPUBLIC OF GERMANY,
H. E. Leroff.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 271-276, 1977.

Descriptors: *Legislation, *Water pollution control, *Water quality standards, *Foreign countries, Sewage treatment, Taxes, Municipal wastes, Industrial wastes, Waste water treatment.
Identifiers: *Federal Republic of Germany.

Water pollution control problems in West Germany are compounded by the fact that pollution is imported by waterways that originate outside Germany's boundaries. International cooperation on water pollution control is enforced by the 1972 Treaties of Oslo and Paris, the European Water Resources Protection Commission, and the Rhine Protection Commission. The framework for water pollution control legislation in West Germany is the Water Resources Act of 1957 with its fourth amendment adopted in 1976. According to the 1957 Act, the creation of detailed regulations and the enforcement of water policy are left up to the individual states. Waste disposal is governed by the Federal Waste Disposal Law of 1972. The law's definition of waste excludes waste water discharged into the courses of waste water treatment plants, but sewage sludge treatment and disposal must conform to waste disposal regulations. Political interference and shortcomings of the legislation have allowed industries and municipalities to resist providing waste water treatment. A waste water taxation program is being considered under which the states will pay a waste water tax for discharging waste water into waterways, with the amount of tax depending on the contamination level of the waste water. Policies of the United Kingdom, the United States, and the German Federal Republic on uniform water quality standards are compared. (Schulz-FIRL)
W78-01224

POLLUTION CONTROL AND LEGISLATION--THE DUTCH APPROACH,
Public Health and Environmental Protection (Netherlands).
H. M. H. Scheltinga.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 263-270, 1977. 1 fig, 2 ref, 2 append.

Descriptors: *Water pollution control, *Legislation, *Biological treatment, *Water quality standards, *Costs, Sewage treatment, Mu-

nicipal wastes, Industrial wastes, Foreign countries, Effluents, Waste water treatment.
Identifiers: Netherlands.

Various aspects of water pollution control and legislation in the Netherlands are discussed. The Pollution of Surface Waters Act of 1970 is the central core of water quality protection in the Netherlands. Based on the principle of decentralization, the Act delegates a portion of the responsibility for water quality management to provincial authorities. A 5-yr plan (1975-1979) was implemented to insure coordination and uniformity of practice with respect to planning, permits, and enforcement. General water standards and objectives are discussed. Discharge standards include required full biological sewage treatment for systems serving more than 500 people and 'best practicable technology' treatment for industries. Taxation for waste treatment is levied on a per capita basis for municipal wastes and in terms of COD and N loading for industrial wastes. Additional taxation for dischargers of heavy metals is being considered. The results obtained in water pollution control since 1970 are illustrated in a projection of 1960-1980 total pollution loading and biological treatment plant capacity in the Netherlands, with 60% of the total biodegradable organic pollution loading (municipal and industrial) slated for full biological treatment by 1980. (Schulz-FIRL)
W78-01225

EPA INDEXES SHOW SHRINKING COST HIKES.
Engineering News-Record, Vol 199, No 12, p 129, September, 1977. 3 tab.

Descriptors: *Costs, *Cost comparisons, *Construction costs, *Annual equivalent costs, *Cost trends, Municipal wastes, Sewers, Waste water treatment.
Identifiers: Cost indexes.

The U. S. Environmental Protection Agency's city indexes for waste water treatment costs are described. Cost indexes are presented for 25 cities in each of three categories based on hypothetical treatment facilities. The hypothetical facilities include a 5-mgd municipal waste water treatment plant, a 50-mgd municipal waste water treatment plant, and a complete urban sewer system. The cost index for the second quarter of 1977, based on the third quarter of 1973, and the percentage of change from the second quarter of 1976 are given for each of the cities. The cost index is also broken down according to percentages for labor, civil materials, other equipment, construction overhead, and buildings. Cost figures indicated that although sewage treatment costs rose from 0.7% to 8.3% above first quarter levels, the rise in construction costs was lower for the second quarter. Average cost increases from the first quarter to the second quarter were 1.9% for the 5-mgd plant, 2.0% for the 50-mgd plant, and 1.9% for the complete urban sewer system. (Schulz-FIRL)
W78-01226

PHYSICAL CHARACTERIZATION AND MICROBIOLOGICAL SETTLING-RATE MODIFICATION OF AQUEOUS SUSPENSIONS FROM HOT-WATER-PROCESS OIL-SANDS EXTRACTION,
Victoria Univ. (British Columbia). Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-01233

EFFECT OF CHEMICAL AGENTS ON SETTLING RATES OF SLUDGES FROM EFFLUENT OF HOT-WATER EXTRACTION OF ATHABASCA OIL SANDS,
Victoria Univ. (British Columbia). Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-01234

INCONSISTENT WASTE OILS EFFICIENTLY RECLAIMED WITH CENTRIFUGES.
Chemical Processing, Vol. 40, No. 4, p 64, April, 1977.

Descriptors: *Centrifugation, *Separation techniques, *Oily water, *Oil wastes, Equipment, Industrial wastes, *Waste water treatment.
Identifiers: Oil purifiers.

The Wallover Oil Company of Strongsville and East Liverpool, Ohio, uses four centrifuges to compound waste oil. The centrifuges, which are produced by the De Laval Separator Company in Poughkeepsie, New York, are used to remove water, dirt, pipe scale, metallic particles, and rust from oil-water emulsions. A 500-1300 gph self-cleaning oil purifier and two 5-15 gpm basket-type centrifuges are used at the Strongsville plant, and a 500-700 gph self-cleaning oil purifier is used at the East Liverpool facility. The basket-type unit is generally used to remove solid contaminants and waste oil is fed to the unit through a contoured feed pipe extending through the cover. Solids which are collected on the perforated basket wall by means of centrifugal force are pushed out by a plow. With the oil purifiers, feed passes from the top of a spinning bowl down through a central tubular shaft. Solids accumulate in a holding space at the bowl's periphery. The remaining liquid passes through a stack of perforated, conical discs with the heavier water-containing liquid travelling on the underside of the discs and the lighter oil-containing liquid moving on the upper surface of the discs. Purified oil is removed from the center of the bowl while accumulated impurities are discharged through holes in the bottom of the bowl. (Schulz-FIRL)
W78-01239

NEW WASTE-WATER-TREATMENT UNIT INSTALLED.
For primary bibliographic entry see Field 5D.
W78-01241

TEXAS WATERWAY PROVES CLEANUP TIDE IS TURNING,
W. Pryblek.
Chemical Engineering, Vol 84, No 17, p 98, 100, 102, August, 1977.

Descriptors: *Estuaries, *Water pollution control, *Industrial wastes, *Municipal wastes, *Texas, Oil wastes, Treatment facilities, Pollution abatement, Waste water treatment, Waste water disposal.
Identifiers: *Galveston Bay(Tex).

The success of water pollution abatement programs being conducted by chemical process industries which discharge into Galveston Bay in Texas is described. The site of a large number of petrochemical plants, Galvestin Bay also supports the area's shell-fishing industry and is used for recreational purposes. Low dissolved oxygen levels in the bay produced by high biochemical oxygen demand loading by the area's industries and municipalities led to massive fish kills in the upper part of Galveston Bay. High bacterial levels caused restrictions on shellfish harvesting. Water quality data for 1977 which illustrate the success of abatement programs by industry are presented by the Texas Water Quality Board. Results of an informal chemical engineering survey on the improvements in water quality are presented. Treatment systems are described for various industries on Galveston Bay, including Rohm and Haas Company, Shell Oil Company, Exxon Corporation, Diamond Shamrock Corporation, Southland Paper Mills, and Armco Steel Corporation. Regional waste water treatment facilities which are operated by the Gulf Coast Waste Disposal Authority to handle a number of companies' waste problems on a contract basis are described. A $550-million expansion program to provide adequate sewage treatment for the city of Houston is presented. (Schulz-FIRL)
W78-01245

CANADIAN STEEL MILL MEETS EFFLUENT GUIDELINES.
For primary bibliographic entry see Field 5D.
W78-01252

WASTE TREATMENT IN THE DANISH DAIRY INDUSTRY,
Statens Forsoegsmejeri, Hillerod (Denmark).
For primary bibliographic entry see Field 5D.
W78-01255

THE NET AMOUNT OF WATER REQUIRED FOR MINING OPERATIONS. (SCHULZ-FIRL)
e phosphatic clay slurries with 3-5% solids includes storage to settle out the clays to 12-15% solids and sprinkling of tailings sand over the settled clay to produce a thick sand-clay mixture. After the excess water is drained off, overburden is spread over the surface and appropriate vegetation is planted. The use of recycled water and the return of water to the aquifer via connector wells reduc
For primary bibliographic entry see Field 5D.
lones to produce a product which contains 70% sol

RECOVERY OF ORGANIC POLLUTANTS VIA SOLVENT EXTRACTION,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-01263

UTILIZATION OF PULP AND PAPER INDUSTRY WASTES (UTILIZATSIYA OTKHODOV TSELLYULOZNO-BUMAZHNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelskii Inst. Bumagi, Moscow USSR.
For primary bibliographic entry see Field 5D.
W78-01271

NEED TO CONTROL DISCHARGES FROM SEWERS CARRYING BOTH SEWAGE AND STORM RUNOFF (RPT. TO THE CONGRESS).
Comptroller General of the United States, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 294, Price codes: A04 in paper copy, A01 in microfiche. Technical Report B-166506, 1973. 54 p, 11 append.

Descriptors: *Combined sewers, *Water pollution control, Runoff, *Storm runoff, *Legislation, *Sewerage, Sewage treatment, Sewers, Water pollution sources, Waste water treatment.

A Congressional report by the Comptroller General of the United States is presented. Federal, state, and local efforts to abate and control discharges from combined sewers were examined. Possible adverse effects of combined sewer discharges are illustrated with five case histories. In general, federal and state efforts were considered inadequate in controlling pollution related to combined sewers. Legislative changes relating to combined sewers are presented. Federal construction programs and benefits available from phased construction of projects to control combined sewer discharges are described. Recommendations to the Environmental Protection Agency and comments by federal, state, and local governments are presented. (Schulz-FIRL)
W78-01281

REPORT ON EVALUATION OF WASTE SOURCES IN THE MEMPHIS, TENNESSEE AREA.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5B.
W78-01282

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REPORT ON WATER QUALITY AND WASTE-SOURCE INVESTIGATIONS-MISSOURI RIVER AND PAPILLION CREEK, OMAHA, NEBRASKA.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5B.
W78-01283

WATER RESOURCE POLICY STUDY.
Water Resources Council, Washington, DC.
Federal Register, Vol. 42, No. 142, p. 37940-59, July 25, 1977.

Descriptors: Federal Water Pollution Control Act, *U.S. Water Resources Council, *Water quality, *Reservation Doctrine, *Water Resources Research Act, Construction, Coordination, Cost sharing, Research and development, Desalination, Environmental sanitation, Federal budget, Fertilizers, Industrial wastes, Municipal wastes, Municipal water, Sewage effluents, Sewage treatment, Waste treatment, Waste water treatment, Water conservation, Water pollution control, Water quality standards, Water reuse.
Identifiers: *Congressional hearings, *Federal Water Pollution Control Act Amendments of 1972, Environmental policy, Non-point sources(Pollution).

The Water Resources Council has published supplemental information on water quality, water resources research, and Federal reserved water rights. The water quality section discusses the approach taken to insure consideration of water quality in all planning, development, use, and management of water resources. It also contains an Environmental Protection Agency (EPA) statement concerning its experience with and proposals for implementation of the Federal Water Pollution Control Act of 1972. The EPA focus will be on controlling toxic pollutants and encouraging conservation, reuse and recycling of water and the elements currently being discharged in waste water. The strategy for meeting these objectives in both municipal and industrial areas are explained. The programs for control of non-point source pollution and regualtion of discharge of dredged and fill materials are also covered. The Water Resources Research section presents options for alleviating problems caused by fragmented research. The final section presents options for establishing procedures to quantify the amount of 'surplus' water subject to state appropriation under the Federal Reserved Water Rights doctrine in order to prevent using costly and time-consuming litigation to determine the respective rights of competing sovereigns under the doctrine. (Spector-Florida)
W78-01349

IS CONGRESS PROTECTING OUR WATER. THE CONTROVERSY OVER SECTION 404, FEDERAL WATER POLLUTION CONTROL AMENDMENTS OF 1972,
Environmental Protection Agency, Washington, DC. Office of General Counsel.
L. E. Caplin.
University of Miami Law Review, Vol 31, No 3, p. 445-95, Spring 1977.

Descriptors: *Navigable waters, *Permits, Federal Water Pollution Control Act, *Water pollution control, *Legislation, Pollutants, Rivers and Harbors Act, Aquatic habitats, Environmental effects, Water quality control, Regulation, Federal government, Jurisdiction, Water pollution sources, Water pollution effects, Discharge(Water), Dredging, Wetlands, High water mark, Protection.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *National Environmental Policy Act, Fill permits, Non-point sources(Pollution), Private interest groups, Navigability, Navigability tests, National Pollution Discharge Elimination System.

In 1976 both Houses of Congress passed amendments to the Federal Water Pollution Control Act but they were unable to write a compromise amendment. The author discusses the environmental and political factors which led to the deadlock, presents the merits of the various proposals, and suggests a course of action for Congress to follow in its re-evaluation of the proposed amendments. The amendments deal with Section 404 of the Act which establishes a permit system for controlling discharge of dredged or fill material into navigable waters. The author feels the Baker-Randolph bill is the most environmentally responsible proposal. This bill recognized the need for broad jurisdiction, provides authority for delegation by the Environmental Protection Agency to the states of all waters lying within their respective jurisdictions, grants a limited exemption from permit requirements of various widespread buut relatively harmless activities, and provides for the general permitting of minor activities. However, the author suggests that the only changes needed are a clarification of what is a discharge of dredged or fill material, a provision for general permits of monor discharges, and a provision that certain discharges be authorized by regulation. (Hammersley-Florida)
W78-01350

PROCEEDINGS OF THE FIRST FEDERAL CONFERENCE ON THE GREAT LAKES, HELD AT ANN ARBOR, MICHIGAN, DECEMBER 13-15, 1972.
National Environmental Research Center, Grosse Ile, MI. Grosse Ile Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 138, Price codes: A15 in paper copy, A01 in microfiche. 1972. 342 p.

Descriptors: *Great Lake region, *Administrative agencies, *Federal government, *International commissions, *International Joint Commission, Commercial fishing, Environment, Fisheries, Hydrology, Lampreys, Mapping, Mineral industry, Recreation, Satellites(Artificial), Sport fishing, St. Lawrence Seaway, Surveying instrument, Surveys, Transportation, Water pollution, Water levels, Waves(Water), Weather forecasting, Conferences.
Identifiers: *Administrative regulations, International agreements.

The Environmental Protection Agency hosted a conference of federal program managers to review the relevant research programs and plans for Great Lakes activities. The conference was concerned with the exposition and discussion of federal programs in marine science and engineering affecting the Great Lakes with the goal of coordinating federal activities in the Great Lakes region. Five discussion groups were established covering the areas of non-living resources and water supply; power and energy; living resources; navigation and transportation; and recreational needs. Each group developed a set of objectives and made recommendations based on these objectives. The conclusions of the conference were: (1) information exchange and program coordination between agencies is needed; (2) the conference satisfied the information exchange need; (3) a common understanding of the specific programs of each agency was developed; (4) informal coordination already exists but should be increased; (5) the conference should be expanded to include university, state and Canadian efforts on the Great Lakes. The committee reports and the papers presented by the fifteen federal agencies involved are included in the conference proceedings. (Capehart-Florida)
W78-01351

SPILL CLEANUP--WHAT ARE THE CAPABILITIES.
Journal Water Pollution Control Federation, Vol 49, No 5, p. 733-36, May 1977.

Descriptors: *Oil spills, Disasters, *Water pollution control, *Regulation, Water pollution, Water pollution sources, Coast Guard Regulations, Toxicity, Accidents, Abatement, Administrative agencies, Industries, Technology, Oceans, Water law, Oil industry, Solubility, Legal aspects, Environmental effects, Biology, Environmental engineering.
Identifiers: *Oil spill cleanup, *Water Pollution Control Act Amendments of 1972, *Hazardous substances(Pollution), Liability, Marine environment, Oil Pollution Act, Private interest groups, Supertankers.

Recent spills of oil and hazardous materials have prompted the enactment of oil spill legislation in the United States and other countries. Research and enforcement in the area of hazardous materials spills has been hampered because the regulations and list of substances have not yet been developed by the Environmental Protection Agency. However, under the Federal Water Pollution Control Act Amendments of 1972, the National Oil and Hazardous Substances Pollution Contingency Plan has been developed. The Environmental Protection Agency and the Coast Guard are responsible for the plan's implementation. The expertise in the plan comes from the Coast Guard's National Strike Force made up of three specially trained 18-man teams available on short notice 24 hours daily. The industrial sector has contributed to spill control by forming cooperatives or groups of companies in a particular geographical region to pool their resources for purchasing spill control equipment. The private sector has also become involved through the development of a number of companies specializing in spill clean-up. However, organizational weaknesses in the national plan and technological problems with high-sea spill containment require that on-going analysis of these systems continue. (Hammersley-Florida)
W78-01353

SECTION 404: A CONTROVERSIAL PROGRAM THAT GREW LIKE TOPSY,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 49, No 5, p. 730-33, May 1977.

Descriptors: *Wetlands, *Jurisdiction, *Dredging, Federal Water Pollution Control Act, *Navigable waters, Water pollution, Landfills, Legislation, Federal government, Environmental effects, Water law, Legal aspects, Environmental engineering, Water policy, Planning, Judicial decisions, Bodies of water, Water, Permits.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Navigability.

Section 404, governing federal regulation of dredge and fill activities, came from a House and Senate conference on PL 92-500 in 1972. The conference resolved that the regulatory system would be administered by the Corps of Engineers with the guidelines drawn up in conjunction with the Environmental Protection Agency (Agency (EPA). In addition, the EPA administrator was given veto power over the Corp's approval of any particular disposal site. In 1974, the Corps proposed to limit its authority under Section 404 by narrowly construing the term 'navigable waters'. However, in a suit brought against the Corps, a federal court upheld the broad definition in the original law. This decision, turned Section 404 into an effective vehicle for national wetlands protection. In 1975, the Corps and the EPA developed Section 404 regulations to be implemented in three phases over a 2-year period. Although implementation of these proposals met with opposition from both Congress and the Administration, the new Administration supports the broad scope of Section 404. Currently two questions remain essential to Section 404's future: (1) whether national wetlands protection is necessary; and (2) if so, whether Section 404 is the proper vehicle to provide it. (Hammersley-Florida)
W78-01354

COASTAL RESOURCE USE - DECISIONS ON PUGET SOUND,
Washington Univ., Seattle. Sea Grant Program.
For primary bibliographic entry see Field 6G.
W78-01355

BUREAU OF OUTDOOR RECREATION LOOKS AT WATER QUALITY,
Bureau of Outdoor Recreation, Washington, DC. Office of Communications.
G. M. Kyle.
Parks and Recreation, Vol. 12, No. 2, p. 19a-21a, February 1977.

Descriptors: *Waste water treatment, *Recreation facilities, *Land use, *Parks, Planning, Legislation, Water quality, Streams, Waste treatment, Sewage treatment, Cities, Water law, Sewage, Water tanks, Water pollution, Water pollution control, Swimming, Fishing, Landscaping, Multiple purpose.
Identifiers: *Environmental policy, *Bureau of Outdoor Recreation, *Federal Water Pollution Control Act Amendments of 1972.

The Water Pollution Control Act Amendments of 1972 have produced positive side-effects beyond the imagination of the creators of the water control program. One of the most pronounced impacts of the massive waste treatment program has been on public recreation, especially in urban areas. The author has summarized some of the ways in which the Bureau of Outdoor Recreation (BOR) and other organizations can work together to help realize the recreation potential under specified sections of the Water Pollution Control Act. The various sections are reviewed in the context of cooperation and participation of park and recreation professionals throughout the United States. BOR, working under the 1972 act, is seen as providing technical assistance in: (1) identifying recreational and pollution control needs; (2) securing finances; and (3) setting up pollution control projects which double as recreation facilities. Current examples of this coalition of pollution control and recreation include: (1) irrigation of landscape with waste water spray; (2) utilization of covers of water tanks and sewage treatment facilities as tennis courts and play spaces; and, (3) the restoration of public shorelines as safe swimming and fishing areas. (McPherson-Florida)
W78-01356

GABLE WATERS, ADJACENT WETLANDS AND COASTAL WETLANDS. IT PASSED IN THE HOUSE, BUT THE SENATE'S RESPONSE WAS A PROPOSAL RETAINING BROAD JURISDICTION, BUT SPLITTING THE PROGRAM BETWEEN THE CORPS AND THE ENVIRONMENTAL PROTECTION AGENCY. THE 95TH CONGRESS PLANS TO UNDERTAKE A FULL SCALE REVIEW OF THE WATER POLLUTION CONTROL ACT. (MAASS-FLORIDA)
sport interstate or foreign commerce. Supporters of the amendment argue that it merely restores the historic definition of navigable waters, while those opposing it contend it drastically reduces the most effective defense against destruction of irreplaceable wetlands. The Wright amendment, which modified the Breaux amendment, restricts the Corps' authority to issue permits only to commercially na
For primary bibliographic entry see Field 6E.
luded the Breaux amendment which strictly limite

PRIVATE COMPENSATION FOR OIL POLLUTION: FLORIDA'S PRACTICAL SOLUTION,
For primary bibliographic entry see Field 6E.
W78-01358

EUTROPHICATION: A THREAT TO NEW HAMPSHIRE'S LAKES AND PONDS - WHAT LEGAL TOOLS ARE AVAILABLE FOR PROTECTION,
Southern Rockingham Regional Planning District Commission, Salem, NH.
R. D. Sokolove.
New Hampshire Bar Journal, Vol. 18, No. 1, p. 23-46, September 1976.

Descriptors: *Eutrophication, *New Hampshire, *Lakes, *Zoning, *Land use, Environmental control, Environmental effects, Local governments, State governments, Legal aspects, Aging(Biological), Lake stages, Population, Water quality, Social aspects, Legislation, Water law, Land classification, Non-structural alternatives, Economic impact, Regional economics, Social impact.

Natural eutropincation changes a lake into a forest over a period of thousands of years. Cultural eutropincation is an accelerated version of the natural process caused by man's polluting tendencies. New Hampshire's lakes are becoming victims of the second type of eutropication. Four legal tools are available to meet this problem. Initially, local governments may promulgate land use regulations based upon a statutory enabling act to pass ordinances for the health, welfare and public safety of the community. Secondly, local planning boards may adopt regulations governing the subdivision of land so as to lessen any danger occasioned by an insufficient water supply. The power of local planning boards may possibly extend to a blanket moratorium over all future construction. Although zoning is another possible control mechanism, several nonconforming uses within the zoned area often defeat the hoped-for effect. A possible solution to this problem is the doctrine of amortization by which a nonconforming use is terminated after the owner is given time to recoup his investment and acquire money for relocation. A final alternative presented is a model statute aimed specifically at lake protection. (Moorhouse-Florida)
W78-01359

SPILL PREVENTION AND CONTROL: A SPECIAL REPORT,
Goodyear Tire and Rubber Co., Akron, OH. Chemigum Plant.
W. H. Weiss.
Pollution Engineering, Vol 8, No 11, p 22-29, November, 1976.

Descriptors: *Oil spills, *Control systems, Equipment, *Water pollution control, *Planning, Design standards, Safety factors, Monitoring, Oil pollution, Oily water, Fuels, Oil industry, Design, Reliability, Design criteria, Drains, Automatic control, Regulation, Protection, Personnel, Training, Inspection.
Identifiers: *Administrative regulations, Oil spill cleanup, Oil spill prevention, Federal Water Pollution Control Act Amendments of 1972, Spill Prevention Control and Countermeasure plans.

Spill prevention regulations, formulated pursuant to the Federal Water Pollution Control Act of 1972, require any facility that stores more than 1320 gallons of 'oil type' material to maintain a Spill Prevention Control and Countermeasure (SPCC) plan. This plan is to be made available to the Environmental Protection Agency and the Coast Guard for review and implementation in case of a spill. The SPCC plan should attempt to predict where a spill might occur and explain what equipment is available and what will be done to prevent the spill from reaching navigable waters. This article recommends methods and procedures that should increase the efficiency of containment once a spill has occurred. The recommendations include suggestions concerning plant design, monitors and controls, and equipment to limit the effected area of a spill. The author believes that proper training of personnel is extremely important. A general procedure to be followed in case of a spill is outlined. The author concludes that the most efficient way to prevent and control spills is to create a plan of action tailored to each specific plant's operation and personnel. A spill prevention plan checklist is included. (Curran-Florida)
W78-01361

CLEAN WATER (REPORT TO CONGRESS, 1974).
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 622, Price codes: A05 in paper copy, A01 in microfiche. June, 1974, 61 p, 5 tab.

Descriptors: *Water pollution sources, Federal Water Pollution Control Act, *Water pollution control, *Water quality control, *Water pollution effects, Effluents, Water quality standards, Legislation, Federal government, Administrative agencies, Water pollution treatment, Industrial wastes, Industrial water, Industrial plants, Law enforcement, Municipal wastes, Municipal water, Sewage, Waste water treatment, Chemicals, Agriculture, Waste disposal, Dredging.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Environmental Protection Agency, *National Pollution Discharge Elimination System, Administrative regulations, Effluent limitations, Effluent guidelines, Non-point sources(Pollution).

The Environmental Protection Agency (EPA), pursuant to Section 516(a) of the Federal Water Pollution Control Act, has submitted its annual report for 1973. During the year, the EPA awarded approximately $3 billion in municipal construction grants. Under the National Pollution Discharge Elimination System 2,037 municipal and industrial permits were issued and 6,266 draft permits were forwarded to states for approval. Of the 531 enforcement actions initiated, most were concerned with oil and hazardous substances liability. 71% of the municipal waste treatment works surveyed showed operational, mechanical or manpower deficiencies. Of 3,155 waterway segments classified, 1,546 should meet water quality standards under existing programs, while 1,609 will require more stringent controls. Waterways containing high degrees of nitrogen and phosphorous are of the poorest quality. The EPA also published reports identifying methods, processes and procedures to control non-point source pollution for various agricultural and industrial activities. Effluent limitation guidelines were established for 23 industrial categories. Nine toxic pollutants were identified and standards proposed to prohibit their discharge. (Moorhouse-Florida)
W78-01363

CLEAN WATER, REPORT TO CONGRESS-1974.
Environmental Protection Agency, Washington, DC.
EPA Report to Congress, June 1974. 88 pp, 19 photos, 24 tab, 5 append.

Descriptors: *Water quality control, *Regulation, *Grants, *Research and development, Administrative agencies, Federal jurisdiction, State jurisdiction, Pollution abatement, Waste water treatment, Water quality standards, Federal Water Pollution Control Act, Water pollution treatment, Effluents, Legal aspects, Sewage treatment, Federal government, Oil pollution, Municipal wastes, Administrative decisions, Permits.
Identifiers: *Environmental Protection Agency, *Administrative regulations, *Hazardous substances(Pollution), Environmental policy, Effluent limitations, Effluent guidelines, Federal Water Pollution Control Act Amendments of 1972, Fill permit, National Pollution Discharge Elimination System, Non-point sources(Pollution).

In an annual report to Congress, the Environmental Protection Agency (EPA) outlined the mea-

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sures taken by the agency in 1973 to implement the objectives of the Federal Water Pollution Control Act. In determining the extent of the nation's water pollution problems, the states and the EPA found about one-third of the nation's classified water segments could meet water quality standards for point source pollution. The water quality has improved in rivers with respect to pollutants receiving the most widespread controls; however, nitrogen and phosphorus pollution has worsened. The EPA made municipal construction grant awards of $3 billion in 1973. Streamlined enforcement procedures have been established under the National Pollutant Discharge Elimination System and stringent restrictions have been applied to individual dischargers. Oil and hazardous substance discharge actions comprised the majority of enforcement proceedings. A study was made of the operations of municipal waste treatment works. A strong research and development program was initiated to increase technical support to the EPA for monitoring and abating pollution. Comprehensive tables list the various activities and actions with which the EPA was involved during 1973. (Cocheu-Florida)
W78-01364

OIL POLLUTION: CLEANING UP THE LEGAL MESS,
Donovan, Donovan, Maloof and Walsh, New York.
For primary bibliographic entry see Field 6E.
W78-01366

INTERVENTION ON THE HIGH SEAS: AN AMERICAN APPROACH EMPLOYING COMMUNITY STANDARDS,
For primary bibliographic entry see Field 6E.
W78-01368

THE APPLICATION OF EFFLUENT LIMITATIONS AND EFFLUENT GUIDELINES TO INDUSTRIAL POLLUTERS: AN ADMINISTRATIVE NIGHTMARE,
For primary bibliographic entry see Field 6E.
W78-01369

AN ANALYSIS OF TECHNICAL AND LEGAL ISSUES RAISED BY THE DEVELOPMENT OF COAL SLURRY PIPELINES,
For primary bibliographic entry see Field 6E.
W78-01370

BERKLEY V. STATE DEPARTMENT OF ENVIRONMENTAL REGULATIONS.
For primary bibliographic entry see Field 6E.
W78-01372

AMERICAN DREDGING CO. V. SELLECK (PERMIT REQUIREMENTS UNDER THE RIVERS AND HARBORS APPROPRIATION ACT OF 1899).
For primary bibliographic entry see Field 6E.
W78-01378

SAVE THE BAY, INCORPORATED V. ADMINISTRATOR OF ENVIRONMENTAL PROTECTION AGENCY (AVAILABILITY OF JUDICIAL REVIEW OF EPA FAILURE TO VETO STATE DISCHARGE PERMIT).
For primary bibliographic entry see Field 6E.
W78-01379

SIERRA CLUB V. TRAIN (ENVIRONMENTAL PROTECTION AGENCY POLLUTION ABATEMENT ORDERS DISCRETIONARY UNDER FWPCA).
For primary bibliographic entry see Field 6E.
W78-01381

WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 6E.
W78-01391

UNITED STATES V. PENNSYLVANIA ENVIRONMENTAL HEARING BOARD (GOVERNMENT CONTRACTOR-OPERATOR OF FEDERAL FACILITIES NOT IMMUNE FROM STATE REGULATION).
For primary bibliographic entry see Field 6E.
W78-01395

EXXON CORP. V. TRAIN (EPA DENIED AUTHORITY TO REGULATE SUBSURFACE DISPOSAL OF WASTES).
For primary bibliographic entry see Field 6E.
W78-01396

INNOVATIVE SOLUTION TO STORM WATER MANAGEMENT PROBLEM.
Public Works, Vol 108, No 9, p 144, September, 1977.

Descriptors: *Storm runoff, *Underground storage, *Construction materials, *Water pollution control, *Urban runoff, Pipes, Storm water, Surface runoff, Storage tanks, Water storage, Retention, Waste water treatment.
Identifiers: Storm water detention tanks, Fiberglass.

Storm water detention facilities were required when the Alexandria Hospital in Virginia decided to expand its parking facilities. VVKR Partnership, an Alexandria firm of architects and engineers, was commissioned to find a solution. The calculated required storage capacity necessary for the 5-acre site was 6,000 cu ft at a 10-yr rainfall intensity and a release rate of 6.4 cfs. Since detention in surface ponds, oversized pipes, concrete chambers, or gravel interceptors was not considered feasible for the site because of problems in construction and maintenance, VVKR investigated the possibility of an underground fiberglass storage tank. Owens-Corning Fiberglass fabricated the 75-ft long, 10-ft diameter tank. The tank, which was shipped in two sections, has a weir-containing junction box at one end to permit the desired release rate of detained storm water. Use of the fiberglass tank resulted in savings in cost and construction time. (Schulz-FIRL)
W78-01413

SEWER PROBLEM BECOMES ASSET.
Water and Wastes Engineering, Vol. 14, No. 10, p 77, October, 1977.

Descriptors: *Urban runoff, *Storm water, *Multi-purpose projects, *Recreation facilities, *Lakes, Erosion control, Reservoir storage, Sewerage, Storm runoff, Engineering structures, Dams, Diversion structures, Waste water treatment.

A storm water management program in western St. Louis County, Missouri, has resulted in the creation of a small recreational lake in Bridgeton City Park. The project was initiated because of problems with flooding and erosion by storm water runoff in the park area. The 1-acre lake was created with an earthen dam and is designed so that storm water is used to maintain an 8-ft permanent depth. Storm water, which may increase in Lake's depth to as much as 12 ft, is slowly released in the sewer system. The storm water retention lake and earthen dam were designed by Kenneth Balk and Associates, Inc. (Schulz-FIRL)
W78-01414

CITY FIGHTS GREASE AND ODOR PROBLEMS IN SEWER SYSTEM.
Public Works, Vol. 108, No. 10, p 74-75, October, 1977.

Descriptors: *Bacteria, *Sewers, *Oil wastes, *Anaerobic digestion, *Microorganisms, Operation and maintenance, Sewerage, Pumping, Nitrogen, Phosphorus, Conveyance structures, Sewage treatment, Waste water treatment.
Identifiers: Sewer cleaning, Burlingame(CA).

Heavy loadings of grease and oil into the 88 miles of sewage collection lines in Burlingame, California, created a need to evaluate alternative means of cleaning lines and lift stations of grease accumulations. Grease-dissolving agents tested included solvents, detergents, enzymes, and other chemical products. The studies indicated that special bacteria cultures from Bower Industries, Inc., (sold under the name DBC Plus Dried Bacteria Cultures) offered the most effective solution to the problem. A pilot study was initiated at two selected pumping stations with average daily flows of 23,000 and 90,000 gal. Of the several bacteria formulas offered by Bower Industries, the type A culture designed for use with domestic sewage was chosen for use. Seven days of heavy application of the culture were required in the initial treatment phase, followed by maintenance doses of 1 lb of culture every three days for the 23,000-gpd station and 3 lbs of culture every three days for the 90,000-gpd station. The cultures, formulated for use with animal and vegetable oils and petroleum derivatives, were added to the pumping stations as a slurry with a water:dry culture ratio of 2:1. A 1-2 hr presoak period is required to fully activate the lyophilized and air-dried cultures. Ammonium phosphate was added to the slurry to insure adequate supplies of nitrogen and phosphorus for the bacteria during the initial heavy cleanup stage. Additional beneficial side effects of the grease removal program included easier servicing of submersible pumps and reduction of odors. (Schulz-FIRL)
W78-01420

A TURN FOR THE BETTER.
Electrical Review, Vol. 201, No. 5, p 31, July, 1977.

Descriptors: *Automatic control, *Operation and maintenance, *Penstocks, *Electrical equipment, Stress relieving, Sewage treatment, Sewers, Waste water treatment, Aeration.

Automatic operation of eight penstocks which control the flow of sewage to aeration tanks at the Beckton waste water treatment plant in North London, England, has been supplied by the Retrofit Division of Rotork Controls Limited. Commissioned by the Thames Water Authority, motorization of the penstocks has reduced from 40 to 6 minutes the time required for closing from fully open position. The more rapid response has produced a better flow balance through the tanks, as well as easier cleaning and maintenance. Push-button control is currently being used for startup, but provisions for future remote control of the system are being made. The Beckton sewage treatment plant is capable of handling a dry weather flow of 250 mgd and a wet weather flow of up to 600 mgd. (Schulz-FIRL)
W78-01434

SYSTEM CONTROLS TREATMENT PLANT.
Instrumentation Technology, Vol. 24, No. 6, p 21, June, 1977.

Descriptors: *Digital computers, *Automation, *Monitoring, *Chemical oxygen demand, *Industrial wastes, Municipal wastes, On-site data collections, Hydrogen ion concentration, Dissolved oxygen analyzers, Chlorination, Treatment facilities, Waste water treatment.
Identifiers: Franklin(OH), Dayton(OH).

The Franklin, Ohio, waste water treatment plant of the Miami Conservancy District has incorporated a digital control system into its facilities. Two MODCOMP computers produced by

Systems Control Inc. of Palo Alto, California, are used to monitor pH, chlorine residual, dissolved oxygen, mixed liquor suspended solids, and primary sludge density. One of the computers is located at the Franklin plant to handle on-site control and monitoring while the second is located at headquarters in Dayton to coordinate operations of up to eight treatment plants. The Franklin plant, with a design capacity of 4.5 mgd and an average loading capacity of 3 mgd, treats combined municipal and industrial wastes for a population equivalent of 200,000. The average daily loading of COD ranges from 70,000 to 100,000 lbs/day. Storing industrial wastes, primarily from four paper mills, the Franklin solid waste recovery plant, and a liquid industrial waste recycling system, are separated from municipal wastes during primary treatment. (Schulz-FIRL)
W78-01442

INNOVATION IN STORM WATER MANAGEMENT.
Civil Engineering-ASCE, Vol 47, No 7, p 20, September, 1977.

Descriptors: *Urban runoff, *Storm water, *Storage tanks, *Construction materials, *Water storage, Storm runoff, Hospitals, Paving, Waste water treatment.
Identifiers: Alexandria(VA).

In construction of additional parking facilities at the Alexandria Hospital, the city of Alexandria, Virginia, also required construction of storm water detention facilities to alleviated runoff problems. The VVKR Partnership of Alexandria was contracted by the hospital to design storage facilities. Calculations indicated that a storage volume of 6000 sq ft would be necessary for the 5-acre site. Conventional methods of storm water detention used in the Washington metropolitan area include surface storage ponds, and below-grade storage in concrete chambers, over-sized pipes, or gravel interceptors. These methods were rejected for the site because of costs, maintenance requirements, and the site topography. A fiberglass tank system was chosen because of its lower costs and construction requirements. Provided by Owens-Corning Fiberglass, the 75-ft diameter tank was shipped in two sections and installed by the Arlington Asphalt Company of Arlington, Virginia. (Schulz-FIRL)
W78-01462

MANAGING SALINE WATER FOR IRRIGATION.
International Center for Arid and Semi-Arid Land Studies, Lubbock, TX.
For primary bibliographic entry see Field 3C.
W78-01492

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALITY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,
Agricultural Research Service, University Park, PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5B.
W78-01501

SALINE WATERS-THEIR POTENTIALITY AS A SOURCE OF IRRIGATION,
For primary bibliographic entry see Field 3C.
W78-01506

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, DES PLAINES, O'HARE WATER RECLAMATION PLANT AND SOLIDS PIPELINE, VOLUME II. APPENDICES.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5D.
W78-01509

PROCEEDINGS OF SANDUSKY RIVER BASIN SYMPOSIUM, HELD AT TIFFIN, OHIO ON MAY 2-3, 1975.
International Reference Group on Great Lakes Pollution from Land Use Activities.
For primary bibliographic entry see Field 5B.
W78-01518

INTRODUCTION TO THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 5B.
W78-01519

ENVIRONMENTAL DEVELOPMENT PLAN (EDP): HYDROTHERMAL ENERGY SYSTEMS FY 1977.
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 4B.
W78-01546

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES,
Battelle-Northwest, Richland, WA. Pacific, Northwest Lab.
G. W. Dawson, M. W. Stradley, and A. J. Shuckrow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 794, Price codes: A08 in paper copy, A01 in microfiche. Volume II-Technical Documentation, EPA-440/9-75-005-b, October 1974. 155 p, 25 fig, 17 tab, 102 ref. EPA-68-01-2268.

Descriptors: *Water pollution, *Accidents, *Regulation, *Penalties(Legal), *Law enforcement, Econometrics, Resources, Methodology, Value, Cost allocation, Freshwater, Saline water, Lakes, Estuaries, Water quality standards.
Identifiers: *IMCO/GESAMP methodology, DOHM methodology, *Hazardous materials.

Methodologies, which designate specific h penalty derive the value of resources lost. The modified IMCO/GESAMP methodology designates harmful quantities and rates of penalty based on a proposed international hazardous material rating/classification system which has been submitted to the United Nations for adoption. The system is utilized to profile hazardous materials on the basis of their relative hazard potentials, relegating materials to categories, determining critical concentration, and then deriving a harmful quantity and base rate of penalty for each category using the resource value methodology. The penalty rate is then modified for individual hazardous materials by an adjustment factor based on hazard potential properties. The unit of measurement methodology addresses legalities using standard trade practice measurement and fixed monetary guidelines. The Division of Oil and Hazardous Materials (DOHM) methodology uses a simplified plug flow model to assess the quantity of a hazardous material (harmful quantity) which when spilled is capable of inflicting substantial harm to key aquatic organisms in a stream. The rate of penalty is equated to the cost that would have been incurred by the discharger had preventive measures been instituted. Two additional approaches offer locational variables which further refine penalty assessments based on the actual water uses and dispersive capacity of the receiving body. (See also W78-01551 and W78-01553) (Wares-IPA)
W78-01552

DETERMINATION OF HARMFUL QUANTITIES AND RATES OF PENALTY FOR HAZARDOUS SUBSTANCES,
Battelle-Northwest, Richland, WA. Pacific Northwest Lab.
G. W. Dawson, M. W. Stradley, and A. J. Shuckrow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 795, Price codes: A08 in paper copy, A01 in microfiche. Volume III-Appendices, EPA-440/9-75-005-c. October 1974, 365 p, 14 fig, 9 tab, 167 ref, 15 append. EPA-68-01-2268.

Descriptors: Water pollution, *Water pollution sources, *Regulation, *Statistics, *Mathematical models, *Data collections, Methodology, Cost analysis, Classification, Chemical properties, Saline water, Freshwater, Lakes, Estuaries, Law of the sea, Water quality standards, *Hazardous materials.

The appendices present a brief profile of the physical/chemical and toxicological data employed in navigable waters pollution control to calculate harmful quantities and rates of penalty for designated hazardous substances. Appendix A contains input data for designated hazardous substances. Appendix B describes specific evaluation procedures employed to derive values for volumes of freshwater lakes and surface areas of estuarine systems. Appendix C is a table of intrinsic adjustment factors for the resource value methodology. Appendix D presents mathematical model determination of the total water volume subjected to a critical concentration from a point source spill of a hazardous material. Appendices E and F present IMCO/GESAMP guidelines for profiling and categorizing hazardous materials. Appendix G is a table of IMCO methodology classification of hazardous materials. Appendix H lists hazardous materials by IMCO hazard category. Appendix I is a determination of IMCO methodology adjustment factors for degradability and dispersibility through the use of a DELPHI technique. Appendix J presents the derivation of representative stream flow. Appendix K lists estuarine types and presents a model equation derivation. Appendix L describes derivation of the time at which the minimum harmful quantity is obtained in the plug flow model. Appendix M presents the total cost of prevention adjustment factors. Appendix N lists final harmful quantities and rates of penalty. Appendix O is a glossary of terms. A more detailed discussion on each designated substance and a complete accounting of available toxicological data can be found in the technical document accompanying the designation regulation. (See also W78-01551 and W78-01552) (Wares-IPA)
W78-01553

CONTROL OF THE RIVER SLANA POLLUTION CAUSED BY THE GEMERSKA HORKA PULP MILL (MOZNOSTI OBMEDZENIA ZNECISTOVANIA RIEKY SLANEJ CELULOZKOU V GEMERSKEJ HORKE),
Celprojekt Ruzomberok (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W78-01569

CONTROL OF ENVIRONMENTAL POLLUTION BY PULP AND PAPER INDUSTRY. I. WATER QUALITY PARAMETERS (SOBRE EL CONTROL DE LA CONTAMINACION AMBIENTAL POR VERTIDOS DE LAS INDUSTRIAS DE CELULOSA Y PAPEL. I. PARAMETROS MAS EMPLEADOS DE CALIDAD DE LAS AGUAS),
Instituto Nacional de Investigaciones Agrarias, Madrid (Spain). Dept. de Celulosa e Industrias de Extraccion.
D. Garcia Martin, R. M. Caminos Muruzabal, and C. Garcia Vallejo.
Investigacion y Tecnica del Papel, Vol. 14, No. 52, p 385-406, April, 1977. 29 ref, 3 tab.

Descriptors: *Pulp and paper industry, *Effluents, *Water quality control, *Water quality standards, Legislation, Europe, North America, Water pollution control.

The selection of parameters adequate for controlling the effectiveness of effluent treatment

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measures and evaluating the polluting load of effluents is considered, as is the standardization of appropriate methods for measuring these parameters. European and North American legislation specifying those parameters most significant for determining and maintaining acceptable water quality (particularly of receiving streams) is summarized. (Sykes-IPC)
W78-01582

CASES IN THE RELATION OF RESEARCH ON REMOTE SENSING TO THE DECISION-MAKERS IN A STATE AGENCY,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 4A.
W78-01594

DEVELOPMENT DOCUMENT FOR BEST TECHNOLOGY AVAILABLE FOR THE LOCATION, DESIGN, CONSTRUCTION AND CAPACITY OF COOLING WATER INTAKE STRUCTURES FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
D. Barnes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 573, Price codes: A12 in paper copy, A01 in microfiche. Report EPA 440/1-76/015-a, April 1976. 272 p, 73 fig, 9 tab, 85 ref, 3 append.

Descriptors: *Cooling water, *Intakes structures, *Environmental effects, Powerplants, Screens, Trash racks, Fish barriers, Structures, Barriers, Intakes, Structural design, Construction, Locating, Fish, Aquatic life, Microbiology, Aquatic microorganisms, Environment.

The Federal Water Pollution Control Act Amendments of 1972 state under Thermal Discharges, Section 316 (b): 'Any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction and capacity of cooling water intake structures, reflect the best technology available for minimizing adverse environmental impact.' This document presented the findings of an extensive study of this 'best technology' available: Since the Act specifies cooling water intake structures, this document was addressed specifically to cooling water intakes. It is evident, however, that the general technical discussion could apply to other water intakes, for example, non-cooling water intakes for industrial, irrigation or domestic water supply. (Sims-ISWS)
W78-01647

LAND USE REPORT.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 037, Price codes: A16 in paper copy, A01 in microfiche. December 1, 1972. 355 p.

Descriptors: *Land use, *Pollution abatement, *Air pollution, *Water pollution, Air pollution effects, Water pollution effects, Environmental effects, Solid wastes, Urbanization, Pesticides, Sewage treatment, Agriculture, Water resources, Erosion, Evaluation, Federal Water Pollution Control Act, Governments, Surveys, Planning.
Identifiers: Environmental impact statements.

The report addressed those Environmental Protection Agency (EPA) programs, as they are conducted in Region 8, which have a significant direct or indirect land-use impact. The programs include the Region's air programs, water programs, solid waste programs, pesticides programs, and noise programs, along with a discussion of the Office of Federal Activities, the Environmental Impact Statement Review Division, and the Planning and Evaluation Section. The recommendations which followed each section of the report pertain to the Region 8 EPA's policy as that policy relates to and affects land-use. (Sims-ISWS)
W78-01653

AD HOC ADVISORY PANEL ON EVALUATED PHYSICAL PROPERTY DATA IN AID OF AQUEOUS ENVIRONMENTAL PROBLEMS.
National Academy of Sciences and National Research Council, Washington, DC. Numerical Data Advisory Board.
For primary bibliographic entry see Field 5B.
W78-01654

CONCEPT DEFINITION OF THE ARMY ENVIRONMENTAL TECHNICAL INFORMATION SYSTEM,
Operations Research, Inc., Silver Spring, MD. Space and Communications System Div.
For primary bibliographic entry see Field 10D.
W78-01657

SOME INITIAL AQUACULTURE EXPERIMENTS IN RECIRCULATING WATER SYSTEMS,
Bayerische Landesanstalt fuer Wasserforschung, Wielen (West Germany). Aussenstelle.
M. Bohl.
Aquaculture, Vol. 11, p. 323-328, 1977. 3 tab, 13 ref.

Descriptors: *Aquiculture, *Fish farming, *Carp, *Recirculated water, *Water reuse, *Nitrates, *Nitrites, *Water purification, *Waste water treatment, *Activated sludge, *Sludge treatment, *Sludge disposal, *Organic wastes, *Fish culture.

First experiences in the management of different recirculating water systems were described after discussion of design and specification of purification plants for intensive fish farming. The problem of nitrate and nitrite concentrations in water was also analyzed. Further investigations directed at the improvement of environmental factors and economic organization of fish recirculating systems were advocated. (Katz)
W78-01669

SEPARATORS,
H. H. Murphy.
U.S. Patent No 4,013,561, 8 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1381, March 22, 1977.

Descriptors: *Patents, *Water pollution treatment, *Oil pollution, *Oil spills, Industrial wastes, *Separation techniques, Skimming.

A separator is provided for skimming floating materials from a body of water, particularly oxidized or emulsified oils and floating solid materials. The invention comprises a pair or contiguous counter-rotating cylinders having a rought-textured frictional traction surface. The traction surface is sufficiently rough in texture to provide an abrasive-like frictional grip with a contrasting layer of liquid. Advancing the textured surface within the body of water abrades and draws the contracting layer of water and proximate floating materials along the advancing traction surface in passage within or through the body of water, thereby conveying the layer of water and floating materials into the collection reservoir. The conveying traction surface material can range from a very soft cellular elastomer such as a sponge rubber, to very hard materials commonly used as industrial abrasives such as granular metallic carbides and oxides, including tungsten carbide, silicon carbide, and aluminum oxide particles, attached to a base material as in conventional abrasive-coated materials. (Sinha-OEIS)
W78-01692

OIL SEPARATOR,
R. L. Tuttle.
U.S. Patent No 4,014,791, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1796, March 29, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Separation techniques, Water quality control, Oil-water interfaces, Equipment.

Oil separation is achieved by injecting the combined fluids into the interior of a closed vessel and directing the flow against a series of baffles which cause the flow to be directed back against itself in such a manner that the initial upward component of flow is substantially nullified so that separated oil flows rapidly to the top of the vessel and separated water flows rapidly to the bottom. Upward flow is directed first against a concave surface which directs the flow back downward into a conically shaped collar which again reverses the flow upward and outward wherein substantial portions of the flow are directed back against themselves which seems to cause rapid separation of the oil particles from the water. Separation is further enhanced by maintaining all of the fluid under positive pressure, and by sensing the location of the oil-water interface, the withdrawal rates of the oil and water are separately controlled so as to maintain a constant pressure even though the relative oil concentration may vary over a considerable range. (Sinha-OEIS)
W78-01700

6. WATER RESOURCES PLANNING

6B. Evaluation Process

FEDERAL WATER RESOURCES MANAGEMENT: THE ADMINISTRATIVE SETTING,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6E.
W78-01499

THE RAJASTHAN CANAL PROJECT,
For primary bibliographic entry see Field 3F.
W78-01505

WATER PROBLEMS IN SOUTHWEST ASIA,
Durham Univ. (England).
P. Beaumont.
In: Problems in the Development and Conservation of Desert and Semidesert Lands, Twenty-Third International Geographical Congress, Working Groups on Desertification in and Around Arid Lands, Pre-Congress Symposium, Ashkhabad, U.S.S.R., July 20-26, 1976, p 105-110. 9 ref.

Descriptors: *Water resources development, *Projects, *Project benefits, *Project planning, *Asia, Multiple-purpose projects, Costs, Project feasibility, Economic feasibility, Arid lands, Cities, Comprehensive planning, Natural resources, Political aspects, Urbanization, Water requirements, Water utilization, Semi-arid climates, Desalination plants, Regions, Population, Agriculture, Industries.
Identifiers: Middle East, Southwest Asia.

High population growth and associated urbanization in Southwest Asia have required the development of water resources projects to meet essential needs rather than for increasing the productive capacity of agriculture and industry. A small number of large reservoir dam projects have been chosen for propoganda purposes and because of the preferences of major international aid-awarding bodies. Actual benefits of these projects have rarely lived up to expectations, due in part to a lack of detailed hydrological observations, underestimation of soil erosion rates in the catchments above major dams, and lack of an

adequately trained and financed agricultural extension service. Consequently, large water resource development schemes have fallen into disfavor in many parts of the region. In the region's more arid countries, such as Kuwait and Saudi Arabia, large sums of money have been spent on desalination plants. If population growth is not soon checked, future projects will have to be developed just to maintain present living standards. Future projects will be very expensive and costs will inevitably be borne by agriculture and industry, which are soon expected to compete in world markets. (Ullery-Arizona)
W78-01508

NEW CASTLE COUNTY DELAWARE RIVER SHORELINE STUDY,
Delaware Univ., Newark. Dept. of Economics.
R. Agnello, L. Donnelley, R. Kirk, P. Jensen, and C. Brine.
College of Marine Studies, Sea Grant Report No. DEL-SG-18-77, (1977) 201 p. Final Report prepared for New Castle County Department of Parks and Recreation.

Descriptors: *Recreation, *Shores, *Rivers, *Land use, *Recreation facilities, Delaware, Sociology, Water resources, Resources development.
Identifiers: Resources management, *Delaware River shoreline.

The final report of the Delaware River Shoreline Study is made up of six sections. Task I is a review and analysis of water-based recreation demand based on existing studies. Task II is a literature survey of water-based recreation facilities in other urban areas of the nation. Task III is an evaluation of shoreline locations for their suitability as water-based recreation sites. Task IV is a synthesis of the results of the three previous tasks into a set of five recreation development scenarios. These scenarios are not recommendations but are alternatives to be evaluated in a public survey. Task V is a report on the workshop held to discuss progress on Tasks I - IV. Task VI presents and analyzes the survey results. (NOAA)
W78-01535

LUMIS-A LAND USE MANAGEMENT INFORMATION SYSTEM FOR URBAN PLANNING,
Caltech Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 4A.
W78-01596

SATELLITE INFORMATION ON ORLANDO, FLORIDA,
Brevard County Planning Dept., Titusville, FL.
For primary bibliographic entry see Field 4A.
W78-01597

REMOTE SENSING IMPACT ON CORRIDOR SELECTION AND PLACEMENT,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01598

IMPROVED RESOURCE USE DECISIONS AND ACTIONS THROUGH REMOTE SENSING,
Michigan State Univ., East Lansing.
R. Hill-Rowley, M. Boylan, W. Enslin, and R. Vlasin.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM-X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1747-1767, September 1975. 7 fig, 2 tab.

Descriptors: *Decision making, *Resources development, *Michigan, *Remote sensing, Planning, Management, Resources allocation, Appraisals, Property values, Administration, Forest management, Coordination, River basins, Highways, Soil erosion, Sediment control, Data processing, Land classification, Land use, Methodology, Census.
Identifiers: *Case studies.

Michigan State University continues to be engaged in applications of remote sensing to a considerable variety of needs of governmental agencies and private organizations in order to facilitate the operational uses of remote sensing for improving management decisions and actions concerning resource uses. Cumulative experience reveals that operational applications are not all the same and that it is important to distinguish between at least two categories, namely: (1) first generation, or direct-action; and (2) second generation, or indirect, delayed-action applications. Making this distinction is crucial for many reasons, such as justifying proposed undertakings, guidance for research design, methodology requuirements, budget allocations, and many others. From among applications completed during 1974-75, seven case studies were offered in illustration of the many contrasts which can be drawn between first and second generation application studies. These include: (1) multi-agency river basin planning; (2) corridor assessment and route location for highway location, together with improvement of county-level planning decisions; (3) improving timber management practices; (4) enforcement of new state statutes; (5) county-wide open space preservation; (6) land value reappraisal relative to property tax equalization; and (7) optimizing agribusiness processing plant locations. In all these applications the user-agency was included as a participant in order to maximize understanding of the processes whereby information and findings are derived, allowing the progressive formulation of tentative decisions, and generating early anticipation of what actions might need to be taken as well as discerning other possible uses for the information. (See also W78-01589) (Humphreys-ISWS)
W78-01599

DEVELOPMENT OF USER APPLICATIONS FOR EARTH RESOURCES SURVEY DATA IN URBAN AND REGIONAL PLANNING IN THE PUGET SOUND AREA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 4A.
W78-01600

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AN ANALYSIS OF CONSTRUCTION COST EXPERIENCE FOR WASTEWATER TREATMENT PLANTS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5D.
W78-01463

ECONOMICS OF TRANSPORTING WASTEWATER SLUDGE,
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5E.
W78-01470

6D. Water Demand

INDIAN WATER RIGHTS IN THEORY AND PRACTICE: NAVAJO EXPERIENCE IN THE COLORADO RIVER BASIN,
California Univ., Los Angeles.
For primary bibliographic entry see Field 6E.
W78-01360

WATER PROBLEMS IN SOUTHWEST ASIA,
Durham Univ. (England).
For primary bibliographic entry see Field 6B.
W78-01508

NEW CASTLE COUNTY DELAWARE RIVER SHORELINE STUDY,
Delaware Univ., Newark. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-01535

6E. Water Law and Institutions

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, MD.
For primary bibliographic entry see Field 2H.
W78-01187

PROCEEDINGS OF THE FEDERAL INTER-AGENCY SEDIMENTATION CONFERENCE, BUREAU OF RECLAMATION, DENVER, COLORADO, MAY 6-8, 1947.
For primary bibliographic entry see Field 4D.
W78-01188

WHITHER POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-01220

WATER RESOURCES - THE PRODUCTIVE CONTRIBUTION OF POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-01221

POLLUTION CONTROL AND LEGISLATION IN THE FEDERAL REPUBLIC OF GERMANY,
For primary bibliographic entry see Field 5G.
W78-01224

POLLUTION CONTROL AND LEGISLATION--THE DUTCH APPROACH,
Public Health and Environmental Protection (Netherlands).
For primary bibliographic entry see Field 5G.
W78-01225

WASTE TREATMENT IN THE DANISH DAIRY INDUSTRY,
Statens Forsoegsmejeri, Hillerod (Denmark).
For primary bibliographic entry see Field 5D.
W78-01255

NEED TO CONTROL DISCHARGES FROM SEWERS CARRYING BOTH SEWAGE AND STORM RUNOFF (RPT. TO THE CONGRESS).
Comptroller General of the United States, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-01281

STATE HAS TITLE TO FORESHORES OF GEORGIA'S NAVIGABLE WATERS,
D. Beigh.
Mercer Law Review, Vol. 27, No. 4, p. 1229-36, Summer 1976.

Descriptors: *Georgia, *Navigable waters, *Shores, *Accretion(Legal aspects), *Intertidal areas, Low water mark, Water rights, Boundaries(Property), Riparian rights, Legal aspects, High water mark, Land tenure, Real property, Tidal marshes, Non-navigable waters, Ownership of beds, Seashores, Watercourses(legal aspects), Legislation, Tidal waters, Public lands.
Identifiers: Foreshore.

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In State v. Ashmore, the Georgia Supreme Court held that the State has fee simple title to the foreshore of all navigable waters. In tracing the history of such ownership, the author found that although several states allow private ownership of the foreshore to the low water mark, Georgia has always held that the state owned the foreshore up to the high water mark. Title could only be extended through specific legislation. In this case, the Ashmores contended that such a provision had been made. However, the supreme court decided it was not the intention of either the 1902 Act or Constitutional Commission of 1943-44 to extend the title of landowners adjacent to tidewaters to the low water mark. The court's decision was narrow since it applied only to navigable waters. The author concludes that although it was a landmark decision it was disappointing because that distinction between navigable and non-navigable waters leaves open the question of ownership of Georgia's marshes. In addition, the court's failure to limit the legislature's power to gratuitously convey portions of the foreshore leaves no guidelines to determine the validity of any future grants of foreshore. (Maass-Florida)
W78-01348

WATER RESOURCE POLICY STUDY.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01349

IS CONGRESS PROTECTING OUR WATER. THE CONTROVERSY OVER SECTION 404, FEDERAL WATER POLLUTION CONTROL AMENDMENTS OF 1972,
Environmental Protection Agency, Washington, DC. Office of General Counsel.
For primary bibliographic entry see Field 5G.
W78-01350

PROCEEDINGS OF THE FIRST FEDERAL CONFERENCE ON THE GREAT LAKES, HELD AT ANN ARBOR, MICHIGAN, DECEMBER 13-15, 1972.
National Environmental Research Center, Grosse Ile, MI. Grosse Ile Lab.
For primary bibliographic entry see Field 5G.
W78-01351

U.S., CUBA AGREE ON MARITIME BOUNDARIES AND FISHERY MATTERS.
Department of State Bulletin, Vol 76, No 1983, p. 686-87, June 27, 1977.

Descriptors: *International law, *Fish harvest, *Commercial fishing, *International waters, Marine fisheries, Oceans, United States, Zoning, Fishing, Boundary disputes, Legal aspects, Water law, Treaties, Foreign waters, Commercial fish, Fish, Fish conservation, Harvesting.
Identifiers: Coastal waters, International agreements, Water rights(Non-riparian), Territorial waters, Cuba, Fishing zone, Marine environment, Marine resources. Vessels.

The Governing International Fishery Agreement between the United States and Cuba has been concluded in accordance with the requirements of the Fishery Conservation and Management Act of 1976 which established a 200-mile fishing zone off the coasts of the United States. The Agreement does not guarantee to Cuban vessels a right to fish, but provides the means by which Cuba may apply for permits which would allow fishing up to a level specified by federal authorities for those fish which have been identified as surplus fish above the harvesting capacities of United States vessels. Until the agreement has been approved by Congress, no permits for Cuban vessels will be issued and no Cuban fishing will be allowed inside the United States fishing zone. The two countries also established a preliminary maritime boundary approximately halfway between the United States and Cuba. It begins at the trijunction point equidistant from the nearest coastal points of the United States, Cuba, and the Bahamas, and extends westward. A map of the line accompanies the text. A final boundary determination must be accomplished by treaty. (Hammersley-Florida)
W78-01352

SPILL CLEANUP--WHAT ARE THE CAPABILITIES.
For primary bibliographic entry see Field 5G.
W78-01353

SECTION 404: A CONTROVERSIAL PROGRAM THAT GREW LIKE TOPSY,
For primary bibliographic entry see Field 5G.
W78-01354

COASTAL RESOURCE USE - DECISIONS ON PUGET SOUND,
Washington Univ., Seattle. Sea Grant Program.
For primary bibliographic entry see Field 6G.
W78-01355

BUREAU OF OUTDOOR RECREATION LOOKS AT WATER QUALITY,
Bureau of Outdoor Recreation, Washington, DC. Office of Communications.
For primary bibliographic entry see Field 5G.
W78-01356

WASHINGTON SCENE (PROPOSED AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT),
B. Kravetz.
Parks and Recreation, Vol. 12, No. 2, p. 12-13, February 1977.

Descriptors: *Legislation, *Water pollution control, *Navigable waters, *Dredging, Federal Water Pollution Control Act, Water quality, Water law, Wetlands, Land use, Land development, Land reclamation, Water resource development, Legal aspects, Jurisdiction, Controlled drainage, Water rights, Water quality control, Pollution abatement, Water permits, Water zoning, Water conservation.
Identifiers: *Fill permits, *Federal Water Pollution Control Act Amendments of 1972, Environmental policy, Congressional hearings, Coastal waters, Navigability tests.

The amendments introduced by the 94th Congress to the Federal Water Pollution Control Act included the Breaux amendment which strictly limited the Army Corps of Engineers' regulatory program for dumping dredge and fill materials in wetlands, lakes and streams. Because a court decision had greatly expanded the definition of navigable waters, many feared the Corps would have too much authority. The amendment limits the Corps' jurisdiction to those waters below the high water mark which are now or could be used to transport interstate or foreign commerce. Supporters of the amendment argue that it merely restores the historic definition of navigable waters, while those opposing it contend it drastically reduces the most effective defense against destruction of irreplaceable wetlands. The Wright amendment, which modified the Breaux amendment, restricts the Corps' authority to issue permits only to commercially navigable waters, adjacent wetlands and coastal wetlands. It passed in the House, but the Senate's response was a proposal retaining broad jurisdiction, but splitting the program between the Corps and the Environmental Protection Agency. The 95th Congress plans to undertake a full scale review of the water pollution control act. (Maass-Florida)
W78-01357

PRIVATE COMPENSATION FOR OIL POLLUTION: FLORIDA'S PRACTICAL SOLUTION,
K. Katz.
University of Florida Law Review, Vol. 27, No. 2, p. 546-59, Winter 1975.

Descriptors: *Oil pollution, *Florida, *Compensation, *Public rights, Coasts, Shores, Disasters, Legislation, Water pollution, Water pollution sources, Oil spills, Legal aspects, Economic impact, Administrative agencies, Legal review, Penalties(Legal), Pollution taxes(Charges), Water law, Federal government, Judicial decisions, State governments.
Identifiers: *Water Quality Improvement Act, Administrative regulations, Citizen suits, Liability, Standing(Legal), Tankers, Vessels.

Florida's Oil Spill and Pollution Control Act of 1971 recognizes the state's seacoast as an asset of high priority. While the 1971 act theoretically provided a private plaintiff with a cause of action against oil pollutors, various allowable defenses made recovery practically impossible. A 1974 amendment to the act rectified the problem by allowing private plaintiffs to recover directly from a fund specifically established to offset pollution damage upon the presentation of a sworn claim stating the amount of damages and the person responsible. The claim is submitted to arbitration and awards are payable directly from the pollution fund. Disadvantages of the proposed scheme include: a waiver of all other remedies upon the presentation of a claim for arbitration; waiver of damages omitted in the claim; the fact that any settlement is binding on the parties and not subject to collateral attack; and finally, a twelve-month time limit after the action arises for presentation of the claim. Although the private individual may still bring a separate judicial action, stringent restrictions on standing to maintain public nuisance actions may well dictate use of the administrative procedure. The amended Florida law should be commended for providing a most practical and simplified route to adequate personal compensation for oil pollution damage. (Moorhouse-Florida)
W78-01358

EUTROPHICATION: A THREAT TO NEW HAMPSHIRE'S LAKES AND PONDS - WHAT LEGAL TOOLS ARE AVAILABLE FOR PROTECTION,
Southern Rockingham Regional Planning District Commission, Salem, NH.
For primary bibliographic entry see Field 5G.
W78-01359

INDIAN WATER RIGHTS IN THEORY AND PRACTICE: NAVAJO EXPERIENCE IN THE COLORADO RIVER BASIN,
California Univ., Los Angeles.
M. E. Price, and G. D. Weatherford.
Law and Contemporary Problems, Vol 40, No 1, p 97-131, Winter, 1976.

Descriptors: *Colorado River Basin, *Indian reservations, *Water allocation(Policy), *Competing uses, *Water supply, Public lands, State governments, Federal government, Governmental interrelations, Administrative agencies, Distribution, Legal aspects, Preferences(Water rights), Water demand, Dams, Economic efficiency, Planning, Prior appropriation, Water law, Beneficial use, Legislation.
Identifiers: *Indian tribes.

Construction of major dam projects in the Western States requires a re-examination of Indian water rights. Roughly analogous to the nineteenth century problem of Indian land rights, the twentieth century issue of Indian water rights has shifted from water ownership to its best use. Conflicts exist between the western water law of prior appropriation and the Indian rights to the water. The United States Supreme Court addressed the issue in Winters v. United States by holding that the Indian rights controlled over state law. However, the standard for measuring the quantity of water reserved to the Indians was not

determined, subsequently causing much conflict. Although the Winters doctrine grants rights to the American Indian the extent to which those rights may be exercised depends upon a number of factors, such as Congressional support, judicial consistency and differing conceptions of reservation purposes and goals. Additionally, Indian interests must be represented before intergovernmental bodies making resource allocation decisions which has not happened in the past. Unless protective action is taken, early-priority Indian water rights may vanish in the face of urban and agricultural development in the West. (Moorhouse-Florida)
W78-01360

SPILL PREVENTION AND CONTROL: A SPECIAL REPORT,
Goodyear Tire and Rubber Co., Akron, OH. Chemigum Plant.
For primary bibliographic entry see Field 5G.
W78-01361

GENERAL IRRIGATION PROJECT REGULATIONS (OPERATION AND MAINTENANCE).
Bureau of Indian Affairs, Washington, DC.
Federal Register, Vol 42, No 114, p 30361-68, June 14, 1977.

Descriptors: *Irrigation, *Irrigation practices, *Irrigation operation and maintenance, *Indian reservations, Water rights, Ditches, Water requirements, Irrigation programs, Right-of-way, Leaching, Irrigation districts, Irrigation water, Water contracts, Water management(Applied), Water delivery, Imported water, Distribution systems, Water resources, Regulation, Domestic water, Stock water, Farm units, Structures.
Identifiers: *Administrative regulations, *Water rights(Non-riparians), Groundwater management, Indians.

The Bureau of Indian Affairs has updated and consolidated its existing regulations governing the operation and maintenance of Indian Irrigation Projects. In general, greater flexibility in project operation is provided for the officer-in-charge. That officer shall establish the irrigation season, and decide whether the carrying of domestic and stock water in the project irrigation system will be detrimental to the system. The definition of 'farm units' for the purpose of receiving water is variable between different projects and is based upon the acreage involved. In the interest of health and sanitation the disposal of sewage and trash in project waterways is prohibited. Regulations also govern distribution and apportionment of water; surface drainage; delivery points; carriage agreements and water rights applications; excess water; leaching water; delivery of water; and application for and record of deliveries of irrigation water. (Brightman-Florida)
W78-01362

CLEAN WATER (REPORT TO CONGRESS, 1974).
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01363

CLEAN WATER, REPORT TO CONGRESS-1974.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01364

DESIGNATION OF NEW RIVER SEGMENT AS A COMPONENT OF THE WILD AND SCENIC RIVERS SYSTEM.
Hearings--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, May 6, 1976, Serial No 94-55, 283 p.

Descriptors: *Flooding, *Flood control, *Wild River Act, *Recreation, *Hydroelectric plants, *North Carolina, *Wild rivers, Lakes, Submergence, Hydro-electric power, Federal Power Act, Electric power, Electric power plants, Rivers, Dams, Reservoirs, Archaeology, Environmental effects, Energy, Electric power production, Peak loads.
Identifiers: Administrative regulations, Dam effects, *Energy crisis, Licenses, Wilderness areas, Environmental policy, Property interests, New River(NC).

House hearings on bills to designate 26.5 miles of the New River in North Carolina a component of the Wild and Scenic Rivers System were complicated by the fact that the Federal Power Commission had issued a license to construct a power project which would inundate the area. The Congressional Research Service, however, concluded that Congress might legislate the revocation of a license issued by another Federal agency and that the bills were otherwise constitutional. Proponents of the bills included the Department of the Interior, North Carolina political leaders, North Carolina citizens, and several environmental organizations. They cited the recreational benefits of this stretch of river in its natural state, the alleged inefficiency of the hydro-electric project, the dangers to wildlife, flora, fauna, endangered species and prehistoric sites, the loss of 40,000 acres of agricultural land, and the displacement of 3,000 people. Opponents included Virginia political leaders, the licensee power company, labor organizations, industrialists, and business developers. They claimed the project would generate power efficiently, save fossil fuels, create employment, bolster the area's economy, control floods, and create recreational opportunities on two large lakes. (Jones-Florida)
W78-01365

OIL POLLUTION: CLEANING UP THE LEGAL MESS,
Donovan, Donovan, Maloof and Walsh, New York.
D. L. Maloof.
Insurance Counsel Journal, Vol 43, No 4, p 605-13 (October, 1976).

Descriptors: *Water pollution, *Oil pollution, *Oil spills, *Legislation, Oil wastes, Water pollution sources, Chemical wastes, Oily water, Organic matter, Regulation, Waste water(Pollution), Law enforcement, Water pollution control, Compensation, Damages, Water quality, Local governments, Judicial decisions, Legal aspects.
Identifiers: *Liability, Absolute liability, Coastal waters, State policy.

Oil pollution of the waterways is a growing problem in the United States. The Water Quality Management Act of 1970, enacted to alleviate the problem, provides for cooperation among federal and local governments to clean up oil spills and allows states to create liabilities for damage incurred from oil discharged into state waters. Although a state's right to impose its own standard of liability is not at issue, the desirability of such impositions is questionable since uniformity of law is as vital to the nation and maritime industry as control of oil pollution is to the states. Historically, state regulation of maritime commerce was prohibited under the pre-emption doctrine unless the latter was one of purely local concern. The pre-emption doctrine is discussed in relation to the Water Quality Improvement Act, the Admiralty Extension Act, and the Limitation of Liability Act. Further complicating the problem is the Florida case upholding the state's Oil Spill Prevention Act which imposes strict liability for oil spills. The proposed federal Comprehensive Oil Pollution Liability and Compensation Act of 1975 may be the only solution to the problems caused by piecemeal state legislation. (Maass-Florida)
W78-01366

COASTAL ZONE MANAGEMENT IN HAWAII,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
F. Skrivanek.
Shore and Beach, Vol 45, No 1, p 8-11, January 1977.

Descriptors: *Institutions, *Hawaii, *Shore protection, *Future planning(Projected), *Regulation, Shores, Coastal structures, Management, Coordination, Decision making, Land management, Administration, Comprehensive planning, National seashores, Seashores, Beaches, Public access, Legal aspects, State government, Governmental interrelations, Federal jurisdiction.
Identifiers: *Coastal zone management, Coastal Zone Management Act of 1972, Coastal zones.

Historically, Hawaii has been concerned with the preservation and accessibility of her coastal shores. State legislation enacted to reflect that concern includes provisions for public access and protection of scenic areas. The National Coastal Zone Management Act mandates further state control over the development of coastal areas. This article surveys both state and national legislation and gives the Hawaiian Department of Planning and Economic Developments (DPED) recommendations for best effectuating the legislative policies. Three issues addressed are: the proper location of the inland boundary line; the appropriate organization to coordinate the various programs; and the preferred political institution to choose the areas of particular concern. The author recommends that: (1) the entire state be designated a coastal zone for purposes of planning and administration; (2) an existing agency, preferably the DPED, or a limited new agency be assigned the role of lead agency for coastal zone management; and (3) the State Plan Policy Council be given regulatory responsibilities to designate areas of particular concern in the context of the coastal zone management program. (Curran-Florida)
W78-01367

INTERVENTION ON THE HIGH SEAS: AN AMERICAN APPROACH EMPLOYING COMMUNITY STANDARDS,
W. K. Bissell.
Journal of Maritime Law and Commerce, Vol 7, No 4, p 718-35 (1976).

Descriptors: *International waters, *International law, *Oil spills, *Treaties, *Law of the Sea, Damages, Legislation, Legal aspects, Ships, Pollution abatement, Pollutants, Political constraints, Political aspects, Coasts, Arctic, Arctic Ocean, Water policy, Water quality, Coast Guard regulations, Oil pollution, Oil, Oil wastes.
Identifiers: *Arctic Water Pollution Prevention Act of 1970, *1969 Convention Relating to Intervention on the High Seas, *Oil tankers.

Coastal states have a significant interest in protecting their marine ecosystems from oil spills by large tankers. However, coastal states often must compete with the vessel's flag state for authority to protect their territorial seas from oil spills. The 1969 Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Public Law Convention) was convened to solve problems relating to the control and liability aspects of oil pollution. Results of this convention, as well as previous traditional approaches for handling problems relating to various uses of the high seas adjacent to coastal states, are discussed. Unilateral solutions on which states have embarked to preserve their interests, including the British Prevention Act and the Arctic Waters Pollution Prevention Act of 1970, are also presented. The report also describes U.S. implementation of legislation regarding the Public Law Convention and enumerates Coast Guard responsibilities under this legislation. (Josepher-Florida)
W78-01368

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THE APPLICATION OF EFFLUENT LIMITATIONS AND EFFLUENT GUIDELINES TO INDUSTRIAL POLLUTERS: AN ADMINISTRATIVE NIGHTMARE,
R. H. Bachmann.
Houston Law Review, Vol 13, No 2, p 348-377 (1976).

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Water pollution control, *Effluents, *Legal aspects, Water quality, Environmental effects, Pollution abatement, Pollutants, Political aspects, Law enforcement, Environmental control, Federal government, Regulation, Economic impact, Technology, Environment, Legal review.
Identifiers: *National Pollutant Discharge Elimination System, *Environmental Protection Agency.

Reviewed here are the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA). Major topics treated include: the National Pollutant Discharge Elimination System (NPDES); technology-related effluent limitations; problems the Environmental Protection Agency (EPA) has had in promulgating regulations and in meeting statutory deadlines; water quality-related effluent limitations; EPA and congressional interpretations that cost should be a factor in setting effluent guidelines; the concept and implications of transferable technology; and judicial review of effluent limitations. The extreme complexity of the Act, compounded by adverse reactions from various public groups, has resulted in many lawsuits against the EPA. These in turn have spawned further regulations and more confusion. Consequently, the EPA has not been able to concentrate on forming a more orderly process under which the FWPCA can work. (Josepher-Florida)
W78-01369

AN ANALYSIS OF TECHNICAL AND LEGAL ISSUES RAISED BY THE DEVELOPMENT OF COAL SLURRY PIPELINES,
N. T. Reed.
Houston Law Review, Vol 13, No 2, p 528-50 (1976).

Descriptors: *Coals, *Water conveyance, *Water importing, *Slurries, *Pipelines, Eminent domain, Water circulation, Political aspects, Legal aspects, Technology, Water permits, Water conservation, Water allocation(Policy), Railroads, Water shortage, Prior appropriation, Water costs, Water policy, Coal mines, Water users, Water utilities, Water yield, Water yield improvement.
Identifiers: *Coal slurry.

Coal slurry pipelines may be the best way to transport western coal to other parts of the country. The recent interest in the slurry pipeline raises legal and technical issues involving environmental concerns, eminent domain grants, railroad pipeline competition, and most significantly, water use. Water and pulverized coal are used in nearly equal proportions to make up the coal slurry. Since water is often scarce in western states, artificial sources of water supply must be found if the coal is to be transported by pipeline. A key legal issue apt to arise will involve the power of a state under its police power to regulate pipeline usage of water. Federal power to regulate in this area might be justified under the broad commerce powers of Congress. (Josepher-Florida)
W78-01370

MAPLE LEAF INVESTERS V. STATE, DEPARTMENT OF ECOLOGY (POWER TO RESTRICT DEVELOPMENT IN A FLOOD CONTROL ZONE).
565 P.2d 1162-66 (Wash. 1977).

Descriptors: *Washington, *Flood plain zoning, *Floodways, *Flood control, Flood damage, Flood plains, Floods, Land use, Land development, Permits, Eminent domain, Waterzoning, Flood protection, Historic floods, Legal aspects, Constitutional law, Damages, Public health, Judicial decisions, Regulation, Legislation.
Identifiers: *Property interests, *Land use controls, State policy, Administrative regulations.

The appellant land developer alleged that an act denying him permission to build single family homes in a flood control zone was unconstitutional. He contended that the act was an invalid exercise of the state's police power as well as taking without just compensation. The statute which the appellant challenged was passed in 1935 to alleviate flood damage to property, natural resources, health and safety. The Supreme Court of Washington, finding that the area in question had a long history of flooding, upheld the denial of the appellant's petition by the regulatory agency and the lower court as a proper exercise of police power. The court also decided that the establishment of a flood control zone along with the enactment of regulations restricting development within a floodway was not a public improvement in the usual sense of the term. The state did not propose to build any facilities or take any action which would increase the water over appellant's property or flood his land. For these reasons the court held that there was no taking. In addition, the regulations did not prohibit all buildings, merely those for residential purposes. (Maass-Florida)
W78-01371

BERKLEY V. STATE DEPARTMENT OF ENVIRONMENTAL REGULATIONS.
347 So. 2d 467-72 (Fla. Ct. App. 1977).

Descriptors: *Florida, *Seawalls, *Landfills, *Permits, Shore protection, State governments, Ecology, Protection, Legal review, Dredging, State jurisdiction, Administrative agencies, Environmental affects, Shores, Public lands, Judicial decisions, Legal aspects, Aquatic habitats, Water quality control, Boundaries(Property).
Identifiers: *Fill permits, Property interests, State policy, Environmental policy, Evidence, Marine ecosystem, Submerged lands.

Petitioner landowner challenged an order by respondent state agency denying his application for a permit to construct a seawall and fill his privately-owned lands. The petitioner's property lay within the boundaries established in 1974 for the Biscayne Bay Aquatic Preserve. No dredging or filling of submerged lands in the Biscayne Bay preserve was allowed except to enhance the quality of the preserve. A subsequent general statute, the Florida Aquatic Preserve Act of 1975, defining preserve boundaries excepted privately-held submerged lands lying landward of established bulkheads. The petitioner contented that under rules of statutory construction the later act superceded prior acts, especially where the later act contained a portion of the particular provisions of the former act. The First District Court of Appeal ruled that the petitioner's property was not subject to the dredge-and-fill prohibition in the Biscayne Bay Aquatic Preserve Act. Even if the act were applicable to the petitioner's property, the court held that the evidence presented demonstrated that the filling project would have enhanced the quality of the preserve. (Cocheu-Florida)
W78-01372

ADJUDICATION OF VESTED WATER RIGHTS; APPROPRIATION OF PUBLIC WATERS (DEFINITIONS AND GENERAL PROVISIONS).
Nev. Rev. Stat. secs 533.010 thru 533.085 (1975).

Descriptors: *Nevada, *Legislation, *Appropriation, *Adjudication procedure, Water rights, Water policy, Beneficial use, Water resources development, Water management(Applied), Preferences(Water rights), Regulation, Water allocation(Policy), Riparian rights, Legal aspects, Water law, Relative rights, Diversion, Eminent domain.
Identifiers: State policy, Property interests.

The water of all sources within the boundaries of Nevada belongs to the public. Subject to existing rights, all such water may be appropriated for beneficial use. Beneficial use is the basis, the measure and the limit of the right to the use of water. Since beneficial use of water is a public use, any person may exercise the right of eminent domain to condemn lands required for the lawful diversion of water. In addition, any person may store water for a beneficial purpose. However, the right to divert water exists only when necessary for a beneficial purpose. Rights to appropriation of water for beneficial purposes may be forfeited by disuse for five consecutive years, but perscriptive rights to use of such water cannot be acquired by adverse possession. A cubic foot of water per second of time is the legal standard for the measurement of water. The quantity of water which may be appropriated is limited to the amount reasonably required for the beneficial use to be served, as determined by the state engineer. Water users owning lands appurtenant to water may rotate the use of the supply to which they are entitled. All maps, surveys and measurements of water are made by a state water right surveyor, appointed by the state engineer. Qualifications for that appointment are listed. (Mulligan-Florida)
W78-01373

APPROPRIATION OF PUBLIC WATERS.
Nev. Rev. Stat. secs 533.325-533.435 (1975).

Descriptors: *Nevada, *Legislation, *Public rights, *Appropriation, Water permits, Water rights, Administrative decisions, Water policy, Beneficial use, Water resources development, Permits, Regulation, Water utilization, Water allocation(Policy), Construction, Water management(Applied), Preferences(Water rights), Priorities, Colorado River.
Identifiers: Groundwater management, Licenses.

Any person or corporation desiring to appropriate public waters in Nevada must apply to the state engineer for a permit. Applications are limited to water of one source and for one purpose. Information required in the application is specified. Notice of filing an application must be published within 30 days and interested persons may protest the granting of the application. All applications require the approval of the state engineer. When endorsing an application, the state engineer must set forth time limitations for the beginning and the completion of construction work, as well as time prior to which the complete application of water to a beneficial use must be made. Periodic work progress statements must be filed and prior to the completion deadline, a statement of proof of beneficial use must be submitted to the state engineer. After satisfactory proof has been made, the state engineer will issue a certificate of appropriation, subject to existing rights. The related fee schedule is listed. (Mulligan-Florida)
W78-01374

UNDERGROUND WATER AND WELLS.
Nev. Rev. Stat. secs 534.010 thru 534A.040 (1975).

Descriptors: *Nevada, *Legislation, *Well regulations, *Groundwater, *Water wells, Well permits, Administrative agencies, Subsurface waters, Wells, Regulation, Permits, Legal aspects, Percolating water, Aquifers, Domestic water, Groundwater resources, Water sources, Artesian wells, Drillers logs, Groundwater basins, Prior appropriation, Beneficial use, Drilling.
Identifiers: Groundwater management.

All underground waters within Nevada state boundaries belong to the public, subject to appropriation for beneficial use only. Ground water basins shall be supervised by either the state engineer or ground water boards. Guidelines for board membership and operation are given. Where necessary,

the state engineer may employ a well supervisor and assistants whose salaries and related expenses shall be paid from well drilling license fees. Water appropriation permit requirements and conditions for sinking wells are covered. Methods of acquisition and forfeiture of rights of appropriation of underground water for beneficial use from an artesian or definable aquifer are specified. Existing water rights are recognized and the state engineer shall adjudicate any claims of vested underground water rights. Rules dealing with forfeiture and abandonment of claims are set forth. The state engineer is authorized to prescribe all necessary rules to administer this chapter. Well drillers' licensing and fee regulations as well as the information required to be kept in their log are established. This chapter does not apply to the development and use of underground water for domestic purposes under certain conditions. (Mulligan-Florida)
W78-01375

COLORADO RIVER RESOURCES.
Nev. Rev. Stat. secs 538.041 thru 538.251 (1975).

Descriptors: *Nevada, *Legislation, *Colorado River, *Water resources development, State governments, Regulation, Administration, Management, Water management(Applied), Administrative agencies, Water policy, Administrative decisions, Interstate rivers, Rivers, Legal aspects, Contract administration, River regulation, Interstate commissions.
Identifiers: Administrative regulations, State policy.

Nevada has created the Colorado River Advisory Commission to advise the Administrator of the Division of Colorado River Resources. Members of the commission are appointed by the governor. Their qualifications, terms of office and guidelines for the commission are set forth. The Administrator collects and organizes all data connected with the Colorado River and represents the state in the negotiation and execution of contracts for power and reclamation projects. However, such contracts are not binding until approved by the governor. The Administrator also cooperates and negotiates with industry, other states and the federal government to obtain for the state maximum benefit from the Colorado river. Procedures governing the lease, sale and contracts of power and water are provided. Revenues derived from the power and water system will be placed in a Colorado River resources fund to defray cost of studies and analysis to develop sources of water and power related to the Colorado River. The Administrator generating machinery and other equipment. Priorities for the disbursement of revenues from the sale of water are given. (Mulligan-Florida)
W78-01376

CALIFORNIA-NEVADA INTERSTATE COMPACT.
Nev. Rev. Stat. sec 538.600 (1975).

Descriptors: *Nevada, *Legislation, *Interstate rivers, *Interstate compacts, State governments, Regulation, Administration, Management, Water management(Applied), Legal aspects, Water policy, River regulation, Rivers, River basin development, River basins, Water resources development, Interstate commissions, Equitable apportionment, Lakes, Watersheds(Basins), *California.
Identifiers: State policy, Administrative regulations.

The major purposes of the California-Nevada Interstate Compact are to promote equitable apportionment of water, governmental cooperation, and future development, use, conservation and control of water within the Lake Tahoe, Truckee River, Carson River and Walker River Basins. Guidelines for the creation, financing and general powers of a California-Nevada Compact Commission are stated. Information regarding storage rights and construction of an overflow weir for Lake Tahoe is given. Allocations and diversion rights for the waters of the Truckee and Carson Rivers are specified. Detailed plans for the distribution of waters of the Walker River are described, including allocations for the Topaz Reservoir and the Walker River Indian Reservation. Waters of the Walker River in excess of allocated amounts shall be administered by a watermaster nominated by the Commission. Both states have the right to develop ground waters and springs within their boundaries if such use does not reduce the water allocated to the other state, and either state may initiate proceedings if it believes its allocation is adversely affected. Violations of this compact shall be investigated by the commission which may take any necessary remedial action including injunctive relief. (Mulligan-Florida)
W78-01377

AMERICAN DREDGING CO. V. SELLECK (PERMIT REQUIREMENTS UNDER THE RIVERS AND HARBORS APPROPRIATION ACT OF 1899).
556 F.2d 180-84 (3rd Cir. 1977).

Descriptors: *Rivers and Harbors Act, *Navigable waters, *Permits, *Floodgates, *Dredging, Tidal marshes, Tidal waters, Federal jurisdiction, Tides, Rivers, Canal construction, State jurisdiction, Common law, Structures, Barriers, Drainage, Ditches, Channel improvement, Administrative agencies, Culverts, Flood control.
Identifiers: Estoppel, Corps of Engineers, Injunctive relief.

Plaintiffs dredging company and municipality sought to prevent enforcement of cease and desist orders issued by the Corps of Engineers for violation of the Rivers and Harbors Appropriations Act of 1899. The plaintiffs began construction after obtaining a state permit to erect floodgates and extend a ditch through the Delaware River estuary. They notified the Corps of their intentions but failed to apply for a federal permit. The Corps subsequently issued cease and desist orders for failure to obtain a permit. The plaintiffs contended that a permit was not necessary because the affected waters were not navigable, that the state permit was sufficient, or that alternatively the Corps should be estopped. The Third District Court of Appeals denied the plaintiffs' request to prevent enforcement. The court held that the construction would affect navigable waters because it would hinder the ebb and flow of the tide. In addition, the court found that the state authority to issue permits was derived from a federal statue that required Corps approval and finally that the Corps could not be stopped because the validity of the state permit was conditioned on issuance of a Corps permit. (Curran-Florida)
W78-01378

SAVE THE BAY, INCORPORATED V. ADMINISTRATOR OF ENVIRONMENTAL PROTECTION AGENCY (AVAILABILITY OF JUDICIAL REVIEW OF EPA FAILURE TO VETO STATE DISCHARGE PERMIT).
556 F.2d 1282-97 (5th Circuit 1977).

Descriptors: *Permits, *Federal Water Pollution Control Act, *Federal jurisdiction, *Waste water(Pollution), Mississippi, Chemical industry, Jurisdiction, Legislation, Pollutants, Pollution abatement, Industrial wastes, Governments, Legal review, Administrative decisions, Discharge(Water), Federal government, Environment, Judicial decisions, Ecology, Administrative agencies, State governments.
Identifiers: *National Pollution Discharge Elimination System, *Private interest groups, *Environmental Protection Agency, Citizen suits, Immunity(Legal aspects), Point sources(Pollution), Federal Water Pollution Control Act Amendments of 1972.

Plaintiff environmental organization sought a declaration that the Environmental Protection Agency (EPA) had unlawfully failed to revoke the National Pollution Discharge Elimination System authority of the Mississippi Air and Water Pollution Control Commission contending that the Commission's approval of a discharge permit for a titanium dioxide plant failed to follow EPA guidelines. The plaintiff also sought a review of the EPA's failure to block the discharge permit through its veto power over state Pollution Discharge Elimination System Commissions. Exercise of the veto requires a clear showing of the state's failure to follow EPA guidelines. Dismissing the petition, the Fifth Circuit Court of Appeals held that while the court had both the authority and obligation to review EPA decisions to withdraw or not to withdraw a state's delegated permit authority, it could not do so in this case since the plaintiff had not sought a complete administrative remedy by requesting the EPA to revoke the Commission's authority. As to review of the EPA failure to veto the permit in question, the court held that was properly a question for Federal District Courts rather than Circuit Courts of Appeals. (Spector-Florida)
W78-01379

UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON V. UNITED STATES (LIABILITY FOR COST OF WRECK REMOVAL).
557 F.2d 438-55 (5th Cir. 1977).

Descriptors: *Rivers and Harbors Act, *Navigation, *Legislation, *Ships, *Negligence, Transportation, Compensation, Cost repayment, Channels, Navigable waters, Harbors, Legal aspects, Accidents, Water law, Federal government, Judicial decisions, United States, Texas, Damages, Hazards.
Identifiers: *Limitation of Liability Act, Wrecks, *Navigation obstructions, Vessels, Corps of Engineers, Liability, Wreck removal.

In April 1974, an oceanographic research vessel owned by the appellant medical college collided with a tanker in Galveston Bay Channel. The tanker in turn collided with and sank a dredge owned by the Corps of Engineers. The federal government removed the sunken wreck at a cost of $3,000,000 and sued the appellant for removal costs under the Rivers and Harbors Act. The appellant contended that under the 1851 Limitation of Liability Act it was liable only up to $240,000, the value of the vessel. The United States Fifth Circuit Court of Appeals held that the Limitation Act did not apply to negligence suits brought under the Rivers and Harbors Act. It pointed out that in past cases the policy had been to allow the government recovery against negligent parties for removal of wrecks. To allow appellant to invoke the Limitation Act, the court felt, would place the burden of removal upon an innocent party. This would be contrary to past policy as well as unfair. The Limitation Act had never been extended to cover wreck removal expenses, and the court declined to do so here. (Malefatto-Florida)
W78-01380

SIERRA CLUB V. TRAIN (ENVIRONMENTAL PROTECTION AGENCY POLLUTION ABATEMENT ORDERS DISCRETIONARY UNDER FWPCA).
557 F.2d 485-91 (5th Cir. 1977).

Descriptors: *Pollution abatement, *Water pollution control, Federal Water Pollution Control Act, *Administrative decisions, *Waste disposal, Regulation, Jurisdiction, Rivers and Harbors Act, Water pollution, Legal aspects, Alabama, Administrative agencies, Legislation, Water quality standards, Water law, Federal government, United States, Water Quality Act, Effluents, Water policy, Political aspects.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Identifiers: Administrative regulations, Citizens suits, *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972, Effluent limitations.

Plaintiff environmental group sought to compel the Environmental Protection Agency (EPA) to issue a pollution abatement order against several corporations allegedly discharging refuse into navigable waters in Alabama. The plaintiff maintained that the Federal Water Pollution Control Act Amendments of 1972 required the defendant to issue such an order. The defendant contended that its duty was discretionary. The defendant also argued that the appeal was moot because the Corps of Engineers had brought suit under the Rivers and Harbors Act of 1899 to enjoin the corporations from such discharge. The United States Fifth Circuit Court of Appeals refused to dismiss for lack of mootness but did dismiss for lack of subject matter jurisdiction. The court stated that while under the Rivers and Harbors Act private citizens may force the EPA to perform mandatory duties, those duties imposed by the FWPCAA were discretionary. The court also pointed out that under the FWPCAA the plaintiff could bring suit directly against the polluters to enforce effluent limitation standards. (Malefatto-Florida)
W78-01381

UNITED STATES V. FEDERAL BARGE LINES, INC. (LIABILITY FOR COST OF REMOVING SUNKEN BARGE FROM RIVERBED).
433 F. Supp. 53-7 (E.D. Mo. 1977).

Descriptors: *Barges, *Transportation, *Rivers and Harbors Act, *Navigation, Damages, Mississippi River, Legal aspects, Negligence, Rivers, Dams, Sand bars, Inland waterways, Navigable waters, Compensation, Channels, Federal government, Judicial decisions, Cost repayment.
Identifiers: *Navigation obstructions, Corps of Engineers, Liability, Vessels.

Plaintiff federal government sued defendent towing and cement companies to recover the cost of removing the latter's sunken barge from the Mississippi River. The defendant's towboat was pulling barges upriver through a buoyed channel when one of the barges grounded on an unmarked obstruction, broke loose, and began to drift downstream. The towboat unsuccessfully attempted to recover the barge which eventually sank near a lock and dam administered by the Corps of Engineers. No damage occurred to these structures. The cement company abandoned the barge after an unsuccessful attempt to remove it. Four years later, the federal government had the wreck removed at a cost of $335,000. The United States District Court held that the government must prove the defendant's negligence in order to recover. Since the cause of the wreck was the unknown and unmarked obstruction in the river the court held the defendant was not negligent as a matter of law. The court also found that since the barge owner was not negligent, he had the right to abandon the barge and was not liable for the cost of removal under federal law. (Malefatto-Florida)
W78-01382

UNITED STATES V. OHIO BARGE LINES, INC. (LIABILITY FOR REMOVAL OF BARGES SUNK IN NAVIGABLE RIVERS).
432 F.Supp. 1023-28 (W.D.Pa. 1977).

Descriptors: *Rivers and Harbors Act, *Navigable waters, *Barges, *Cost repayment, Judicial decisions, Ohio River, Legal aspects, Legal review, Rivers, Harbors, Navigation, Navigable rivers, Federal government, Law enforcement, Water law, Legislation, Negligence, Accidents, Safety, Compensation.
Identifiers: Navigability, *Navigation obstructions, Liability, Vessels, Wreck removal.

Defendants barge company and river vessel moved to dismiss plaintiff United States' claim that the defendants had violated the Rivers and Harbors Act of 1899 by causing or permitting three barges to sink in the Ohio River. The government contended that the incident caused an obstruction to navigation in violation of Sections 403 and 409 of the Act. Pursuant to these sections the government claimed that the defendants were obligated to provide or pay for services to remove obstruction. Defendant barge company claimed no cause of action existed within the Third Circuit because the unintentional sinking of a barge creates no in personam rights under section 10 of the Act and a negligently sunken barge is no obstruction. In interpreting the word 'obstruction', the United States District Court, relying on previous case law which broadly interpreted Section 10, held that a barge sunk in any manner in a navigable river is an obstruction. The court further held that the government's power to protect the navigable capacity of rivers implies a right to be reimbursed for protecting the safety of others during the removal of sunken barges. (Mulligan-Florida)
W78-01383

JOHNSON V. MCCOWEN (APPORTIONMENT OF ALLUVION BETWEEN ADJOINING LITTORAL OWNERS).
348 So. 2d 357-61 (Fla. App. 1977).

Descriptors: *Adjacent land owners, *Florida, *Accretion(Legal aspect), Alluvium, *Riparian land, Littoral, Land tenure, Boundary disputes, Legal aspects, Real property, Boundaries(Property), Water law, Shores, Riparian rights, Riparian waters, Surveys, Beds, Ownership of beds, Channels.
Identifiers: *Declaratory judgments, Submerged lands.

The parties to this action are owners of adjoining littoral waterfront lots with an irregular shoreline. The appellants filed a complaint for declaratory judgment claiming that the original lot had increased in area due to natural accretion after the purchase of the lots from a common grantor and, therefore, a portion of the formerly submerged lands was their property. The apportionment of the alluvion desired by the appellants would restrict appellees' access to the waterfront. The Florida First District Court of Appeal upheld the trial court which had preserved to the parties substantially the same relative waterfront as each had at the time of the original conveyance. The aim of all rules as applied to adjoining littoral proprietors on an irregular shoreline is to give each, when possible, a fair and reasonable opportunity of access to the channel and a fair share of the land by giving him a share of the outward line proportional to a share of the line of original shore owned by him. The court said the lay of the upland shore line, the channel direction and the landowners' correlative rights should all be considered. (McPherson-Florida)
W78-01384

REGULATING USE OF OCEAN SHORE.
Ore Rev Stat secs 390.635 thru .760 (1973).

Descriptors: *Shore protection, *Coastal engineering, *Resources development, *Land resources, *Oregon, Legislation, Resources, Land development, Resource allocation, Planning, Water law, Land use, Land management, Landscaping, Oceans, Shores, Coasts, Coastal structures, Permits, Vegetation.

Regulation of improvements on Oregon's ocean shores is necessary to promote the public welfare and to preserve the financial and aesthetic value of such areas. Therefore, permits must be obtained from the State Highway Engineer before improvements may be made. This legislation promulgates standards for improvement permits and mandates the consideration of such things as the public need for conservation or for development of the resources of the area, stability of the area, trends of existing land uses, and the desirability of the land for future development. Permit decisions of the engineer may be appealed to the circuit court. Certain areas on the ocean shore may be zoned for motor vehicle or aircraft use. Furthermore, removal of rocks, sand, minerals or marine growth, other than souveniers or fish or wildlife must be in compliance with state permits. This section does not apply to certain densely vegetated land areas. (Josepher-Florida)
W78-01385

BEAR RIVER INTERSTATE COMPACT.
Idaho Code Ann sec 42-3402 (Supp 1976).

Descriptors: *Idaho, *Interstate compacts, *Interstate commissions, *Interstate rivers, Water resources development, Utah, Wyoming, State jurisdiction, Water allocation(Policy), Water distribution(Applied), Water resources, Domestic water, Water supply development, Water contracts, Reservoir storage.
Identifiers: *Bear River Compact(Idaho-Wyo-Utah).

Idaho has ratified the Bear River Compact along with Utah and Wyoming. The major purposes of the compact are to: eliminate controversies over the distribution and use of the waters of the Bear River; provide for efficient use of its waters; permit development of the waters of the Bear River; and promote interstate comity. An interstate administrative commission is created and empowered to: promulgate regulations consistent with this compact; conduct property transactions; enforce this compact; contract, sue and be sued; and cooperate with state and federal agencies in matters relating to water pollution of interstate significance. This compact specifies limitations on the states' rights to direct flow water. Storage rights for existing reservoirs are quantified and reserves for irrigation are designated. Uses of water for farm and ranch domestic, and stock watering purposes are allowed without deduction from specified allocations. The participating states and the United States shall have the right to construct or use water works in each of the states. Stored water, or water from another watershed may be turned into the channel of the Bear River in one state and a like quantity and quality may be taken out of the Bear River in another state. (Josepher-Florida)
W78-01386

ADJUDICATION OF WATER RIGHTS.
Idaho Code Ann. secs 42-1401 thru 1413 (1948), as amended, (Supp 1976).

Descriptors: *Idaho, *Water rights, *Adjudication procedure, *Legislation, *Prior appropriation, Priorities, Beneficial use, Water policy, Irrigation water, Irrigated land, Irrigation permits, Water utilization, Water permits, Water management(Applied), Water law, Water allocation(Policy).
Identifiers: *Appurtenant rights.

Idaho has enacted legislation providing that district courts, in adjudicating water rights, shall allot the waters of any stream according to the rights and priorities of those using the waters. Such allotments shall be made to the beneficial use to which the water is applied. Water rights which are applied to irrigational uses shall be appurtenant to the land irrigated. Appurtenant water rights shall pass with the conveyance of the attached land. Allocations for beneficial uses shall never be in excess of amounts used for beneficial purposes. Adjudication procedures for determining priority of rights to use of any state water system are described. Both private parties and the state department of water resources are authorized to bring suits to determine water rights. Furthermore, the department of water resources is vested with

power to investigate and evaluate claims filed. Its reports are filed with the district court. Court decrees shall be conclusive of the disputed rights of all existing claimants with any water user who has been joined but fails to appear and prove his claim barred from asserting rights adjudicated within the entered decree. (Josepher-Florida)
W78-01387

WATER IMPROVEMENT DISTRICTS.
Ore Rev Stat Ann secs 552.013 thru .438 (1973).

Descriptors: *Legislation, *Oregon, *Water districts, *Water management(Applied), *Governmental interrelations, Project planning, Public lands, Public benefits, Public utility district, Water contracts, Wafer conservation, Water policy, Water delivery, Water costs, Water control, Water resources development, Water rates.

Oregon has enacted legislation creating water districts whose purpose is to prevent flood damage and to improve agricultural and other uses of land and water in the public interest. Land owners in areas of one thousand acres or more may petition for the creation of a district. Elected boards of directors manage the districts and promulgate their rules. The districts constitute governmental subdivisions of the state. As such, they have powers to condemn, purchase and accept grants of land, contract for the operation of public works, undertake necessary construction projects, appropriate and acquire water rights, and otherwise act in the interest of the district. Water rates for domestic, industrial, and municipal purposes are fixed by the district. Furthermore, land designated for recreational purposes must also serve some other use in furtherance of irrigation, flood control, or water development. Finally, certain district engineering plans must be approved by the state, with open bidding and public hearings to be held regarding these engineering plans. (Josepher-Florida)
W78-01388

DRAINAGE AND FLOOD CONTROL (GENERAL PROVISIONS).
Ore. Rev. Stat. secs 549.010 thru .990 (1973).

Descriptors: *Legislation, *Oregon, *Flood control, *Water management(Applied), *Drainage programs, Federal government, Assessments, Cost allocation, Flow control, Property values, Project benefits, Project planning, Repairing, Local governments, Drainage, Drainage water, Dam failure, Dam construction, Dams, Dikes, Flood protection, Drainage districts, Drainage practices, Drainage area.

Oregon has enacted legislation giving county governments discretionary authority to contract with the federal government for federally-financed flood control projects. Landowners requiring drainage of their land may apply to the county court for permission to construct means of drainage over adjacent lands. Costs and damages to the lands affected are assessed against the applicant. Owners of land west of the Cascade Mountains may petition the county to drain such lands or improve natural drainage courses. Property owners who benefit from a common dike may make necessary repairs to the dike and recover reasonable costs in the event the contiguous property owner refuses to repair. The State Water Resources Board is authorized to acquire property and enter into contracts regarding desirable federal flood control projects. The state waives its immunity to suit. Counties with populations over 50,000 persons are given broad discretion in carrying out and contracting for water conservation and flood control projects. (Josepher-Florida)
W78-01389

STATE WATER RESOURCES BOARD (PURPOSE AND POWERS).
Ore Rev Stat secs 536.210 thru .490 (1973).

Descriptors: *Oregon, *Legislation, *Water policy, *Beneficial use, *Water resources development, Water rights, Water quality, Water management(Applied), Economic justification, Economic feasability, Conservation, Drainage effects, Water resources, Legal aspects, State governments, Priorities.

Oregon has enacted legislation which recognizes that it is in the public interest to develop and enforce a coordinated state water resources policy. Such a policy should secure maximum beneficial use of both existing and additional water supplies. A board is created to evaluate existing water resources and to formulate plans which augment and conserve such resources. Various policies to be considered by the board in formulating its plans include: regard for existing water rights and priorities; recognition that a coordinated water policy should be achieved for the maximum economic development of the state; regard for possible harmful effects resulting from drainage; and a preference for consumptive uses over mutually exclusive conflicting uses. The board shall classify water sources as to their highest and best use. Procedural guidelines delineating the board's duties with regard to other state and federal agencies are also detailed. (Josepher-Florida)
W78-01390

WATER POLLUTION CONTROL.
Ore Rev Stat secs 468.005 thru .075, 468.700 thru .997 (1973).

Descriptors: *Oregon, *Water quality control, *Legislation, *Water pollution control, *Water policy, Wastes, Effluents, Water rights, Water pollution, Water resources, Damages, Water policy, Waste water, Waste disposal, Water, Legal aspects, Oil spills, Oil wastes, Permits, Ships, Federal Water Pollution Control Act.

Oregon has enacted legislation to carry out its policy of conserving the waters of the state and of preventing and abating water pollution. This chapter creates a commission to enforce policy provisions and to perform all necessary acts. Effluent limitations for discharges into state waters are required to meet the guidelines set forth in the Federal Water Pollution Control Act. Water quality and purity standards should be set after consideration of several factors set forth in the act. Permits are required for the dumping of sewage and wastes into state waters, and persons who negligently or intentionally spill oil from ships or offshore facilities into state waters are made strictly liable for resultant damages to persons and property. (Josepher-Florida)
W78-01391

WYANDOTTE ORCHARDS, INC. V. OROVILLE-WYANDOTTE IRRIGATION DISTRICT (WATER ALLOTMENT FOR ENTIRE ACREAGE RATHER THAN DEVELOPED LAND).
123 Cal. Rptr. 135-41 (Cal. App. 1975).

Descriptors: *California, *Water contracts, *Water rights, *Irrigation districts, Contracts, Supply contract, Water users, Flow, Boundaries(Property), Water supply, Pipes, Water allocation(Policy), Water law, Legal aspects, Judicial decisions, Irrigated land, Regulated flow, Relative rights, Water policy.
Identifiers: Declaratory judgments.

Plaintiff landowner sought declaratory relief against defendant irrigation district. The action was based on an alleged contractual entitlement to water. Before 1922 an agreement was executed between the landowner and two water companies. Under this agreement the quantity to be supplied was twenty-five California miner's inches continuous flow annually. In 1922 the defendant took over the water service from these two companies. At that time landowners whose lands were outside the boundaries of the new district filed a protest because they feared they would be left without adequate protection as to future flow and rates. As a result the defendant district then agreed to supply 'present water users' with one inch of water for each four acres of land. In this action, the plaintiff claimed entitlement to water for his entire acreage. The defendant sought to limit the acreage to that portion developed at the time of the agreement. The California Third District Court of Appeal affirmed the trial court, holding that the phrase 'present water user' referred to the entire acreage of the water customer at the time of the takeover rather than the developed portion of the acreage. (Petruff-Florida)
W78-01392

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. STAMM (ADEQUACY OF FINAL ENVIRONMENTAL IMPACT STATEMENT).
430 F. Supp. 664-68 (N.D. Cal. 1977).

Descriptors: *Water allocation(Policy), *Water management(Applied), *Project planning, *Water delivery, *Water sources, Aquatic animals, Fish, Aquatic life, Aquatic environment, Aquatic habitats, Projects, Management, Governments, Decision making, Administrative agencies, Water resources development, Canals, Legal aspects, Water law, Return flow, Transportation, Reservoirs, Water quality, Non-structural alternatives, Judicial decisions.
Identifiers: Groundwater management, Private interest groups, *Environmental impact statements, Injunctive relief, Private interest groups, Standing(Legal), Administrative regulations, Evidence, Water rights(Non-riparians), Citizen suits.

Plaintiff environmental groups sought to enjoin defendant federal agency from proceeding with the San Felipe Division of the Central Valley Project which would transport large quantities of water from northern to southern California. The plaintiffs contended that the Final Environmental Impact Statement (EIS) for the proposed project was inadequate on the grounds that: (1) it failed to adequately consider the negative effects of the project on the water quality of the area proposed as the source of the water to be transported; (2) it did not adequately discuss alternatives to the proposed project; (3) it was deficient in dealing with seismic and safety problems relating to a particular dam and reservoir proposed by the project; and (4) it failed to adequately consider the negative impact upon the Pajaro River, its fish and surrounding groundwater. The United States District Court denied the injunction. The court said the purposes of an EIS are to enable decision makers to consider a project with full awareness of the environmental consequences, to inform the public, and to encourage public participation in information development. The court found the project EIS adequate since it fulfilled these purposes. (Brightman-Florida)
W78-01393

WARM SPRINGS DAM TASK FORCE V. GRIBBLE (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
431 F. Supp. 320-24 (N.D. Cal. 1977).

Descriptors: *Environmental effects, *Dam construction, *Earth dams, *Water quality, Archaeology, Flood control, Water supply, Recreation, California, Environmental engineering, National historic sites, Earthquakes, Earthquake engineering, Reservoirs, Faults(Geologic), Water law, Judicial decisions, Legislation, Impounded waters, Legal review, Federal jurisdiction, Multiple-purpose projects.
Identifiers: Citizen suits, Corps of Engineers, Dam effects, *Environmental impact statement, Injunctive relief.

Plaintiff citizens group filed suit against the Corps of Engineers charging that the environmental impact statement (EIS) for construction of an earth-fill dam was deficient in two areas: (1) in project safety because of potential damage by earthquake; and (2) in the water purity of the project reservoir. The trial court denied a preliminary injunction but ordered the Corps of Engineers to reconsider the project in light of the nomination of archaeological

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sites in the area for listing on the National Register of Historical Places. The appellate court, in observing that the Corps was reviewing the problems in question, remanded the case for consideration of the materials developed. At the hearing on the plaintiffs' motion for a permanent injunction, the United States District Court denied the motion holding that all segments of the EIS and its supplement fully complied with the National Environmental Policy Act. The court further stated that the proper forum for presentation of subsequently developed material not reasonably available to the preparers of the EIS was not the court but the executive branch officials who had the power to act. (Jones-Florida)
W78-01394

UNITED STATES V. PENNSYLVANIA ENVIRONMENTAL HEARING BOARD (GOVERNMENT CONTRACTOR-OPERATOR OF FEDERAL FACILITIES NOT IMMUNE FROM STATE REGULATION).
431 F.Supp. 747-55 (M.D. Pa. 1977).

Descriptors: *Waste water disposal, *Federal Water Pollution Control Act, *Federal jurisdiction, *Industrial wastes, Pennsylvania, Discharge(Water), State jurisdiction, Water pollution, Water pollution legislation, Sources, Effluents, Penalties(Legal), Water law, Permits, Administrative decisions, Judicial decisions.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Liability, Sovereign immunity, State policy, Immunity(Legal aspects).

The contractor-operator of an Army ammunitions plant was fined over one-and-a-half million dollars by Pennsylvania's Department of Environmental Resources for the discharge of untreated industrial wastes into a river without a permit in violation of Pennsylvania's Clean Streams Law. The United States then filed this action requesting that the state law be declared inapplicable against the United States, and that the civil penalty be declared invalid. The government based its argument on the fact that federal installations are shielded from regulation by the states in the absence of Congressional mandate. Both the Federal Water Pollution Control Act Amendments of 1972 and the Federal Clean Air Act require suits against federal facilities to be brought in federal district court. The United States District Court found, under a restrictive application of immunity, that the contractor was not a governmental agency and therefore not immune from suit. The argument that the state could only bring its action in federal court failed. The federal statutes were held to have no bearing upon the state's action and its penalty against the munitions manufacturer was upheld. (Jones-Florida)
W78-01395

EXXON CORP. V. TRAIN (EPA DENIED AUTHORITY TO REGULATE SUBSURFACE DISPOSAL OF WASTES).
554 F. 2d 1310-31 (5th Cir. 1977).

Descriptors: Federal Water Pollution Control Act, *Waste water disposal, *Discharge(Water), *Underground waste disposal, *Natural gas, Alabama, Permits, Administrative decisions, Judicial decisions, Legislation, Oil industry, Federal jurisdiction, State jurisdiction, Water pollution, Water pollution sources, Legal aspects, Water law, Administrative agencies.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Environmental Protection Agency.

The plaintiff operated a natural gas production facility which disposed of its waste water through discharge into surface pits and into a formerly producing oil well. After the enactment of the 1972 Amendments to the Federal Water Pollution Control Act (FWPCAA), the plaintiff applied to the Environmental Protection Agency (EPA) for a discharge permit. A permit for surface discharge was issued, but later the EPA asserted jurisdiction over the subsurface disposal. The plaintiff sought review of the EPA's jurisdictional claim, its denial of a permit modification authorizing subsurface disposal, and its denial of an adjudicatory hearing on the permit denial. The plaintiff argued that the EPA had jurisdiction only over pollutants to navigable waters. The EPA disclaimed direct authority to regulate subsurface disposal of waste water but claimed the authority to impose conditions in the surface discharge permits that would limit or prohibit subsurface disposal where both methods were used by a single applicant. The Fifth Circuit Court of Appeals examined the FWPCAA and its legislative history concluding that the act left control over subsurface pollution to the states until further studies, determined possible methods for handling the problem. (Jones-Florida)
W78-01396

HITCHINGS V. DEL RIO WOODS RECREATION AND PARK DISTRICT (NAVIGABILITY IN FACT DIFFERENT FROM NAVIGABILITY IN LAW).
127 Cal. Rptr. 830-38 (Cal. App. 1976).

Descriptors: *California, *Navigable waters, *Non-navigable waters, *Seasonal, Navigable rivers, Legal aspects, Judicial decisions, Rivers, Recreation, Regulation, Boating, Recreation facilities, Parks, River regulation, Public access, Water law, Streams, Riparian rights, Streamflow.
Identifiers: *Declaratory judgments, *Navigability tests, Water rights(Non-riparian).

Plaintiffs brought action against defendant recreation and park district to establish the right to free and unobstructed navigation of a portion of the Russian River. The lower court declared the river section involved to be nonnavigable. This finding was based on theories of navigability, implied dedication, prescription, and custom. Plaintiffs appealed and the appellate court reversed basing its decision solely on the theory of navigability. Although substantial evidence existed to support the lower court's finding that the river was not navigable in fact in all seasons in its natural condition, the First District Court of Appeal reversed holding that navigability in fact can be distinguished from navigability in law. Relying on cases from other jurisdictions, the court found that navigability in law is not dependent on navigability in fact at all times or all seasons, nor on continuity of use or capacity for use. The Russian River in its natural condition was found to be navigable in fact for approximately nine months every year. The court stated that this was a sufficient period to make the river useful under California's recreational boating test of navigability. (Petruff-Florida)
W78-01397

KOSMATKA V. DEPARTMENT OF NATURAL RESOURCES (PERMIT FOR STRUCTURES IN NAVIGABLE LAKES).
253 N.W. 2d 887-92 (Wis. 1977).

Descriptors: *Wisconsin, *Riparian land, *Permits, *Piers, Water rights, Navigable waters, Recreational facilities, Administrative agencies, Runoff, Administrative decisions, Docks, Lakeshores, Lakes, Flood flow, Penalties(Legal), Regulation, Water law, Riparian rights, Judicial decisions, Structures, Legal review.
Identifiers: Administrative regulations, Declaratory judgments, Property interests, Navigability, Notice, Public hearing, Nuisance(Legal aspects), Property, Navigation obstructions.

The plaintiff riparian landowner constructed a pier in a navigable lake and then sought a permit for the structure from the state agency. Following a public hearing on the structure's compliance with the statutory requirements, the state agency refused to issue a permit, found the pier to be in violation, and subsequently brought criminal action against the landowner when he did not either appeal the decision through proper channels or remove the pier. The plaintiff collaterally sought a declaratory judgment contending that the pier was exempt from the permit requirements since it complied with the statutory exemption. The trial court found for the plaintiff. The Wisconsin Supreme Court reversed holding that the plaintiff's failure to appeal through proper channels, and other procedural faults, precluded the declaratory judgment. The court said that the plaintiff's structural changes would allow him to petition the agency for a new hearing. The court also suggested the state agency be more specific in identifying the nature of a structure's non-compliance so that an owner might correct the problem. (Yawn-Florida)
W78-01398

SURVEYS, INVESTIGATIONS AND ADJUDICATION OF WATER RIGHTS.
N.M. Stat ann secs 75-4-1 thru -11 (1968).

Descriptors: *Public utilities, *New Mexico, Hydrographs, *Surveys, *Adjudication procedures, Water rights, Municipal water, Interstate rivers, Interstate, Hydrography, Hydrograph analysis, Condemnation, Eminent domain, Water supply, Water supply development, Water resources, Water users, Water utilization, State governments, Public benefits, Public rights, Public utility districts.
Identifiers: *Water bonds.

New Mexico has enacted legislation imposing the duty of establishing and constructing drainage systems on the state engineer who must co-operate with county commissioners and state surveyors. The county commissioners have the authority to condemn property for the development of a public water system. In addition, commissioners must issue water revenue bonds to pay the cost of acquiring property for the construction of a water supply system. No voter approval or consent from any governmental body is required prior to the issuance of water bonds. Hydrographic surveys shall be conducted by the state engineer in cooperation with agencies of the United States to determine water rights and approximations of water supplies. In addition, the state engineer shall administer the diversion and storage of waters from interstate streams in the public interest in cases where rights of owners in the state have been subject to litigation in courts of an adjoining state. (Josepher-Florida)
W78-01399

DITCHES OR ACEQUIAS.
N.M. Stat Ann sec 75-14-1 thru -61 (1968).

Descriptors: *Acequias, *New Mexico, *Ditches, *Local governments, *Irrigation ditches, Irrigation districts, Water management(Applied), Water policy, Water supply, Water zoning, Regulation, State governments, Jurisdiction, Irrigation water, Irrigation practice, Irrigated land, Water rights, Community development, Political aspects, Irrigation programs, Water law.

Ditches known as community ditches, which are not private, not incorporated under the laws of any state or territory, and which are held and owned by more than two owners as joint tenants, or tenants in common, are the subject of these New Mexican regulations. Community ditch associations and acequias, political subdivisions of the state, are controlled by three commissioners and a mayordomo, whose duties are statutorily defined. Persons failing to perform duties or pay fees relating to the welfare of the community ditch may be fined or deprived of use of such ditch water. Mayordomos are vested with power to regulate water from joint drainage outlets, change the location of ditches and acquire land through which ditches are to be opended, and prosecute persons illegally using ditch water. All inhabitants of New Mexico have the right to construct private or com-

mon acequias and to take water from any acequia which they desire, conditioned on just compensation to the person through whose land the acequia passes. (Josepher-Florida)
W78-01400

NATURAL RESOURCE CONSERVATION DISTRICT ACT.
N.M. Stat Ann Secs 45-5-42 thru 64 (1966), as amended, (Supp 1976).

Descriptors: *Water districts, *New Mexico, *Soil conservation, *Water conservation, Water management(Applied), Water resources development, Water control, Water resources, Water policy, Water supply development, Erosion control, Erosion, Recreation, Impounded waters, Soil surfaces, Water, Water injury, Conservation, Resources, Resource allocation, Soil erosion, Soil management.

New Mexico has enacted legislation creating a commission to promote soil and water conservation, prevent floodwater damage, and further recreational, environmental, and industrial uses of impounded water. The commission creates and oversees the operation of six natural resource conservation regions. Each region is further subdivided into geographical districts made up of a minimum of twenty-five landowners. These districts are political subdivisions of the state and are vested with broad contractual powers, authority to levy assessments, and the power to sue and be sued in the name of the district. Furthermore, districts are empowered to conduct research, publish findings, and administer various programs in furtherance of resource conservation and development. The act provides for the election and appointment of district members and the dissolution or amendment of existing districts. (Josepher-Florida)
W78-01401

FEDERAL WATER RESOURCES MANAGEMENT: THE ADMINISTRATIVE SETTING,
Resources for the Future, Inc., Washington, DC.
H. Ingram, and J. R. McCain.
Public Administration Review, Vol 37, No 5, p 448-455 September/October 1977. 1 tab, 18 ref.

Descriptors: *Water policy, *Federal government, *Water resources development, *Administrative agencies, Environment, Administration, Federal project policy, Institutional constraints, Institutions, Multiple-purpose projects, Project purposes, Water demand, Southwest US, Governments, Governmental interrelations, Regions, Colorado River Basin, Arizona, New Mexico, Water pollution, Political aspects, Political constraints, Public benefits, Water users, US Water Resources Council.
Identifiers: Environmental Protection Agency, Army Corps of Engineers, Office of Management and Budget, Fish and Wildlife Service.

The long-standing traditional administrative structure and policy arena of water resources is described, the forces for change are examined, and the current administrative setting and opportunities for future modification of water policy assessed. The traditional policy-making process has closely associated water resources with the various benefits, (but rarely the costs) of economic development and has proceeded on a perception of water as an unlimited birthright. Water policies have traditionally considered water to be infinitely divisible, and policy demands from groups and individuals have been highly fragmented. The active participation of different levels of government, especially states, has further fragmented water policy-making. The resulting policies bind together a large number of diverse interests so that programs will achieve wide consent and legitimization. These same 'log-rolling' practices have also governed interagency relationships. This approach has, however, become subject to two major pressures toward change: (1) prevailing patterns of water use have reached heretofore unacknowledged physical limits, and (2) groups with environmental interests are insisting on participating in decisions and may be difficult to accommodate within the traditional policy approach. Agencies involved in water resources management have attempted to adapt to these new stresses within the traditional approach. While the regulatory authority of the Environmental Protection Agency signals a potential basis for altering the traditional approach, in practice the agency has not significantly altered the on-going pattern of interagency relationships. Opportunities for future modifications may rest upon the physical limits of water becoming more obvious, as well as upon budgetary limitations. (Ullery-Arizona)
W78-01499

WATER-RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN ARIZONA 1977.
Army Engineer District, San Francisco, CA. South Pacific Div.
(1977), 80 p.

Descriptors: *Water resources development, *Arizona, *Federal government, *Projects, Multiple-purpose projects, Planning, Project purposes, Water resources, Water utilization, Project benefits, Federal project policy, Construction, Dam construction, Flood control, Flood plains, Investigations, Water supply, Water quality, Regulation, Legislation, Navigation, Navigable waters, Arid lands, Local governments, Civil engineering, Recreation facilities.
Identifiers: *Army Corps of Engineers.

The stated purpose of this book is to provide information on the scope and progress of current programs being undertaken by the Corp of Engineers in Arizona including the Corps' authorities for participating in water-resources development; its role in planning, constructing and operating projects; active investigations; and projects that are completed, under construction, or in the planning stage. An opening chapter concerning highlights of the agency's work in Arizona is followed by chapters devoted to each of the state's three subregions. Flood control projects, flood plain management services, emergency work, survey investigations, and multiple purpose storage projects in each region are described. A fifth chapter discusses the Corps participation in civil works projects concerning navigation, recreational development, water supplies, water quality, and flood control. Flood plain management services, investigative activities, special authorities, and regulatory functions of the agency are also treated. Two final chapters describe how the agency's projects are initiated, authorized, and constructed as well as how local interests share in Federal projects. A map of Corps of Engineers Projects in Arizona is attached at the end of the pamphlet. (Ullery-Arizona)
W78-01502

THE ROLE OF STATE LEGISLATION IN GROUND WATER MANAGEMENT,
Arizona Univ., Tucson. Coll. of Law.
For primary bibliographic entry see Field 4B.
W78-01503

6G. Ecologic Impact Of Water Development

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE DELAWARE COUNTY, OHIO BOARD OF COMMISSIONERS, OLENTANGY ENVIRONMENTAL CONTROL CENTER AND INTERCEPTOR SYSTEM.
Environmental Protection Agency, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-01230

RECOMMENDATIONS FOR MICROBIOLOGICAL STUDIES IN THE CONTINENTAL SHELF AREAS. RESULTS FROM TWO WORKSHOPS CONVENED 10-11 AUGUST 1976 AND 19-20 OCTOBER 1976 IN BOULDER, COLORADO. OUTER CONTINENTAL SHELF ENVIRONMENTAL ASSESSMENT PROGRAM.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5C.
W78-01274

FIELD STUDIES ON BENTHIC COMMUNITIES IN THE NEW ENGLAND OFFSHORE MINING ENVIRONMENTAL STUDY (NOMES),
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 5C.
W78-01275

REVIEW OF EXISTING INFORMATION ON FISHES IN THE DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES) AREA OF THE TROPICAL PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01276

PRELIMINARY RESULTS WITH A PILOT-PLANT WASTE RECYCLING-MARINE AQUACULTURE SYSTEM,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5D.
W78-01277

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, DES PLAINES, O'HARE CONVEYANCE SYSTEM.
For primary bibliographic entry see Field 5D.
W78-01280

COASTAL RESOURCE USE - DECISIONS ON PUGET SOUND,
Washington Univ., Seattle. Sea Grant Program.
R. L. Bish, R. Warren, L. F. Weschler, J. A. Crutchfield, and P. Harrison.
University of Washington Press, Seattle, 1975, 206 p.

Descriptors: *Estuarine environment, *Political aspects, *Human population, *Land use, *Washington, Administrative agencies, Commercial fishing, Land development, Local governments, Federal government, Fish management, Governmental interrelations, Industries, Lumbering, Pulp and paper industry, Recreation, Salmon, Regulation, Sport fishing, State governments, Water pollution control, Water pollution, Shores.
Identifiers: *Coastal zone management, *Land use controls, *State policy, Deep water port facilities, Groundwater management, Property interests.

Nearly two-thirds of the population of Washington state lives within the Puget Sound region. This study begins with a description of the geography of the Sound, and a detailed examination of the population, urbanization, employment, and income structure of the area. The major users of the Sound--recreation, transportation, logging, fishing, and other industries--must often compete for limited resources. The authors illustrate these environmental conflicts by describing the controversies concerning four proposals for major facilities in relatively undeveloped areas: a refinery, an aluminum reduction plant, a summer home and pleasure boat development, and a deep water port. The evolution of the Washington Shoreline Management Act from its proposed form to its final passage is used as an example of the political process in environmental decision-making. However, the Act provides no specific planning or conern for the Sound itself as an integrated

resources system. The authors conclude that the wide variety of governmental units responsible for the Sound have done a satisfactory job in creating an institutional structure for governing Puget Sound's resources that matches the diverse and complex resource system with the uses people make of it. (Jordan-Florida)
W78-01355

DESIGNATION OF NEW RIVER SEGMENT AS A COMPONENT OF THE WILD AND SCENIC RIVERS SYSTEM.
For primary bibliographic entry see Field 6E.
W78-01365

AN ANALYSIS OF TECHNICAL AND LEGAL ISSUES RAISED BY THE DEVELOPMENT OF COAL SLURRY PIPELINES,
For primary bibliographic entry see Field 6E.
W78-01370

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. STAMM (ADEQUACY OF FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W78-01393

WARM SPRINGS DAM TASK FORCE V. GRIBBLE (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W78-01394

CENTRAL KITSAP COUNTY WASTEWATER FACILITIES, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 5D.
W78-01407

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, DES PLAINES, O'HARE WATER RECLAMATION PLANT AND SOLIDS PIPELINE, VOLUME II. APPENDICES.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5D.
W78-01509

SANDUSKY RIVER BORDERS AND RESERVOIRS AS MIGRATORY BIRD REFUGES,
Heidelberg Coll., Tiffin, OH.
H. W. Hintz, and H. T. Barlett.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 245-252. 10 ref.

Descriptors: *Birds, *Migratory birds, *Migration patterns, *River basins, Ohio, Rivers, Reservoirs, Watersheds(Basins), Census, Lake Erie, Ponds, Insects, Seasonal.
Identifiers: *Sandusky River Basin(Ohio), Four flyways theory.

The Sandusky River Basin in Ohio, situated at the confluence of several bird migration routes, includes wooded valleys, large reservoirs, and numerous farm ponds which provide habitat in an area of urban sprawl and intensive agriculture. The basin's cool-weather production of addisflies, stoneflies, alderflies, mayflies, and other insects provides food at critical times (spring and fall) for the small nocturnal migrant birds which move in a broad front across the eastern United States. Dedar waxwings, warblers, vireos, and flycatchers all feed upon these insects. Day migrants, according to the 'four flyways theory' are influenced by major topographic features--the Atlantic coast, Mississippi River, Rocky Mountains, and the Pacific coast and mountains. Two 'tributaries' each of the Atlantic and Mississippi flyways meet at the western end of Lake Erie. The Sandusky River guides the two Mississippi flyway tributaries. With the loss of much of the Lake Erie habitat, the Sandusky Basin is becoming an important migration stop. High concentrations of the orders Gaviidae, Anatidae, Charadriidae, and Scolopacidae have been observed. The Beaver Creek Reservoir, built in 1972, is primarily responsible for an increase in recorded species in Seneca County from 205 to 228 between 1968 and 1975. Seven of the 14 new water birds can be directly attributed to the reservoir, as well as increases in the numbers of common loons and horned grebes. (See also W78-01518) (Lynch-Wisconsin)
W78-01528

THE ECOLOGY OF RUNNING WATERS: THEORY AND PRACTICE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 277-293. 5 fig, 2 tab, 8 ref.

Descriptors: *Ecology, *Rivers, *Streams, Lotic environment, Running waters, Watersheds(Basins), Classification, Watershed management, Water management(Applied), River basin development.

Lotic ecologists in the last 50 years have concentrated on smaller streams and rivers because of easier sampling and lesser human influence. But socioeconomic problems of flowing waters generally involve larger rivers, and it is important therefore to determine which elements of basic theory developed for smaller streams can be transferred to the larger rivers. Successful manipulation of running waters must involve (1) quantitative identification of key functional processes (theory); (2) derivation of procedures for continued assessment of community status (monitoring); and (3) adoption of procedures for maintaining or reestablishing functional balance (management). Modifications of existing classification systems of running water should include channel shape, watershed slope, temperature, discharge and runoff, and the light regime. Regardless of stream size, the overall watershed must always be considered. Broadly speaking, streams may be characterized as follows: Headwaters (orders 1-3): heterotrophic, light and nutrient poor, lesser temperature fluctuation, coarse sediments predominate. Medium-sized rivers (orders 4-6): often autotrophic, light and nutrient-rich, greater temperature fluctuation, finer sediments. Larger rivers (orders 7-12): usually heterotrophic, light-poor and nutrient-rich, lesser temperature fluctuation, fine sediments. Whereas 85% of all stream miles in the U.S. are in orders 1 to 3, the volume is in the higher orders; in higher stream orders the influence of upstream input becomes more important and terrestrial runoff less important. (See also W78-01518) (Lynch-Wisconsin)
W78-01530

SOME BRIEF REFLECTIONS ON THE SYMPOSIUM, THESE PROCEEDINGS AND WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Heidelberg Coll., Tiffin, OH.
For primary bibliographic entry see Field 5B.
W78-01534

DEVELOPMENT DOCUMENT FOR BEST TECHNOLOGY AVAILABLE FOR THE LOCATION, DESIGN, CONSTRUCTION AND CAPACITY OF COOLING WATER INTAKE STRUCTURES FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W78-01647

LAND USE REPORT.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-01653

CONCEPT DEFINITION OF THE ARMY ENVIRONMENTAL TECHNICAL INFORMATION SYSTEM,
Operations Research, Inc., Silver Spring, MD. Space and Communications System Div.
For primary bibliographic entry see Field 10D.
W78-01657

7. RESOURCES DATA

7B. Data Acquisition

ANALYSIS OF HYDROLOGICAL FEATURES OF PORTIONS OF THE LAKE ONTARIO BASIN USING SKYLAB AND AIRCRAFT DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W78-01186

VISCOSITY AND SURFACE TENSION EFFECTS ON WEIR FLOW,
Roorkee Univ. (India), Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-01286

PRECISION WITH WHICH SELECTED SOIL PHYSICAL PARAMETERS CAN BE ESTIMATED,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2G.
W78-01302

SPONTANEOUS CHANGES OF TRANSPIRATION UNDER CONSTANT ENVIRONMENTAL CONDITIONS, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
For primary bibliographic entry see Field 2I.
W78-01412

FLOWMETER MOUNTINGS SOLVE PROBLEMS IN MUNICIPAL I AND I STUDY,
P. Daniels.
Water and Sewage Works, Vol. 124, No. 9, p 94-95, September, 1977.

Descriptors: *Sewers, *Infiltration, *Inflow, *Flow measurement, *Sewerage, On-site data collections, Storm water, Combined sewers, Flow profiles, Flowmeters, Instrumentation, Logging(Recording), Waste water treatment.
Identifiers: Infiltration and inflow analysis.

An inflow and infiltration study conducted in Philadelphia, Pennsylvania, by Southern Line Cleaning, Inc., may become the prototype for evaluations of other vintage municipal sewer systems. Flow is being measured at master control points, key manhole meter locations, and other selected sites to provide information on dry and wet weather high groundwater conditions, and on the effects of rainfall. For simplification, the Philadelphia system was divided into a series of subsystems and mini-systems with a broad range of age variance. The systems were presented on a series of 121 plats to aid in selecting the approximately 500 meter locations used in the monitoring program. Several types of flowmetrs were tested for use in Philadelphia before the NB Instruments float meter was chosen, including ultrasonics systems and dipper meters. Offset of the manholes

instead of direct positioning above the sewers caused problems in centerline mounting of the meters. A modified type of transducer arrangement in which a roof-mounted bracket was equipped with a float rod appropriate to the effective head depth was used. Waterproof materials were necessary since the meter element may be submerged in a combined system's mainstream under conditions of high inflow. (Schulz-FIRL)
W78-01419

PSYCHROMETRIC ANALYSIS OF TURGOR PRESSURE RESPONSE: A POSSIBLE TECHNIQUE FOR EVALUATING PLANT WATER STRESS RESISTANCE,
Agricultural Research Service, Logan, UT. Crops Research Lab.
For primary bibliographic entry see Field 2I.
W78-01500

PERFORMANCE INVESTIGATION OF THE MANNING MODEL S-4000 PORTABLE WASTEWATER SAMPLER AND THE MODEL F-3000 DIPPER FLOWMETER,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-01516

HYDRAULIC SENSOR INSTRUMENTATION OF A SHORE FACE IN A TIDAL CURRENT CONVERGENCE ZONE--CAPE HENRY, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W78-01536

THE USE OF UNDERWATER EQUIPMENT IN FRESHWATER RESEARCH.
Virginia Polytechnic Inst. and State Univ. Blacksburg.
Sea Grant Report No. VPI-SG-77-03, April 1977. 71 p. George M. Simmons, Jr. Editor.

Descriptors: *Equipment, *Underwater, *Research equipment, *Scuba diving, Lakes, Reservoirs, Sampling, Freshwater, Temperate.
Identifiers: Underwater breathing.

The 25th annual meeting of the North American Benthological Society was held April 6, 1977, in Roanoke, Virginia. The following papers were presented: Research Diving: An Overview, by George M. Simmons, Jr.; Scuba, The Problem Solver in Sampling River Benthos, by William F. Gale; The Use of Underwater Research Equipment in Temperate Lakes and Reservoirs, by Charles I. Dubay; and The Use of Underwater Research Equipment in Large Lakes and Cold Water, by Lee H. Somers. (NOAA)
W78-01537

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, MD.
P. A. Castruccio, H. L. Loats, T. R. Fowler, and S. L. Frech.
Available from the National Technical Information Service, Springfield, VA 22161 as N75 25263, Price codes: A05 in paper copy, A01 in microfiche. Technical Report ECO 75:C-3-III. Sponsored by Goddard Space Flight Center, Greenbelt, Maryland, May 1975. 100 p, 26 fig, 15 tab, 29 ref.

Descriptors: *Remote sensing, *Hydrologic data, *Computer models, *Water resources development, Planning, Management, Data processing, Costs, Computer programs, Digital computers, Mathematical models.
Identifiers: *Computer usage, Data loads, Water resources users.

Principal water resources users were surveyed to determine the impact of remotely sensed data on hydrologic computer models. Analysis of responses has demonstrated that: (1) most water resources efforts suitable to remote sensing inputs are conducted by the 11 major Federal agencies or through Federally stimulated research; (2) most hydrologic models suitable to remote sensing data are Federally developed; and (3) Federal computer power is extensive. An analysis of current computer usage by major water resources users was made to determine the trends of usage and costs for the principal hydrologic users/models. The laws and empirical relationships governing the growth of the data processing loads were described and applied to project the future data loads. Data loads for ERTS CCT image processing were computed and projected through the 1985 era. The analysis shows significant impact due to the utilization and processing of ERTS CCT data. This impact and the mechanisms required to optimally utilize new remote sensing data were stressed. (Bell-Cornell)
W78-01541

REMOTELY SENSED AND LABORATORY SPECTRAL SIGNATURES OF AN OCEAN-DUMPED ACID WASTE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-01545

EXPERIENCE IN THE USE OF THE METHOD OF MICROELECTRICAL VERTICAL SOUNDINGS IN STUDYING IRRIGATED SOIL EVOLUTION, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
For primary bibliographic entry see Field 2F.
W78-01559

ANNUAL BOOK OF ASTM STANDARDS. PART 31. WATER.
American Society for Testing and Materials, Philadelphia, PA.
For primary bibliographic entry see Field 5A.
W78-01576

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, LAND USE-MARINE RESOURCES, VOLUME I-C.
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17552, Price codes: A00 in paper copy, A00 in microfiche. Report No. NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, September 1975 (3 Vol). 683 p. Smistad, O., Coordinator.

Descriptors: *Conferences, *Remote sensing, *Land use, *Surveys, Satellites(Artificial), Winds, Surface waters, Lakes, Water quality, Marshes, Coasts, Oceans, Salinity, Suspended solids, Mapping, Water temperature, Upwelling, Land classifications, Land resources, Terrain analysis.
Identifiers: *Marine resources, LANDSAT, Skylab.

The symposium combined a report on the utilization and the results of data from NASA programs involving LANDSAT, the Skylab Earth resources experiment package, and aircraft with information from other data acquisition programs. The primary emphasis was on the practical applications of Earth resources survey technology of interest to a large number of potential users. Also featured were scientific and technological exploration and research investigations with potential promising applications. Technical sessions were structured to provide governmental and private organizations with a comprehensive picture of various applications in the management and implementation of remote-sensing data use in their own programs. Volume I-C contained technical papers related to land use and marine resources. (See W78-01590 thru W78-01618) (Humphreys-ISWS)
W78-01589

AN EXAMINATION OF THE POTENTIAL APPLICATIONS OF AUTOMATIC CLASSIFICATION TECHNIQUES TO GEORGIA MANAGEMENT PROBLEMS,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4A.
W78-01590

OHIO'S STATEWIDE LAND USE INVENTORY: AN OPERATIONAL APPROACH FOR APPLYING LANDSAT DATA TO STATE, REGIONAL AND LOCAL PLANNING PROGRAMS,
Ohio Dept. of Economic and Community Development, Columbus. Div. of Community Services.
For primary bibliographic entry see Field 4A.
W78-01591

THE DESIGN, IMPLEMENTATION, AND USE OF A STATEWIDE LAND USE INVENTORY: THE NEW YORK EXPERIENCE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 4A.
W78-01592

ALASKAN RESOURCES, CURRENT DEVELOPMENT, TRADITIONAL CULTURAL VALUES, AND THE ROLE OF LANDSAT DATA IN CURRENT AND FUTURE LAND USE MANAGEMENT PLANNING,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W78-01593

CASES IN THE RELATION OF RESEARCH ON REMOTE SENSING TO THE DECISION-MAKERS IN A STATE AGENCY,
Wisconsin Univ.-Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 4A.
W78-01594

THE DEVELOPMENT OF A LAND USE INVENTORY FOR REGIONAL PLANNING USING SATELLITE IMAGERY,
Ohio-Kentucky-Indiana Regional Council of Governments, Cincinnati, OH.
For primary bibliographic entry see Field 4A.
W78-01595

THREE EXAMPLES OF APPLIED REMOTE SENSING OF VEGETATION,
Texas A and M Univ. College Station.
For primary bibliographic entry see Field 7C.
W78-01602

PRESENT AND POTENTIAL LAND USE MAPPING IN MEXICO,
Mexican Water Plan, Mexico City. Physical Resources and Water Uses Group.
For primary bibliographic entry see Field 4A.
W78-01603

APPLICATION OF LANDSAT AND SKYLAB DATA FOR LAND USE MAPPING IN ITALY,
Central Lab. for Geophotogrammetry and Remote Sensing, Munich (West Germany).
For primary bibliographic entry see Field 4A.
W78-01604

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

THE SIGNIFICANCE OF THE SKYLAB ALTIMETER EXPERIMENTsRESULTS AND POTENTIAL RESULTS,
Battelle Columbus Labds., OH.
A. G. Mourad, S. Gopalapillai, and M. Kuhner.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1887-1909, September 1975. 10 fig, 1 tab, 13 ref. NASA/JSC NAS913276, EPN 440.

Descriptors: *Oceans, *Surfaces, *Topography, *Remote sensing, *Mathematical models, Analytical techniques, Measurement, Profiles, Altitude, Height, Sea level, Analysis, Satellites(Artificial), Gravity, Geology, Navigation, Tides, Geophysics, Oceanography.
Identifiers: *Altimetry, Skylab, Geoid, Geodesy.

The Skylab Altimeter Experiment has proven the capability of the altimeter for measurement of sea surface topography. The geometric determination of the geoid/mean sea level from satellite altimetry is a new approach, having significant applications in many disciplines including geodesy and oceanography. A Generalized Least Squares Collocation Technique was developed for determination of the geoid from altimetry data. The technique solves for the altimetry geoid and determines one bias term for the combined effect of sea state, orbit, tides, geoid, and instrument error using sparse ground truth data. The influence of errors in orbit and a priori geoid values were discussed. Although the Skylab altimeter instrument accuracy is about + or - 1 m, significant results have been obtained in identification of large geoidal features, such as over the Puerto Rico trench. Comparison of the results of several passes showed that good agreement exists between the general slopes of the altimeter geoid and the ground truth, and that the altimeter appears to be capable of providing more details than are now available with best known geoids. The altimetry geoidal profiles show excellent correlations with bathymetry and gravity. Potential applications of altimetry results to geodesy, oceanography, and geophysics were discussed. (See also W78-01589) (Humphreys-ISWS)
W78-01605

A COMPARISON OF SKYLAB S-193 AND AIRCRAFT VIEWS OF SURFACE ROUGHNESS AND A LOOK TOWARD SEASAT,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.; National Oceanic and Atmospheric Administration, Miami, FL. Sea-Air Interaction Lab.
For primary bibliographic entry see Field 2L.
W78-01606

SKYLAB S-193 RADSCAT MICROWAVE MEASUREMENTS OF SEA SURFACE WINDS,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2L.
W78-01607

A PROCEDURE FOR ESTIMATION OF SEA-SURFACE TEMPERATURE FROM REMOTE MEASUREMENTS IN THE 10-13 MICROMETER SPECTRAL REGION,
Science Applications, Inc., La Jolla, CA.
For primary bibliographic entry see Field 2L.
W78-01608

SURFACE CIRCULATION IN THE GREAT LAKES AS OBSERVED BY LANDSAT-1 AUGUST 1972 TO DECEMBER 1973: SOUTHERN LAKE MICHIGAN,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2H.
W78-01609

OCEAN COLOR IMAGERY- COASTAL ZONE COLOR SCANNER,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-01610

SKYLAB INVESTIGATION OF THE UPWELLING OFF THE NORTHWEST COAST OF AFRICA,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-01611

THE FEASIBILITY OF UTILIZING REMOTELY SENSED DATA TO ASSESS AND MONITOR OCEANIC GAMEFISH,
K. J. Savastano, and T. D. Leming.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2023-2062, September 1975. 21 fig, 8 tab, 26 ref.

Descriptors: *Remote sensing, *Fisheries, *Oceans, *Gulf of Mexico, Model studies, Forecasting, Distribution, Fish, Monitoring, Chlorophyll, Water temperature, Turbidity, Salinity, Oceanography, Testing, Satellites(Artificial), Aerial photography, Instrumentation, On-site investigations, Analytical techniques, Analysis, Evaluation, Measurement.
Identifiers: *Game fish, Skylab, Dolphin, Wahoo, Tuna.

An investigation was conducted to establish the feasibility of utilizing remotely sensed data acquired from aircraft and satellite platforms to provide information concerning the distribution and abundance of oceanic gamefish. The data from the test area were jointly acquired by NASA, the Navy, the Air Force, and NOAA/NMFS elements and private and professional fisherman in the northeastern Gulf of Mexico. The data collected has made it possible to identify significant environmental parameters for white marlin. Prediction models, based on catch data and surface truth information, have been developed and have demonstrated a potential for significantly reducing search by identifying areas that have a high probability of productivity. Three of the parameters utilized by the models, chlorophyll-a, sea surface temperature, and turbidity, were inferred from aircraft sensor data and have been tested. Effective use of Skylab data was inhibited by cloud cover and delayed delivery. Initial efforts toward establishing the feasibility of utilizing remotely sensed data to assess and monitor the distribution of oceanic gamefish has successfully identified fisheries significant oceanographic parameters and demonstrated the capability of remotely measuring most of the parameters. (See also W78-01589) (Humphreys-ISWS)
W78-01612

LANDSAT DIGITAL DATA PROCESSING - A NEAR REAL-TIME APPLICATION,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
J. Barker, C. Bohn, L. Stuart, and J. Hill.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2063-2073, September 1975. 5 fig.

Descriptors: *Remote sensing, *Data processing, *Timing, *Feasibility studies, *Gulf of Mexico, Upwelling, Plankton, Sediments, Monitoring, Oceans, On-site investigations, Analytical techniques, Satellites(Artificial), Evaluation.
Identifiers: *Mississippi plume, LANDSAT.

Reported herein was an application of rapid generation of classed digital images form LANDSAT-1, and an evaluation by NASA in conjunction with the Environmental Protection Agency, Texas A and M University, and the Cousteau Society of its feasibility. The primary purpose was to show that satellite data could be processed and transmitted to the Calypso, which was used as a research vessel, in time for use in directing it to specific locations of possible plankton upwellings, sediment, or other anomalies in the coastal water areas along the Gulf of Mexico. LANDSAT data were received at Goddard Space Flight Center. Computer Compatible Tapes produce from the original wide band video tapes were analyzed, classified on an interactive computer system, and monochromatic prints facsimiled via the ATS-3 satellite to the Calypso, located approximately 25 kilometers offshore. This process was completed in 20 hours for one site and in less than three days for the other sites. Of the four LANDSAT-1 images examined, two were cloud-free. Large areas of silt and sediment were identified off the coasts of Florida and Louisiana. The rapid analysis of the LANDSAT images proved useful in determining the relative locations of different types of water while underway at sea, resulting in a more meaningful sampling program. (See also W78-01589) (Humphreys-ISWS)
W78-01613

QUANTITATIVE SUSPENDED SEDIMENT MAPPING USING AIRCRAFT REMOTELY SENSED MULTISPECTRAL DATA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
R. W. Johnson.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2087-2098, September 1975. 5 fig, 3 tab, 6 ref.

Descriptors: *Suspended solids, *Remote sensing, *Tidal waters, *Virginia, Mapping, Estuaries, Monitoring, Analytical techniques, Analysis, Evaluation, Water quality, Movement, Chlorophyll, Secchi disks, On-site investigations, Surveys, Dispersion, Regressional analysis.
Identifiers: James River(VA).

Suspended sediment is an important environmental parameter for monitoring water quality, water movement, and land use. Quantitative suspended sediment determinations were made from analysis of aircraft remotely sensed multispectral digital data. A statistical analysis and derived regression equation were used to determine and to plot quantitative suspended sediment concentration contours in the tidal James River, Virginia, on May 28, 1974. From the analysis, a single band, Band 8 (0.70-0.74 microns), was adequate for determining suspended sediment concentrations. A correlation coefficient of 0.89 was obtained with a mean inaccuracy of 23.5% for suspended sediment concentrations up to about 50 mg/l. Other water quality parameters - secchi disc depth and chlorophyll - also had high correlations with the remotely sensed data. Particle size distributions had only a fair correlation with the remotely sensed data. Additional remotely sensed data in conjunction with ground truth from a number of environmentally different areas will be required to further define the accuracy of and conditions under which regression equations for quantitative analysis of digital multispectral data may be applied. (See also W78-01589) (Humphreys-ISWS)
W78-01615

REMOTE SENSING OF SALINITY,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W78-01616

AUTOMATIC INTERFACE MEASUREMENT AND ANALYSIS,
National Aeronautic and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
K. H. Faller.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2127-2146, September 1975. 7 fig, 2 tab, 6 ref.

Descriptors: *Remote sensing, *Coasts, *Alabama, *Mississippi, *Mississippi River, Length, Measurement, Monitoring, Interfaces, Land, Water, Land classification, Marshes, Vegetation, Mapping, Evaluation, Data processing, Deltas.
Identifiers: LANDSAT.

A technique for detecting and measuring the interface between two categories in classified scanner data was described together with two application demonstrations. Measurements were found to be accurate to 1.5% RMS error on features of known length, while comparison of measurements made using the technique on LANDSAT data to opisometer measurements on 1:24,000 scale maps showed excellent agreement. Application of the technique to two frames of LANDSAT data classified using a two channel, two class classifier resulted in a computation of 64 km annual measured using LANDSAT data. Based on the measurement of this portion, the total tidal shoreline length of Alabama is estmated to be 1313 kilimeters. (See also W78-01589) (Humphreys-ISWS)
W78-01617

THE MAPPING OF MARSH VEGETATION USING AIRCRAFT MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 7C.
W78-01618

SURGE ACTIVITY ON THE BARNES ICE CAP,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W78-01637

HELLEY-SMITH BED LOAD SAMPLERS,
Agricultural Research Service, Boise, ID.
For primary bibliographic entry see Field 2J.
W78-01641

A PROCEDURE USED FOR A GROUND TRUTH STUDY OF A LAND USE MAP OF NORTH ALABAMA GENERATED FROM LANDSAT DATA,
National Aeronautics and Space Administration, Huntsville, AL. George C. Marshall Space Flight Center.
For primary bibliographic entry see Field 7C.
W78-01651

A COMPARISON OF OCEANIC PRECIPITATION AS MEASURED BY GAGE AND ASSESSED FROM WEATHER REPORTS,
National Oceanic Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2B.
W78-01656

7C. Evaluation, Processing and Publication

ANALYSIS OF HYDROLOGICAL FEATURES OF PORTIONS OF THE LAKE ONTARIO BASIN USING SKYLAB AND AIRCRAFT DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
F. C. Polcyn, D. L. Rebel, and J. E. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18613, Price codes: A05 in paper copy, A01 in microfiche. ERIM 102300-19-F, January 1976. 111 p, 28 fig, 9 tab, 16 ref, 1 append. NASA NAS9-13275.

Descriptors: *Remote sensing, *Watersheds(Basins), *Lake Ontario, *Soil moisture, Satellites(Artificial), Aircraft, Model studies, Mathematical models, Data processing, Photography, Water quality, Currents(Water), Lakes, Wetlands, Vegetation, Soil water, Computer models, Computer programs, Hydrology.
Identifiers: *Skylab.

The usefulness of Skylab and aircraft data for mapping features of hydrological interest in portions of the Lake Ontario drainage basin was investigated. S190A and S190B photographic coverage is useful for mapping large-scale geomorphological features and for assessing water depth and water quality. The available S192 data were affected by low frequency noise due to a diode light which was inadvertently left of during data collection, but data preparation was successful in partially reducing this problem. The resulting data were processed using a red, near IR, and thermal band to produce a map and areal statistics of hydrologically significant features. A thermal model and a reflectance model for determination of soil moisture were developed and implemented on aircraft data over a site where field determinations of soil moisture had been made. The reflectance model appears to have promise for inferring surface soil moisture in partially vegetated terrain. (Sims-ISWS)
W78-01186

TIME SERIES ANALYSIS ON AMMONIA CONCENTRATION AND LOAD VALUES OF THE RIVER RHINE,
Nijmegen Univ. (Netherlands). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-01219

SAMPLING AND ANALYSIS OF MINNESOTA TRIBUTARIES AND MUNICIPAL POINT SOURCES TO LAKE SUPERIOR.
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5B.
W78-01229

WORLD DATA CENTER A: GLACIOLOGY.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 10C.
W78-01272

A LEAST SQUARES METHOD FOR COMPUTING STATISTICAL TOLERANCE LIMITS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
J. R. Wallace, and J. L. Grant.
Water Resources Research, Vol 13, No 5, p 819-823, October 1977. 2 fig, 9 ref. ARS 12-14-7001-98.

Descriptors: *Statistical methods, *Statistics, *Least squares method, Hydrologic data, Precipitation(Atmospheric), Runoff, Streamflow, Equations, Numerical analysis, Mathematics, Hydrology.
Identifiers: *Tolerance limits.

Statistical analysis often requires the fitting of a probability density function to sample data in order to estimate either the population parameters or a particular percentile point of the population. In either case, the exact determination of the population values cannot be expected because a sample generally does not completely describe the population. The theories of statistical confidence regions and tolerance limits allow inferences to be drawn regarding relationships between the estimates and the corresponding unknown population values. A least squares procedure was devised which allows the construction of confidence regions and tolerance limits for arbitrary distribution functions. The class errors were defined as the difference between the sample histogram and the expected frequency based upon the density function. Equations were presented which define the confidence region and tolerance limits. (Sims-ISWS)
W78-01307

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1976.
Geological Survey, Jackson, MS. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 754, Price codes: A15 in paper copy, A01 in microfiche. Water-Data Report MS-76-1, April 1977. 342 p, 5 fig.

Descriptors: *Mississippi, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Mississippi consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of wells. This report contains discharge records for 79 gaging stations, stage records for 15 of these gaging stations, stage only records for 4 gaging stations, contents for 4 lakes and reservoirs; water quality for 20 gaging stations and 1 miscellaneous site, and water levels for 168 observation wells. Also included are data for 138 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Mississippi. (Woodard-USGS)
W78-01317

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1975.
Geological Survey, Okemos, MI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 807, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report MI-75-1, August 1976. 574 p, 8 fig, 5 tab, 31 ref.

Descriptors: *Michigan, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 207 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 57 continuous-record stations, 169 partial-record stations, and 3 lakes; and water levels for 29 observation wells. Also included are 104 crest-stage partial-record stations and 43 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are

published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Michigan. (Woodard-USGS)
W78-01318

WATER RESOURCES DATA FOR CONNECTICUT, WATER YEAR 1976.
Geological Survey, Hartford, CT. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 782, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report CT-76-1, April 1977. 449 p, 3 fig.

Descriptors: *Connecticut, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Connecticut consist of records of stage, discharge, and water quality of streams; contents and water quality of lakes and reservoirs; and water levels and water quality in wells. This report contains discharge records for 59 gaging stations; tidal volume for 1 gaging station; stage only records for 3 tidal-gaging stations; contents for 36 lakes and reservoirs; water quality for 80 gaging stations, 3 lakes, and 13 wells; and water levels for 24 observation wells. Also included are 59 crest-stage partial-record stations and 45 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Connecticut. (Woodard-USGS)
W78-01319

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1975.
Geological Survey, Tucson, AZ. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 326, Price codes: A20 in paper copy, A01 in microfiche. Water-Data Report AZ-75-1, September 1976. 440 p, 7 fig, 4 tab, 19 ref.

Descriptors: *Arizona, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Arizona consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of observation wells. This report contains discharge records for 221 gaging stations, 185 crest-stage partial-record stations, and discharge measurements at 60 miscellaneous sites; stage records at 3 gaging stations; stage and contents records for 10 lakes and reservoirs; 17 supplementary records, included with gaging-station records, consisting of monthend or monthly stage, contents, and evaporation of lakes and reservoirs, diversion, and return flows; water-quality records for 58 continuous-record stations, 4 partial-record stations, and 30 miscellaneous sites; and water levels for 95 observation wells. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal and State agencies in Arizona. (Woodard-USGS)
W78-01320

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1975.
Geological Survey, Madison, WI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 825, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report WI-75-1, October 1976. 569 p, 8 fig, 4 tab, 26 ref.

Descriptors: *Wisconsin, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1975 water year for Wisconsin include records of streamflow at gaging stations, partial-record stations, and miscellaneous sites; records of reservoir storage, records of chemical, physical, and biological characteristics of surface water, ground water, and precipitation; and records of water levels in observation wells. Records for a few gaging stations in bordering States also are included. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Wisconsin. (Woodard-USGS)
W78-01321

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1975.
Geological Survey, Honolulu, HI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 668, Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report HI-75-1, March 1976. 401 p, 26 fig, 4 tab, 27 ref.

Descriptors: *Hawaii, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.
Identifiers: *Guam, *American Samoa.

Water resources data for the 1975 water year for Hawaii and other Pacific areas consist of records of stage, discharge, and water quality of streams; stage of a reservoir; and water levels and water quality in wells and springs. This report contains discharge records for 164 gaging stations; stage only record for 1 gaging station; water quality for 10 gaging stations, 56 partial-record flow stations and 113 wells; and water levels for 8 observation wells. Also included are 107 crest-stage partial-record stations and 103 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, Territorial, and Federal agencies in Hawaii and other Pacific areas. (Woodard-USGS)
W78-01322

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1976.
Geological Survey, Indianapolis, IN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 885, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report IN-76-1, April 1977. 363 p, 3 fig, 22 ref.

Descriptors: *Indiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 192 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 36 gaging stations, and water levels for 47 observation wells. Also included are 119 crest-stage partial-record stations and 49 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS)
W78-01323

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1975.
Geological Survey, Boise, ID. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 998, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report ID-75-1, July 1976. 684 p, 22 fig, 6 tab, 40 ref.

Descriptors: *Idaho, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report contains discharge records for 192 gaging stations; stage only records for 2 gaging stations; stage for 6 lakes; contents for 24 lakes and reservoirs; water-quality for 100 gaging stations, 59 partial-record stations, 2 lakes, and 33 wells; and water levels for 79 observation wells. Also included are data for 58 crest-stage partial-record stations and 180 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Idaho. (Woodard-USGS)
W78-01324

WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1975.
Geological Survey, Charleston, WV. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 742, Price codes: A13 in paper copy, A01 in microfiche. Water-Data Report WV-75-1, November 1976. 288 p, 4 tab, 3 fig, 32 ref.

Descriptors: *West Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for West Virginia consist of records of stage, discharge, and water quality of streams and springs; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 131 gaging stations stage only records for 1 gaging station, stage and

contents for 6 lakes and reservoirs, contents for 1 reservoir, water quality for 41 gaging stations, and water levels for 37 observation wells. Also included are 38 crest-stage partial-record stations and 9 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in West Virginia. (Woodard-USGS)
W78-01325

WATER RESOURCES DATA FOR IOWA, WATER YEAR 1976.
Geological Survey, Iowa City, IA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 992, Price codes: A15 in paper copy, A01 in microfiche. Water-Data Report IA-76-1, April 1977. 319 p, 6 fig.

Descriptors: *Iowa, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Iowa consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 112 gaging stations, stage and contents for 8 lakes and reservoirs, water quality for 41 gaging stations, and water levels for 43 observation wells. Also included are 128 crest-stage partial-record stations, 321 low-flow partial-record stations, and 249 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. The data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Iowa. (Woodard-USGS)
W78-01326

WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1976.
Geological Survey, Champaign, IL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 379, Price codes: A20 in paper copy, A01 in microfiche. Water-Data Report IL-76-1, March 1977. 464 p, 4 fig.

Descriptors: *Illinois, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 167 gaging stations, stage only records for 5 gaging stations, stage and contents for 3 lakes and reservoirs, stage only for 5 lakes stations, water quality for 45 gaging stations, and water levels for 3 observation wells. Also included are data for 151 crest-stage partial-record stations and 251 flood-profile stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Illinois. (Woodard-USGS)
W78-01327

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 1. OHIO RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 022, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report OH-76-1, May 1977. 611 p, 2 fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Ohio River.
Identifiers: *Ohio River Basin(Ohio).

Water resources data for the 1976 water year for Ohio, presented in two volumes (Vol. 1, Ohio River basin; Vol. 2, St. Lawrence River basin), consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report in the two volumes contains discharge records for 166 gaging stations, stage and contents for 32 lakes and reservoirs, water quality for 156 gaging stations, 131 partial-record stations and 164 wells, and water levels for 46 observation wells. Also included are 67 crest-stage partial-record stations and 65 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (See also W78-01329) (Woodard-USGS)
W78-01328

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1976--VOLUME 2. ST. LAWRENCE RIVER BASIN.
Geological Survey, Columbus, OH. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 023, Price codes: A10 in paper copy, A01 in microfiche. Water-Data Report OH-76-2, May 1977. 216 p, 2 fig.

Descriptors: *Ohio, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.
Identifiers: *St. Lawrence River basin(Ohio).

Water resources data for the 1976 water year for Ohio, presented in two volumes (Vol. 1, Ohio River basin; Vol. 2, St. Lawrence River basin), consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report in the two volumes contains discharge records for 166 gaging stations, stage and contents for 32 lakes and reservoirs, water quality for 156 gaging stations, 131 partial-record stations and 164 wells, and water levels for 46 observation wells. Also included are 67 crest-stage partial-record stations and 65 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Ohio. (See also W78-01328) (Woodard-USGS)
W78-01329

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 1. DELAWARE RIVER BASIN.
Geological Survey, Harrisburg, PA. Water Resources Div.
Water-Data Report PA-76-1, June 1977. 371 p, 12 fig, 4 tab.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Delaware River.
Identifiers: *Delaware River basin(Pa).

Water resources data for the 1976 water year for Pennsylvania consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report on the Delaware River basin, contains discharge records for 84 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 40 gaging stations, 54 partial-record stations, and water levels for 16 observation wells. Also included are 41 crest-stage partial-record stations and 31 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (See also W78-01331 and W78-01332) (Woodard-USGS)
W78-01330

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
Water-Data Report PA-76-2, September 1977. 395 p, 7 fig, 1 tab.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Potomac River.
Identifiers: *Susquehanna River basin(Pa), *Potomac River basin(Pa).

Water resources data for the 1976 water year for Pennsylvania consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report on the Susquehanna and Potomac River basins, contains discharge records for 92 gaging stations; stage and contents for 10 lakes and reservoirs; watr quality for 38 gaging stations, 15 partial-record stations, and water levels for 30 observation wells. Also included are 24 crest-stage partial-record stations and 46 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (See also W78-01330) (Woodard-USGS)
W78-01331

WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1976--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS.
Geological Survey, Harrisburg, PA. Water Resources Div.
Geological Survey Water-Data Report PA-76-3, August 1977. 262 p, 6 fig.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Ohio.
Identifiers: *Ohio River basin(Pa), St. Lawrence River basin(Pa).

Water resources data for the 1976 water year for Pennsylvania consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report on the Ohio and St. Lawrence River basins, contains discharge records for 93 gaging stations; stage and contents for 22 lakes and reservoirs; water quality for 3 gaging stations and water levels for 20 observation wells. Also included are 12 crest-stage partial-record stations and 27 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (See also W78-01330) (Woodard-USGS)
W78-01332

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
Water-Data Report TX-76-1, July 1977. 565 p, 1 tab.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites.
Identifiers: *Arkansas River basin, *Red River basin, *Neches River basin, *Sabine River basin, *Trinity River basin.

Surface-water data for the 1976 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 1) includes the Arkansas River, Red River, Sabine River, Neches River, Trinity River, and intervening Coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W78-01334 and W78-01335) (Woodard-USGS)
W78-01333

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
Water-Data Report TX-76-2, July 1977. 411 p, 1 tab.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites.
Identifiers: *San Jacinto River basin, *Brazos River basin, *San Bernard River basin.

Surface-water data for 1976 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 2) includes the San Jacinto River, Brazos River, San Bernard River and intervening Coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W78-01333) (Woodard-USGS)
W78-01334

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1976--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, TX. Water Resources Div.
Water-Data Report TX-76-3, July 1977. 557 p, 1 tab.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites.
Identifiers: *Colorado River basin, *Lavaca River basin, *Guadalupe River basin, *Nueces River basin, *Rio Grande basin.

Surface-water data for the 1976 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 3) includes the Colorado River, Lavaca River, Guadalupe River, Nueces River, Rio Grande, and intervening Coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W78-01333) (Woodard-USGS)
W78-01335

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1975.
Geological Survey, Anchorage, AL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 228, Price codes: A18 in paper copy, A01 in microfiche.
Water-Data Report AK-75-1, December 1976. 410 p, 1 fig, 4 tab, 32 ref.

Descriptors: *Alaska, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Alaska consist of records of stage, discharge, and water quality of streams; stage and water quality of lakes; and water levels and water quality in wells and springs. This report contains discharge records for 107 gaging stations; stage only records for 2 gaging stations; water quality for 31 stations; and water levels for 19 observation wells. Also included are 85 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements of discharge, lake stage, or water quality. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alaska. (Woodard-USGS)
W78-01336

WATER RESOURCES DATA FOR MAINE, WATER YEAR 1976.
Geological Survey, Augusta, ME. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 930, Price codes: A10 in paper copy, A01 in microfiche.
Water-Data Report ME-76-1, May 1977. 216 p, 3 fig.

Descriptors: *Maine, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Maine consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 66 gaging stations, stage only records for 2 gaging stations, contents for 17 lakes and reservoirs, water quality for 13 gaging stations and 22 wells, and water levels for 17 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies. (Woodard-USGS)
W78-01337

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1975.
Geological Survey, Albuquerque, NM. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 548, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report MN-75-1, October 1976. 603 p, 5 fig, 4 tab, 39 ref.

Descriptors: *New Mexico, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for New Mexico consist of records of discharge and

water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 201 gaging stations; stage and contents for 23 lakes and reservoirs; water quality for 62 gaging stations, 77 partial-record flow stations, 1 reservoir, 47 springs and 197 wells; and water levels for 93 observation wells. Also included are 162 crest-stage partial-record stations and 2 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Mexico. (Woodard-USGS)
W78-01338

WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1976.
Geological Survey, Huron, SD. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 453, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report SD-76-1, March 1977. 435 p, 6 fig.

Descriptors: *South Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for South Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 96 gaging stations, stage and contents for 10 lakes and reservoirs, water quality for 26 gaging stations, and water levels for 16 observation wells. Also included are 105 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Dakota. (Woodard-USGS)
W78-01339

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 800, Price codes: A09 in paper copy, A01 in microfiche. Water-Data Report NH-VT-75-1, December 1976. 186 p, 2 fig, 3 tab, 30 ref.

Descriptors: *New Hampshire, *Vermont, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data Collections, Sites.

Water-resources data for the 1975 water year for New Hampshire and Vermont consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 91 gaging stations, stage records for 5 lakes, monthend contents for 27 lakes and reservoirs, water-quality data for 5 continuing stations and 16 partial-record stations, and water levels for 17 wells. Also included are data for 42 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations in the bordering States and in the Province of Quebec also are included in this report. The data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Hampshire and Vermont. (Woodard-USGS)
W78-01340

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1975.
Geological Survey, Boston, Mass. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 801, Price codes: A13 in paper copy, A01 in microfiche. Water-Data Report MA-RI-75-1, December 1976. 288 p, 4 fig, 3 tab, 30 ref.

Descriptors: *Massachusetts, *Rhode Island, *Hydrologic data, *Surface waters, *Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1975 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 111 gaging stations, monthend contents for 15 lakes and reservoirs, water quality for 24 gaging stations and 14 wells, and water levesl for 44 observation wells. Also included are data for 10 low-flow partial-record stations and 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations in the bordering States are included. The data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Massachusetts and Rhode Island. (Woodard-USGS)
W78-01341

SYSTEM CONTROLS TREATMENT PLANT.
For primary bibliographic entry see Field 5G.
W78-01442

ASSESSMENT OF MATHEMATICAL MODELS FOR STORM AND COMBINED SEWER MANAGEMENT, APPENDIX F: SELECTED COMPUTER INPUT AND OUTPUT,
Battelle Pacific Northwest Labs., Richland, WA. Water and Land Resource Dept.
For primary bibliographic entry see Field 5B.
W78-01514

SIMULATION OF NUTRIENT LOADINGS IN SURFACE RUNOFF WITH THE NPS MODEL,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5B.
W78-01515

CALIBRATION OF ROUGHNESS PARAMETERS FOR MATHEMATICAL MODELS OF RIVERS WITH FLOOD-PLAINS USING DYNAMIC PROGRAMMING, (IN GERMAN),
For primary bibliographic entry see Field 8B.
W78-01540

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
Ecosystems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W78-01541

COMPARISON OF COMPUTER SIMULATION MODELS WITH FIELD DATA FROM NEARSHORE ENVIRONMENTS,
Williams Coll. Williamstown, MA.
For primary bibliographic entry see Field 2H.
W78-01543

PROCEEDINGS OF THE NASA EARTH RESOURCES SURVEY SYMPOSIUM, JUNE 1975, TECHNICAL SESSION PRESENTATIONS, LAND USE-MARINE RESOURCES, VOLUME I-C.
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-01589

AN EXAMINATION OF THE POTENTIAL APPLICATIONS OF AUTOMATIC CLASSIFICATION TECHNIQUES TO GEORGIA MANAGEMENT PROBLEMS,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4A.
W78-01590

OHIO'S STATEWIDE LAND USE INVENTORY: AN OPERATIONAL APPROACH FOR APPLYING LANDSAT DATA TO STATE, REGIONAL AND LOCAL PLANNING PROGRAMS,
Ohio Dept. of Economic and Community Development, Columbus. Div. of Community Services.
For primary bibliographic entry see Field 4A.
W78-01591

THE DESIGN, IMPLEMENTATION, AND USE OF A STATEWIDE LAND USE INVENTORY: THE NEW YORK EXPERIENCE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 4A.
W78-01592

ALASKAN RESOURCES, CURRENT DEVELOPMENT, TRADITIONAL CULTURAL VALUES, AND THE ROLE OF LANDSAT DATA IN CURRENT AND FUTURE LAND USE MANAGEMENT PLANNING,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W78-01593

THE DEVELOPMENT OF A LAND USE INVENTORY FOR REGIONAL PLANNING USING SATELLITE IMAGERY,
Ohio-Kentucky-Indiana Regional Council of Governments, Cincinnati, OH.
For primary bibliographic entry see Field 4A.
W78-01595

LUMIS-A LAND USE MANAGEMENT INFORMATION SYSTEM FOR URBAN PLANNING,
Caltech Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 4A.
W78-01596

SATELLITE INFORMATION ON ORLANDO, FLORIDA,
Brevard County Planning Dept., Titusville, FL.
For primary bibliographic entry see Field 4A.
W78-01597

REMOTE SENSING IMPACT ON CORRIDOR SELECTION AND PLACEMENT,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Thomson, and A. N. Sellman.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1729-1745, September 1975. 11 fig, 1 tab, 3 ref.

Descriptors: *Highways, *Locating, *Michigan, *Planning, Remote sensing, Environment, Model studies, Analytical techniques, Land use, Computer models, Data processing, Mapping, Sites, Social aspects, Environmental effects.
Identifiers: LANDSAT.

Computer-aided corridor selection techniques, utilizing digitized data bases of socio-economic, census, and cadastral data, were developed for highway corridor routing. The Environmental Research Institute of Michigan has generated land resource data form various remote sensing data sources, and in cooperation with Transportation (MDSHT), has successfully merged the land resource data generated from LANDSAT-1 with the ancillary data files of MDSHT corridor selection model, and has designed proto-type highway corridors using the combined data set. A case study demonstrated the application of the model in selecting a highway corridor. (See also W78-01589) (Humphreys-ISWS)
W78-01598

IMPROVED RESOURCE USE DECISIONS AND ACTIONS THROUGH REMOTE SENSING,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 6B.
W78-01599

DEVELOPMENT OF USER APPLICATIONS FOR EARTH RESOURCES SURVEY DATA IN URBAN AND REGIONAL PLANNING IN THE PUGET SOUND AREA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 4A.
W78-01600

APPLICATION OF SATELLITE REMOTE-SENSING DATA,
Alaska Univ., College. Geophysical Inst.
W. J. Stringer, J. M. Miller, A. E. Shapiro, and J. H. Anderson.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975. Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1785-1795, September 1975. 4 fig, 9 ref. USDI/BOIR E00C14201079 NASA NGL 02-001-092.

Descriptors: *Remote sensing, *Mapping, *Alaska, *Land classification, Land use, Maps, Natural resources, Exploration, Forest, Vegetation, Analysis, Geologic investigations, Surveys, Mining.
Identifiers: LANDSAT, Thermatic maps.

The Alaskan regional Native corporations currently are engaged in the selection of land entitlements authorized in the Alaska Native Claims Settlement Act by the U.S. Congress in 1971. Vegetation maps delineating potential commercial timber and maps of suggested mineral prospecting areas of seven scattered regions were prepared by interpretation of LANDSAT images, coupled with a limited amount of ground truth. Images acquired both in winter and summer seasons were registered to township maps and used in making interpretations of the areal extent of commercial timber potentials. The amount of snow cover visible through the forest canopies was found to be a useful indicator of timber potentials. No attempt was made to estimate timber volume. The satellite images were also interpreted to identify the nature of bedrock where this was possible. Identification was also made of characteristic topographic features which are typical of flood plain deposits or of the well-developed trellis drainage patterns which can indicate the strike of structural grain of underlying Cretaceous sedimentary rocks. The presence of igneous and mixed igneous and metamorphic rocks was indicated by combinations of spectral differences and anomalous interruptions of satellite data was performed on a spot basis by inspection from low altitude aircraft. Good conformity was found between the timber maps prepared from the satellite images and the selected test areas. (See also W78-01589) (Humphreys-ISWS)
W78-01601

THREE EXAMPLES OF APPLIED REMOTE SENSING OF VEGETATION,
Texas A and M Univ. College Station.
J. W. Rouse, Jr., A. R. Benton, R. W. Toler, and R. H. Haas.
In: Proceeding of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use -Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 1797-1810, September 1975. 6 photos. NASA NGL 44-001-001.

Descriptors: *Vegetation, *Monitoring, *Remote sensing, *Texas, Aquatic plants, Control, City planning, Mapping, Land use, Lakes, Surveys, Aerial photography, Analytical techniques, Analysis, Land development, Turf grasses, Law enforcement, Regulation.

This paper described three very different cases in which remote sensing techniques were adapted to assist in the solution of particular problem situations involving vegetation in Texas. In each case, the final sensing technique developed for operational use by the concerned organizations employed photographic sensors which were optimized through studies of the spectral reflectance characteristics of the vegetation species and background conditions unique to the problem being considered. The three examples described were: (1) assisting aquatic plant monitoring and control; (2) improving vegetation utilization in urban planning; and (3) enforcing the quarantine of Diseased Crops. (See also W78-01589) (Humphreys-ISWS)
W78-01602

PRESENT AND POTENTIAL LAND USE MAPPING IN MEXICO,
Mexican Water Plan, Mexico City. Physical Resources and Water Uses Group.
For primary bibliographic entry see Field 4A.
W78-01603

APPLICATION OF LANDSAT AND SKYLAB DATA FOR LAND USE MAPPING IN ITALY,
Central Lab. for Geophotogrammetry and Remote Sensing, Munich (West Germany).
For primary bibliographic entry see Field 4A.
W78-01604

THE SIGNIFICANCE OF THE SKYLAB ALTIMETER EXPERIMENT-RESULTS AND POTENTIAL RESULTS,
Battelle Columbus Labds., OH.
For primary bibliographic entry see Field 2L.
W78-01605

SKYLAB S-193 RADSCAT MICROWAVE MEASUREMENTS OF SEA SURFACE WINDS,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2L.
W78-01607

A PROCEDURE FOR ESTIMATION OF SEA-SURFACE TEMPERATURE FROM REMOTE MEASUREMENTS IN THE 10-13 MICROMETER SPECTRAL REGION,
Science Applications, Inc., La Jolla, CA.
For primary bibliographic entry see Field 2L.
W78-01608

SURFACE CIRCULATION IN THE GREAT LAKES AS OBSERVED BY LANDSAT-1 AUGUST 1972 TO DECEMBER 1973: SOUTHERN LAKE MICHIGAN,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2H.
W78-01609

LANDSAT DIGITAL DATA PROCESSING - A NEAR REAL-TIME APPLICATION,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-01613

NEARSHORE COASTAL MAPPING,
Environmental Research Inst. of Michigan, Ann Arbor.
F. C. Polcyn, and D. R. Lyzenga.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2075-2086, September 1975. 6 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Bathymetry, *Coasts, *Lake Michigan, *Puerto Rico, *Mapping, Seashores, Water quality, Beds under water, Oceans, Surveys, Lakes, Analysis, Analytical techniques, Evaluation, Sounding, Shallow water, Satellites(Artificial), Data processing.
Identifiers: Skylab.

Two test sites of different water quality and bottom topography were used to test for maximum water depth penetration using the Skylab S-192 MSS for measurement of nearshore coastal bathymetry. Sites under investigation lay along the Lake Michigan coastline where littoral transport acts to erode sand bluffs and endangers developments along 1,200 miles of shore, and on the west coast of Puerto Rico where unreliable shoal location and depth information constitutes a safety hazard to navigation. The S-192 and S-190A and B provide data on underwater features because of water transparency in the blue/green portion of the spectrum. Depth to 20 meters were measured with the S-192 in the Puerto Rico test site. The S-190B photography, with its improved spatial resolution, clearly delineates the triple sand bar topography in the Lake Michigan test site. Several processing techniques were employed to test for maximum depth measurement with least error. The results are useful for helping to determine an optimum spectral bandwidth for future space sensors where a bottom reflection is detectable. (See also W78-01589) (Humphreys-ISWS)
W78-01614

QUANTITATIVE SUSPENDED SEDIMENT MAPPING USING AIRCRAFT REMOTELY SENSED MULTISPECTRAL DATA,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 7B.
W78-01615

REMOTE SENSING OF SALINITY,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W78-01616

AUTOMATIC INTERFACE MEASUREMENT AND ANALYSIS,
National Aeronautic and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 7B.
W78-01617

THE MAPPING OF MARSH VEGETATION USING AIRCRAFT MULTISPECTRAL SCANNER DATA,
National Aeronautics and Space Administration, Bay St. Louis, MS. Earth Resources Lab.
M. K. Butera.
In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Land Use-Marine Resources, Volume I-C. Report No. NASA TM X-58168, Symposium held June 9-12, 1975, Houston, Texas, p 2147-2166, September 1975. 27 fig, 3 tab, 8 ref.

Descriptors: *Remote sensing, *Coastal marshes, *Louisiana, *Mapping, Marshes, Coasts, Salinity, Vegetation, Monitoring, On-site investigations, Water, Interfaces, Aerial photography, Brackish water, Freshwater.

A test was conducted to determine if salinity regimes in coastal marshland could be mapped and monitored by the identification and classification of marsh vegetative species from aircraft multispectral scanner data. The data was acquired at 6.1 km (20,000 ft.) on October 2, 1974, over a test area in the coastal marshland of southern Louisiana including fresh, intermediate, brackish and saline zones. The data was classified by vegetational species using a supervised, spectral pattern recognition procedure. Accuracies of training sites ranged from 67% to 96%. Marsh zones based on free soil water salinity were determined from the species classification to demonstrate a practical use for mapping marsh vegetation. (See also W78-01589) (Humphreys-ISWS)
W78-01618

RAINFALL ANALYSIS FOR DRAINAGE DESIGN, VOLUME II, LONG-DURATION PRECIPITATION DATA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2B.
W78-01649

A PROCEDURE USED FOR A GROUND TRUTH STUDY OF A LAND USE MAP OF NORTH ALABAMA GENERATED FROM LANDSAT DATA,
National Aeronautics and Space Administration, Huntsville, AL. George C. Marshall Space Flight Center.
S. W. Downs, Jr., G. C. Sharma, and C. Bagwell.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA TND-8420, Price codes: A04 in paper copy, A01 in microfiche. Technical Note D-8420, February 1977. 62 p, 27 fig, 6 tab, 6 ref.

Descriptors: *Remote sensing, *Satllites(Artificial), *Land use, *Alabama, Forests, Surface waters, Wetlands, Agriculture, Cities, Ranges, Snow cover, Data processing, Classification, Land classification, Analytical techniques.
Identifiers: *LANDSAT-1.

A land use map of a 5 county area in North Alabama was generated from LANDSAT data using a supervised classification algorithm. There was good overall agreement between the land use designated and known conditions, but also there were obvious discrepancies. In ground checking the map, two types of errors were encountered, shift and misclassification; and a method was developed to eliminate or to reduce greatly the errors. Randomly selected study areas containing 7,525 pixels were analyzed. Overall, 76.3% of the pixels were classified correctly. A contingency coefficient of correlation was calculated to be 0.7, which is significant at the alpha = 0.01 level. The study showed that land use maps generated by computers from LANDSAT data are useful for overall land use by regional agencies. However, care must be used when making detailed analysis of small areas. The procedure used for conducting the ground truth study together with data from representative study areas were presented in this report. (Sims-ISWS)
W78-01651

AD HOC ADVISORY PANEL ON EVALUATED PHYSICAL PROPERTY DATA IN AID OF AQUEOUS ENVIRONMENTAL PROBLEMS.
National Academy of Sciences and National Research Council, Washington, DC. Numerical Data Advisory Board.
For primary bibliographic entry see Field 5B.
W78-01654

CONCEPT DEFINITION OF THE ARMY ENVIRONMENTAL TECHNICAL INFORMATION SYSTEM,
Operations Research, Inc., Silver Spring, MD. Space and Communications System Div.
For primary bibliographic entry see Field 10D.
W78-01657

8. ENGINEERING WORKS

8A. Structures

WATER-RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN ARIZONA 1977.
Army Engineer District, San Francisco, CA. South Pacific Div.
For primary bibliographic entry see Field 6E.
W78-01502

THE RAJASTHAN CANAL PROJECT,
For primary bibliographic entry see Field 3F.
W78-01505

8B. Hydraulics

EROSION BY IMPINGING CIRCULAR TURBULENT JETS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-01284

ERODIBILITY OF COARSE SAND-CLAYEY SILT MIXTURES,
Lehigh Univ., Bethlehem, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-01285

VISCOSITY AND SURFACE TENSION EFFECTS ON WEIR FLOW,
Roorkee Univ. (India), Dept. of Civil Engineering.
K. G. Ranga Raja, and G. Lal Asawa.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY10, p 1227-1231, October 1977. 2 fig, 1 tab, 9 ref, 1 append.

Descriptors: *Weirs, *Discharge measurement, *Discharge coefficient, *Flowmeters, Hydraulics, Water properties, Overflow, Equations, Laboratory tests, Measurement, Viscosity, Surface tension, Analysis, Discharge(Water).
Identifiers: Sharp crested weirs, Triangular weirs.

Weirs have been in use for a number of decades for the measurement of discharge in channels. The existing discharge relations for weirs predict the discharge reasonably well at high heads; however, the accuracy of these relations is questionable at low heads. This is mainly due to the fact that the effects of viscosity and surface tension of the liquid are important at low heads. Proposed discharge equations for predicting discharge at low heads introduced a correction factor to account for the effects of viscosity and surface tension. The experimentally determined correction factors were presented graphically. In general, the data presented indicated an error of + or - 5% in the prediction of discharge. (Humphreys-ISWS)
W78-01286

BOUNDARY LAYER DEVELOPMENT IN OPEN WATER-CHANNEL,
Cambridge Univ. (England). Engineering Lab.
A. M. Binnie.
Journal of Hydraulic Research, Vol. 15, No. 3, p 203-210, 1977. 3 fig, 3 tab, 7 ref.

Descriptors: *Boundary layers, *Open channel flow, *Mathematical models, *Laboratory tests, Theoretical analysis, Model studies, Equations, Channel flow, Laminar flow, Numerical analysis, Approximation method, Hydraulics, Flow, Foreign research.

In accordance with experiments on a horizontal rectangular channel supplied steadily from a reservoir through a contraction, the boundary layer on the bottom was taken as laminar and two-dimensional, and the main stream above it was supposed at every cross section to possess uniform velocity. Simple alternative shapes were assumed for the boundary layer, as in well-known aeronautical theory. With the aid of the continuity and momentum equations, convergent numerical results were obtained; and it was found that, as the boundary layer thickens downstream, the free surface falls very slightly and the velocity of the main stream increases. The energy equation also was examined and provides a check on the previous work. The calculated boundary layer thickness was not inconsistent with measurements made in a channel 14 in. wide and 6 ft long. (Humphreys-ISWS)
W78-01299

LOCAL SCOUR AROUND CYLINDRICAL PIERS,
Waterloopkundig Lab., Delft (Netherlands).
H. N. C. Breusers, G. Nicollet, and H. W. Shen.
Journal of Hydraulic Research, Vol. 15, No. 3, p 211-252, 1977. 34 fig, 90 ref.

Descriptors: *Scour, *Piers, *Reviews, *Alluvial channels, Cohesionless soils, Erosion, Depth, Sediments, Documentation, Flow characteristics, Vortices, Eddies, Laboratory tests, On-site investigations, Erosion control, Model studies, Hydraulic models, Hydraulics.
Identifiers: Cylindrical piers.

A 'state of the art' report on the subject of local scour around cylindrical piers was given. After a description of the scouring process, a critical review of literature on model and field data was presented, and the empirical data were compared with theoretical considerations. The final result is a set of design suggestions together with possibilities for protection against scour. Although it was possible to present a wealth of experimental data and useful design relations have been developed, it cannot be said that all aspects of local scour near bridge piers have been cleaned up. Theoretical developments are limited, and there is not much hope for a rapid success in this complicated interaction of flow field and sediment transport. More experimental data for large diameter piers in the full range of water depths and sufficiently large flow velocity would be helpful to test the relations given. Also, prototype data are needed to improve the relations developed on the basis of

model experiments. The data would have to give relevant information of geometry, bed material, and flow field, and therefore, are difficult to obtain because maximum scour depth will occur during floods. (Humphreys-ISWS)
W78-01300

EVALUATION OF SEDIMENT CONTROL DAMS,
Pennsylvania Dept. of Transportation, Harrisburg. Bureau of Materials, Testing and Research.
For primary bibliographic entry see Field 4D.
W78-01313

ECONOMIC OPTIMIZATION OF RELIEF SEWER DESIGN,
Florida Univ., Gainesville, Dept. of Civil Engineering.
S. Graham.
Water and Pollution Control, Vol 115, No 9, p 27-28, September, 1977. 1 fig, 7 ref.

Descriptors: *Mathematical models, *Design criteria, *Sewers, *Storm water, *Combined sewers, Hydrologic aspects, Urban runoff, Storm runoff, Costs, Cost-benefit analysis, Sewerage, Pipes, Municipal wastes, Waste water treatment.

While sewer design capacities must be adequate to handle the expansion of urban areas, designs to accomodate the largest, most intense storms may be prohibitively expensive. A 'rational formula' is often used to compute the maximum discharge for an arbitrary design storm, but the method may have several drawbacks. In-system storage and surcharge can not be predicted because pipes have free surface flow. Water quality and flows in pipe networks without steady, uniform conditions can not be measured. Problems with flooding or surcharging are normally solved with pipe enlargement or twinning, although these procedures are not necessarily cost-effective. Various storm water management models, such as SSWMM and WRE, have been developed to allow analysis of surcharge and flows through a pipe system. Although the use of the models may require expensive data collection, actual running costs are low and the models can be used to find the lowest cost solution to the local storm water problem. A hypothetical example is presented to compare the cost of a larger relief system based on the rational method and a numerical model. (Schulz-FIRL)
W78-01411

SEAMLESS PIPE FOR SANITARY, STORM SEWERS.
Water and Pollution Control, Vol. 115, No. 8, p 23, August, 1977.

Descriptors: *Sewers, *Plastic pipes, *Pipes, *Conduits, *Joints(Connections), Combined sewers, Sewage treatment, Waste water treatment.

The Spiralene seamless pipe, available from UNX Ltd. of Orangeville, Ontario, can be used in gravity feed sanitary and storm sewer conduit systems. Spiralene pipe, which is produced from a high molecular weight polyethylene manufactured by Union Carbide Canada Ltd., is available in 20-ft lengths with inside diameters of up to 10 ft. Features of Spiralene pipe include a smooth inner surface, reinforced walls, and bell and spigot ends. Pipes can be joined by force fitting for storm sewers, fitted with a rubber ring gasket for sanitary sewers, or bead welded for use with corrosive liquids. (Schulz-FIRL)
W78-01415

PIPEWORK IN RIVER OR SEA ENVIRONMENTS.
Surveyor, Vol. 150, No. 4445, p 13, August, 1977.

Descriptors: *Pipes, *Sewers, *Joints(Connections), *Welded joints, *Structural members, Conveyance structures, Outfall sewers, Construction materials, Metal pipes, Pipelines, Water conveyance, Equipment, Waste water treatment.

The Stanton and Stavely Group of British Steel Corporation's Tubes Division has begun producing a series of joints for ductile iron pipeline systems. A self-anchoring joint, the Tyton Anchor, is a modified version of the Tyton gasket in which a series of stainless steel locking teeth have been molded. The Tyton Anchor utilizes standard pipes and fittings with diameters of 80-300 mm and can be self-anchored at working pressures up to 10 bars. The joint is suggested for use in water and sewage pipelines for river crossings, or in ground with poor bearing strength. Stanton and Stavely also produce a Tie-bar joint for use with larger diameters of 350-1200 mm. The Tie-bar joint is also self-anchoring and is a harness version of the standard push-in Tyton or Stantyte joint. Suitable for long sea outfalls and river crossings, the joint consists of a welded flange near the spigot which is connected to a loose flange by means of tie bolts. (Schulz-FIRL)
W78-01422

ECONOMY IN CONSTRUCTION OF SEWERAGE SYSTEM,
Bokaro Steel Ltd. (India).
A. C. Banerjee.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 3, p 83-84, June, 1977. 3 fig, 1 tab.

Descriptors: *Structural engineering, *Stress relieving, *Manholes, *Construction costs, *Sewage, Engineering structures, Conveyance structures, Construction materials, Waste water treatment.
Identifiers: Relief shelves.

Design modifications to reduce costs of manhole construction are described. The use of relief shelves is suggested as a means of eliminating the need for thicker walls in deep manholes. The shelves are used to reduce the magnitude of the active earth pressure thrust, the lever arm, and the moment about the base. An equation relating the degree of pressure reduction to the height of the wall and the depth of the relief from ground level is presented. Construction of a relief shelf involves the emplacement of a bracket or foot step to hold a pre-cast slab or wooden plank. The use of relief shelves for a 1,500 mm x 1,500 mm manhole 4.05 m deep resulted in a 20% saving in construction costs. Total costs are compared for standard construction methods and construction with relief shelves. (Schulz-FIRL)
W78-01423

'PIGGY-BACK' SEWER SOLVES OVERLOAD PROBLEM,
Shafer, Kline and Warren, Kansas City, Mo.
T. E. Bieszczat.
Public Works, Vol. 108, No. 10, p 87-88, October, 1977. 1 fig.

Descriptors: *Sewers, *Sewerage, *Pipelines, *Environmental engineering, *Conveyance structures, Design criteria, Separated sewers, Municipal wastes, Waste water treatment.
Identifiers: Sewerage capacity, Sewer construction techniques.

Existing sewer mains were not considered adequate to handle wet weather flow and flow anticipated for the St. Joseph's Hospital complex in Kansas City, Missouri. Several options were considered to increase the sewage capacity without extensive reconstruction. Pressurizing the existing main with bolt-down manhole rings and covers on existing and proposed manholes was not considered feasible because of the age of the existing mains and the calculated peak flow of the hospital. The construction of a supplementary line was hindered by a solid limestone ledge through which any parallel sewer would have to be installed. Replacement of the existing line with a new one in the same trench would be costly and would require interim facilities to handle the flow during construction. The installation of a 'piggy-back' supplementary line directly above the existing main was chosen and required a minimum of reconstruction. Use of the existing trench eliminated the need for rock removal and interruption of service. Armco Steel Corporation manufactured the 12 inch and 15 inch pipe used for connection of the hospital complex to the existing main. Slight modifications to the existing manholes were necessary. The application of the piggy-back solution to alleviate sewer maintenance problems in Leawood, Kansas, is described. (Schulz-FIRL)
W78-01425

GROIN LENGTH AND THE GENERATION OF EDGE WAVES,
Oregon State Univ. Corvallis. School of Oceanography.
M. K. Gaughan, and P. D. Komar.
Sea Grant College Program Reprint No. ORESU-R-77-015, Reprinted from Proceedings of the 15th Coastal Engineering Conference, held Honolulu, Hawaii, July 11-17, 1976. (ASCE), Chap 86, p 1459-1476. 7 fig, 13 ref.

Descriptors: *Groins(Structures), *Beach erosion, *Sedimentation, *Waves(Water).
Identifiers: *Edge waves, Incident waves.

A series of wave basin experiments were undertaken to better understand the selection of groin spacings and lengths. Rather than obtaining edge waves with the same period as the normal incident waves, subharmonic edge waves were produced with a period twice that of the incoming waves and a wave length equal to the groin spacing. Rips were present in the wave basin but their origin is uncertain and they were never strong enough to cause beach erosion. Subharmonic edge waves interacted with the incoming waves to give an alternating sequence of surging and collapsing breakers along the beach. Their effects on the swash were sufficient to erode the beach in some place and cause deposition in other places. Thus major rearrangements of the sand were produced between the groins, but significant erosion did not occur as had been anticipated. The ratio of this critical length to the spacing of the groins was approximately 0.15 to 0.20, and did not vary with the steepness of the normal incident waves. (NOAA)
W78-01538

CHANGES DUE TO JETTIES AT TILLAMOOK BAY, OREGON,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, and T. A. Terich.
Sea Grant College Program Reprint No. ORESU-R-77-016, Reprinted from: Proceedings 15th Coastal Engineering Conference held Honolulu, Hawaii, July 11-17, 1976. (ASCE), Chap 104, p 1791-1811. 9 fig, 14 ref.

Descriptors: *Jetties, *Erosion, *Littoral drift, Oregon, Sedimentation, Beach erosion.

Bayocean Spit, separating Tillamook Bay from the Pacific Ocean on the north Oregon coast, underwent severe erosion following construction of a north jetty at the bay entrance in 1914-17. This erosion ultimately led to the complete breaching of the spit in 1952. Simultaneous to the spit erosion south of the entrance, the shoreline north of the north jetty advanced seward by some 600 m (2000 ft). This pattern of erosion and deposition following jetty construction has generally been interpreted as the jetty blocking a large northward littoral drift in the area. Reexamination of the shoreline changes and patterns of erosion and deposition following jetty construction

agrees with this interpretation, and instead it is concluded that all of the changes resulted from local rearrangements of the beach due to the disrupted equilibrium following jetty construction, but at the same time maintaining an overall condition of zero net littoral drift. This interpretation is supported by other evidence that indicates a near-zero net drift on this portion of the Oregon Coast. Thus severe coastal erosion can result from jetty construction even in areas of zero net littoral drift. (NOAA)
W78-01539

CALIBRATION OF ROUGHNESS PARAMETERS FOR MATHEMATICAL MODELS OF RIVERS WITH FLOOD-PLAINS USING DYNAMIC PROGRAMMING, (IN GERMAN),
O. Uslu.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28079, Price codes: A09 in paper copy, A01 in microfiche. Technischen Universitat Munchen, PHD Thesis, 1974. 187 p, 29 fig, 3 tab, 58 ref.

Descriptors: *River flow, *Reach(Streams), *Roughness(Hydraulic), *Dynamic programming, *Mathematical models, Flood plains, Optimization, Hydraulics, Equations, Algorithms, Systems analysis.
Identifiers: Water surface profile, Sensitivity analysis.

Mathematical models for river flow must be calibrated with respect to their parameters. These parameters are primarily the roughness coefficients which are a measure for the energy dissipation of the flow. The state variables of one dimensional flow equations exhibit sequential interdependencies. Consequently, a dynamic programming approach to determine the optimum roughness coefficients has been used. The reach of a river under consideration is divided into subreaches of different lengths. For each of these subreaches optimum vectors of roughness coefficients for the main channel and the flood plains are determined as functions of steady discharges. The objective function of the optimization procedure is defined as the sum of the squares of the deviations between the measured and calculated water surface profiles. (Bell-Cornell)
W78-01540

ON A DIFFERENTIALLY HEATED SALT-WATER-ICE SYSTEM,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W78-01624

FORCED PLUME CHARACTERISTICS,
Monash Univ., Clayton (Australia). Geophysical Fluid Dynamics Lab.
P. F. Crapper.
Tellus, Vol. 29, No. 5, p 470-475, October 1977. 5 fig, 7 ref.

Descriptors: *Jets, *Turbulent flow, *Flow, Entrainment, Froude number, Hydrodynamics, Hydraulics, Dispersion, Equations, Mathematical studies, Mathematics.
Identifiers: *Force plume, Boussinesq approximation.

An investigation was made of turbulent forced plumes generated by the steady release of mass, momentum, and buoyancy from a finite source in a uniform environment. The entrainment coefficient assumption was made; however, a variable coefficient was used so that the characteristics of the transition from jet to plume behavior can be presented more clearly. A modified Broussinesq approximation was made which corrects for the effect of density variations in the mass and momentum fluxes. The treatment revealed that the characteristics of forced plumes can best be discussed by reference to the Froude number. For all cases of forced plumes (except a pure jet), the Froude number approaches a particular constant value as the height increases. (Lee-ISWS)
W78-01625

AN EXPERIMENTAL STUDY OF BLUFF BUOYANT TURBULENT SURFACE JETS,
M.M.M. Engineering Coll., Gorakhpur U.P. (India), Dept. of Civil Engineering.
P. B. B. Lal, and N. Rajaratnam.
Journal of Hydraulic Research, Vol. 15, No. 3, p 261-275, 1977. 10 fig, 1 tab, 32 ref.

Descriptors: *Turbulence, *Jets, *Turbulent flow, Velocity, Temperature, Hydrodynamics, Hydraulic, Theoretical analysis, Surfaces, Equations, Mathematical studies, Profiles.
Identifiers: *Bluff turbulent surface jets, Richardson numbers, Velocity profile, Temperature profile.

Described was an experimental study on the behavior of bluff turbulent surface jets discharged into a stagnant ambient for moderate and large source Richardson numbers. Based on fairly extensive observations, the velocity and temperature profiles in the lateral and vertical directions were found to be similar. Using the results of an earlier theoretical analysis and the present experimental results, the variation of the velocity, temperature excess, and length scales were correlated with the nondimensional longitudinal distance from the outlet (made dimensionless with the square root of the surface jet at source), and the source Richardson number. (Lee-ISWS)
W78-01633

EROSION BY CIRCULAR TURBULENT WALL JETS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and B. Berry.
Journal of Hydraulic Research, Vol. 15, No. 3, p 277-289, 1977. 8 fig, 1 tab, 12 ref.

Descriptors: *Erosion, *Jets, Turbulence, River beds, Dispersion, Froude number, Scour, Hydraulics, Mathematical studies, Profiles.
Identifiers: *Turbulent wall jets, Loose beds, Circular turbulent wall jets.

Described was an experimental study on the erosion of loose beds of sand and polystyrene by circular turbulent wall jets of air and water. Characteristics of the scour hole were observed during its growth and also in the final asymptotic state. The profiles in general were found to be similar when expressed in dimensionless forms with some dispersion near the ridge which forms at the downstream end of the hole. The length scales (made dimensionless with the jet diameter) and the dimensionless characteristic time were found to be functions mainly of the densimetric Froude number. Some observations also were made on the behavior of the jet in the asymptotic erosion state. (Lee-ISWS)
W78-01634

TRANSVERSE DISPERSION IN RECTANGULAR CHANNELS,
Canada Centre for Inland Waters, Burlington (Ontario).
Y. L. Lau, and B. G. Krishnappan.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY10, Proceedings Paper 13294, p 1173-1189, October 1977. 11 fig, 2 tab, 18 ref, 1 append.

Descriptors: *Diffusion, *Channels, *Dispersion, Open channels, Open channel flow, Hydraulics, Mathematical studies, Flow, Circulation, Water pollution, Width, Mixing.
Identifiers: *Transverse dispersion coefficient, Secondary circulation, Turbulent diffusion, Dispersion relations.

Dimensional analysis showed that the commonly used dimensionless transverse dispersion coefficient, e sub z/uda*h, should depend on both the friction factor and the width-to-depth ratio of the flow. Results for e sub z lead to the conclusion that secondary circulation, and not turbulent diffusion, is the dominant transport mechanism. The results help to explain the failure to find consistent trends in the variation of e sub z/u*h and suggest that u*h is not a good representation for e sub z. Two alternative dimensionless dispersion coefficients, e sub z uW and e sub z/uda*W, were introduced. Both appear to account for secondary circulation effects more properly. The dimensionless parameter e sub z/uds*W is a function of the width-to-depth ration and appears to be affected only slightly by variations in the friction factor. The parameter e sub z/uW shows distinct dependence of both friction factor and width-to-depth ratio. Both of these are better dimensionless transverse dispersion coefficients to use than e sub z/uda*h. (Lee-ISWS)
W78-01639

MCNARY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON, SECOND-STEP COFFERDAM CLOSURE, HYDRAULIC MODEL INVESTIGATION.
Army Engineer District, Portland, OR.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 408, Price code: A06 in paper copy, A01 in microfiche. Report No 51-1, May 1956. 73 p, 50 fig, 2 tab, 21 plate, 1 append.

Descriptors: *Oregon, *Washington, *Columbia River, *Cofferdams, *Spillways, Model studies, Hydraulic similitude, Methodology, Dams, Hydraulics, River flow, Testing.
Identifiers: *Cofferdam closure, *McNary Dam.

The closure of the second-step cofferdam at McNary Dam on the Columbia River was accomplished by depositing in a gap in the upstream leg of the cofferdam sufficient 12-ton tetrahedrons to divert the bulk of the river flow through the partially completed spillway and to allow subsequent placement of the small materials to seal the gap. The model studies that led to the successful closure of the cofferdam investigated several models and provide useful information for future studies. The procedural details were derived from the model tests for the expected range of river flows during the closure. (Singh-ISWS)
W78-01644

SURVEY OF COASTAL REVETMENT TYPES,
Coastal Engineering Research Center, Fort Belvoir, VA.
B. L. McCartney.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 255, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Report 76-7, May 1976. 49 p, 5 fig, 7 tab, 36 ref, 1 append.

Descriptors: *Retaining walls, *Coastal engineering, *Shore protection, Research and development, *Design criteria, Wave pile-up, Cost analysis, Data processing, Structural design, Stability, Filters, Scour, Riprap.
Identifiers: Wave runup, Wave reflection, Armoring.

The object of the report was to provide information to coastal engineers for the planning, design and construction of a suitable coastal revetment type at a particular site. A review of 25 selected revetment types, a procedure for revetment design which includes identification of controlling site conditions, a comparative cost analysis method, and an example problem were presented. Design data included prototype installation examples, available model test results, and estimates of zero-damage wave heights, wave runup, and revetment wave reflection properties. The optimum revetment should be rough and permeable to reduce

wave runup and reflection, and it should be flexible to prevent failure during settlement. Success of any revetment will depend on accurate evaluation of wave conditions and the prediction of beach changes after construction. (Singh-ISWS)
W78-01646

RECENT PROGRESS IN POLYMER DRAG REDUCTION,
Naval Undersea Center, San Diego, CA. Dept. of Fleet Engineering.
J. W Hoyt.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A003 941, Price codes: A04 in paper copy, A01 in microfiche. NVC TP 433, October 1974. 54 p, 20 fig, 172 ref. ONR NR 062-329.

Descriptors: *Polymers, *Turbulence, *Fluid mechanics, *Flow characteristics, Jets, Propellers, Cavitation, Drag, Heat transfer, Reviews, Suspension.
Identifiers: *Drag-reducing suspensions, Flow noise, Lift.

Recent developments on various aspects of polymer friction reduction in turbulent flow were reviewed, with special emphasis on the areas where intensive work currently is under way. Detailed attention was given to the topics of drag-reducing suspensions, heat transfer in polymer solutions, and the effect of polymers on cavitation, jets, and lift. (Adams-ISWS)
W78-01652

8C. Hydraulic Machinery

ACOP PUMPING SAMPLER. ALLUVIAL RIVER MECHANICS PROJECT,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 4D.
W78-01314

SWAMPY SEWER JOB MOVES WITH BIG BACKHOES.
Highway and Heavy Construction, Vol. 120, No. 10, p 142, October, 1977.

Descriptors: *Interceptor sewers, *Construction equipment, *Earth handling equipment, *Excavation, *Sewers, Conveyance structures, Pipelines, Pipes, Sewerage, Waste water treatment.
Identifiers: Backhoes.

Two large backhoes were used by Marvec-Allstate, Inc., of Verona, New Jersey, for the emplacement of 7 miles of large diameter interceptor sewers in Ocean County, New Jersey, as part of a $5.2 million project for the Ocean County Sewer Authority. The two Koehring 1266-D backhoes, equipped with 6-cu-yd digging buckets, allowed emplacement of the sewers at a rate of 500 ft/day in spite of unfavorable hydrologic and soil conditions. In the western part of the project 20,000 ft of 20 in- and 24 in-diameter prestressed concrete gravity flow pipe was installed in open-cut, sloped trenches equipped with steel trench boxes. The eastern half of the project required the installation of three side-by-side pipelines to transport raw sewage from the island communities and to carry treated effluent to an ocean outfall. A dewatering system was necessary because of the area's high water table and special precautions were necessary because of underground cables in the area. (Schulz-FIRL)
W78-01417

LICKING OPERATIONAL PROBLEMS THE HARD WAY,
Meriden Sewer Authority, CT.
B. Nicolai.
Water and Wastes Engineering, Vol. 14, No. 9, p 51-52, 54, September, 1977.

Descriptors: *Pumping, *Pumps, Equipment, *Sewage treatment, *Sewers, Treatment facilities, Conveyance structures, Electric power failure, Power operation and maintenance, Municipal wastes, Waste water treatment.
Identifiers: Meriden(CT).

Operating problems at the Rasted Lane pumping station resulted in an inspection of several pumping stations in the Meriden, Connecticut, sewage system. Problems at the Rasted Lane station included an inoperative 50-hp 1500-gpm motor with bearing failure, a jammed gate valve, and failure of the remaining pump due to overloading of the combined thermal heater. A survey of other pumping stations revealed similar problems. Modifications were made to the system to allow simultaneous operation of the pumps and to provide a standby system in case of power failure. Goodking and O'Dea, Inc., were retained as consultants to design additions to increase pumping capacities of four of the pumping stations. As part of the sewer renovation program, 'package can' pumping systems are being phased out. (Schulz-FIRL)
W78-01418

SAFER, CLEANER HANDLING OF SEWAGE PUMPS.
Surveyor, Vol. 150, No. 4443, p 23, August, 1977.

Descriptors: *Pumps, *Equipment, *Pumping plants, *Pumping, *Operation and maintenance, Sewage treatment, Waste water treatment.
Identifiers: Submersible pump transport.

Missing Links, a series of submersible sewage pump transport units, are being produced by Treatment Contracts Limited of Andover, England. The Missing Link is capable of lifting and transporting pumps by means of a trailer-mounted framework which can extend the slide rail system above ground. The pump can be drawn up into a cage for cleaning and servicing. A service unit for ladder racks, inspection lamps, tools, and replacement pumps is also available. Two models of the pump handling systems are marketed for pumps of 2-5 hp and for pumps in the 7.5-30 hp range. (Schulz-FIRL)
W78-01433

SLUDGE EXTRACTION WITH PNEUMATIC ASSISTANCE.
Water Services, Vol 81, No 978, p 506, 509, August, 1977.

Descriptors: *Pumping, *Hydraulic equipment, *Pressure(Head), *Sludge treatment, *Dewatering, Pistons, Air entrainment, Automation, Ultrasonics, Equipment, Waste water treatment.
Identifiers: Hydrostatic valves.

The Sewpas unit was designed as a mechanical aid for sludge withdrawal from a hydrostatic valve with an operating range of approximately 1 m hydraulic differential head. The Sewpas unit was tested over a 12-month period at the Upper Stour Main Drainage Board works in England and reduced the sludge volume by 20% over the volume achieved with manual control of desludging operations. Installation requirements include the connection of an air pipe to the existing sludge pipe via a flange adaptor, and the installation of a vertical upstand pipe to contain discharge from the airlift. The Sewpas system is designed to handle sludges with solids concentrations of 8-10%. Unlike a conventional air lift system which alters the specific gravity of the sludge, the Sewpas unit utilizes a large air bubble as a piston to eject the sludge. Semi-automatic process control is provided to regulate the on-off periods of the unit. The use of ultrasonics to measure sludge solids concentrations is discussed as a future method of controlling the cut-off of the air pump. (Schulz-FIRL)
W78-01458

WAVE-POWERED PNEUMATIC SYSTEM FOR POWER GENERATION,
R. D. Bolding.
U.S. Patent No. 4,013,379, 7 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1324, March 22, 1977.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Coastal structures, Electric power production, Shore protection, Powerplants, Energy conversion, Equipment, Powerplants(Wave action).

A wave-powered pneumatic system for producing compressed air to be used for energy storage or power generation is comprised of an elongated seawall extending parallel to the shore and at a distance out from the shore, upon which an air-accumulating structure is built. The air-accumulating structure is divided by partitions, each consisting of stacked air chambers arranged one above the other. Each of the chambers is relatively shallow in the vertical dimension, and each chamber is closed on all sides except the end facing out to sea. A plenum chamber is connected to each of the air chambers by separate ducts having check valves which allow air to flow into the plenum chamber when pressure within the duct exceeds the pressure in the plenum chamber. The plenum chamber is connected to the air storage or power generating means. Depending upon the wave height, one or more of the chambers will be filled with a solid mass of water from each wave as the latter moves toward shore. This mass of shoreward-moving water acts as a piston, driving the air trapped in the chamber toward the rear end, and compressing it, the compressed air being forced out through the duct to the plenum chamber, and finally to the air-driven power generating means. Another advantage to the invention is that is utilizes and absorbs the kinetic energy contained in the waves, and thereby reduces the destructive potential of the waves, virtually eliminating erosion of the shores. (Sinha-OEIS)
W78-01685

WAVE POWER APPARATUS SUPPORTED AND OPERATED BY FLOATS IN WATER,
R. E. Diggs.
U.S. Patent No. 4,013,382, 12 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 4, p 1326, March 22, 1977.

Descriptors: *Patents, *Waves(Water), *Ocean waves, Power plants, Energy transfer, Floats, Mechanical equipment, Hydraulic machinery, Powerplants(Wave action).

An apparatus for converting water wave movement into power is located on a float in a body of water. The apparatus converts the up and down movement of that float caused by waves in the water to operate a pump to displace hydraulic fluid through a hydraulic pumping station which actuates fluid motors to produce power. The force of the float movement is multiplied by a mechanical advantage so that the pump displaces the hydraulic fluid on both the upward and downward movement of the float even in calm water. A number of modules are interconnected to take advantage of as much of a wave front as desired. (Sinha-OEIS)
W78-01686

DYNAMIC POSITIONING SYSTEM FOR A VESSEL CONTAINING AN OCEAN THERMAL ENERGY CONVERSION SYSTEM,
TRW, Inc., Redondo Beach, CA. (Assignee).
R. O. Pearson.
U.S. Patent No 4,014,279, 13 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1632, March 29, 1977.

Descriptors: *Patents, *Energy conversion, Ships, Hydraulics, *Hydraulic systems, Effluents, Jets, Nozzles, Equipment, Ocean currents.
Identifiers: Ocea Thermal Energy Conversion(OTEC), Position holding.

A dynamic positioning system for a sea-going vessel containing an ocean thermal energy conversion (OTEC) system utilizes the thrust produced by the sea water effluents resulting from the energy conversion process to position the vessel against wind and ocean current forces. The vertical stability of the vessel containing the OTEC apparatus presents no unusual difficulty. However, the horizontal positioning of the vessel poses unique problems because of the large hull displacement and the requirement for a huge cold water pipe that extends to unusual depths. Both the warm water and cold water discharges are collected in a common annular plenum and then discharged through nozzles spaced angularly around the periphery of the plenum. Each nozzle is rotatable through a 90 degree arc in a vertical plane to alter the direction of the discharge water jet and to thereby alter the horizontal component of the thrust or the driving force acting upon the vessel. The nozzles may be selected as to location and angular orientation to attain the net resultant force vector necessary to provide station-keeping or propulsion to the vessel under most any combination of wind and ocean current conditions. (Sinha-OEIS)
W78-01693

8D. Soil Mechanics

SLAG AND QUARRY WASTE AS PIPE BEDDING MATERIAL,
Bokaro Steel Ltd. (India).
A. C. Banerjee.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 3, p 89-90, June, 1977. 4 fig, 2 tab.

Descriptors: *Construction materials, *Fine aggregates, *Gravels, *Soil mechanics,*Sewers, Pipelines, Soil mechanics, Costs, Stress, Structural design, Conveyance structures, Waste water treatment.
Identifiers: Slag, Quarry wastes.

External loading and internal stresses on a buried rigid sewer pipe can be influcenced by a variety of factors, including the nature of the backfill, the unit weight of the filling material, the vertical load of the soil due to overburden, and the width of the trench. The type of bedding and the diameter of the pipe also place constraints on the depth of overburden which can safely be placed in the trench. The safe depth of the overburden for 600-mm diameter pipe would be 1.75 m for ordinary bedding and 3.25 m for first-class bedding. The use of slag and quarry wastes in a configuration with 15 mm crushed stone, 20 mm granulated blast furnace slag, and quarry dust increases the allowable overburden depth to 5 m. Use of the slag and quarry wastes instead of concrete cradle bedding results in a savings of 59 rupees/m of pipe. (Schulz-FIRL)
W78-01416

DIGGING BEFORE PILE DRIVING SPEEDS HULL SEWER JOB.
Engineering and Contract Record, Vol. 90, No. 8, p 74, August, 1977.

Descriptors: *Sewers, *Excavation, *Soil engineering, *Earth handling equipment, Concrete technology, *Piles(Foundations), Sheet piling, Construction materials, Cast-in-place structures, Pipe driving, Waste water treatment.
Identifiers: Hull(Quebec Canada), Aylmer(Quebec Canada).

Fedex and the Duquesne Piling Company are using partial pre-excavation before driving piles at the Hull area sewer project in Quebec, Canada. The sewage collection system will eventually traverse the 15 miles between Aylmer and a planned sewage treatment plant at Templeton. To eliminate the need for frames to line up piles before driving, the ditch is excavated to a depth of 19 ft below the surface and the first level of whales is emplaced. Vibratory driver/extractors are being used to drive all piles. After further excavation a second row of whales and struts is installed. The piles are being used to stabilize the 45-ft ditch in which the 8.5-ft diameter conduit is poured. The success of pre-excavation is dependent on soil type, working best in cohesive clayey soils. (Schulz-FIRL)
W78-01424

LEAKAGE OF GROUNDWATER THROUGH A SLOT IN A SHEET PILE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
C. C. Mei.
Journal of Hydraulic Research, Vol. 15, No. 3, p 253-259, 1977. 3 fig, 2 tab, 3 ref.

Descriptors: *Leakage, *Groundwater movement, *Foundations, *Sheet piling, Mathematical models, Equations, Seepage, Wetting, Depth, Boundary processes, Head loss, Aquifers, Velocity, Groundwater.
Identifiers: Slots.

An analytical solution was obtained for the two-dimensional problem of a narrow horizontal slot in a deeply driven sheet pile which separates a water pool from a dry foundation. It was shown that the presence of even a small gap allows enough flow through it to cause considerable wetting on the protected side of the foundation. (Visocky-ISWS)
W78-01632

MCNARY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON, SECOND-STEP COFFERDAM CLOSURE, HYDRAULIC MODEL INVESTIGATION.
Army Engineer District, Portland, OR.
For primary bibliographic entry see Field 8B.
W78-01644

8F. Concrete

STUDY ON SLUDGE TREATMENT--2ND REPORT,
For primary bibliographic entry see Field 5E.
W78-01512

8G. Materials

POLYMERS FOR USE IN WATER TREATMENT,
Betz Labs., Inc., Trevose, PA. (Assignee).
For primary bibliographic entry see Field 5F.
W78-01190

ELASTICIZED POLYOLEFIN POND LINING HELPS MASONITE MEET NOVA SCOTIA STANDARDS.
For primary bibliographic entry see Field 5D.
W78-01231

BLUE-CODED PIPING SOLVES WATER SERVICE PROBLEMS IN CALIF.
Water and Wastes Engineering, Vol. 14, No. 9, p 69, September, 1977.

Descriptors: *Plastic pipes, *Construction materials, *Pipe flow, *Corrosion control, Hydraulic properties, Conveyance structures, Water conveyance, California.
Identifiers: Polybutylene pipes, Alameda County(CA).

The Alameda County Water District in California has begun using corrosion-resistant polybutylene piping because of extremely corrosive soil conditions in the area. The piping is color-coded, enabling easier tracing and separation of the water lines from other underground utilities. Alameda uses polybutylene tubing for 1 inch, 1.5 inch, and 2 inch water service connections in all single and multiple dwellings, as well as commercial and industrial facilities, for the installation of new systems and the replacement of older, corroded metal lines. Polybutylene's design stress (1000 psi at 73 F) enables the tubing to deliver 30% more volume than other plastic piping of the same outside diameter, and the added strength also allows use of thinner pipe walls. Other advantages of polybutylene piping are the lower costs compared with conventional copper tubing and the speed of installation. (Schulz-FIRL)
W78-01421

SELF-CLEANING FILTER/SCREEN.
Water and Waste Treatment, Vol. 20, No. 7, p 46-47, July, 1977.

Descriptors: *Filters, *Suspended solids, *Screens, *Separation techniques, *Sewage treatment, Industrial wastes, Filtration, Equipment, Waste water treatment.

A continuous, self-cleaning filter screen, the Japanese-designed Aqua-Guard, is described. A filter element-rake combination is used to remove suspended and entrained materials from 3-300 mm in size. Collected solids are ejected to a collector to provide continuous filtering with minimal supervision and maintenance. Designed as an alternative to conventional bar or rotary screens, and Aqua-Guard contains an endless belt of interconnected filter elements which move around an upper sprocket. Aqua-Guard is suggested for use in industrial water and waste treatment, and for removal of trash from sewage influent. The filters are capable of handling up to 465,000 gal/min to remove up to 560 tons of trash/hr, and are available in a variety of screen sizes. (Schulz-FIRL)
W78-01441

RECENT PROGRESS IN POLYMER DRAG REDUCTION,
Naval Undersea Center, San Diego, CA. Dept. of Fleet Engineering.
For primary bibliographic entry see Field 8B.
W78-01652

8I. Fisheries Engineering

DEVELOPMENT DOCUMENT FOR BEST TECHNOLOGY AVAILABLE FOR THE LOCATION, DESIGN, CONSTRUCTION AND CAPACITY OF COOLING WATER INTAKE STRUCTURES FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W78-01647

CONTROLLING GRASS CARP (CTENOPHARYNGODON IDELLA) WITH ANTIMYCIN, ROTENONE, AND THANITE AND BY ELECTROFISHING,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W78-01666

PUGET SOUND INTERIM STUDIES, ACOUSTIC AND NET SURVEYS OF FISHES AND ZOOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English, and R. E. Thorne.

Municipality of Metropolitan Seattle, Wash., Final Report, June 1977. 64 p, 35 fig, 15 tab, 6 ref.

Descriptors: *Seasonal, *Fish eggs, Fish populations, *Acoustics, *Sound waves, *Sounding, Larvae, Distribution patterns, Temporal distribution, Spatial distribution, Dye dispersion, *Outfall sewers, *Sewage effluents, *Zooplankton, *Municipal wastes, Water pollution sources, Water pollution effects, Sampling, Herrings, Washington, *Echo-sounding, *Puget Sound, Seattle(Wash).

Acoustic and net surveys of fish and zooplankton were made in central Puget Sound in the vicinity of some Metro sewer outfalls. The abundance of fishes showed substantial seasonal variation, especially juvenile herring. The patches of fishes were typically small and widely dispersed, with striking temporal instability. The abundance of fish eggs and larvae differed over the seasons, with several patterns of geographic distribution. Acoustic observations revealed restricted areas where fewer target organisms were associated with maxima of dye used to track the plume from the West Point outfall. No major or widespread effects of plumes from Metro sewer outfalls were observed using the methods of this study. (Katz)
W78-01670

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1973.
Federal Highway Administration, Washington, DC.
For primary bibliographic entry see Field 2J.
W78-01185

WATER-RESOURCES . DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN ARIZONA 1977.
Army Engineer District, San Francisco, CA. South Pacific Div.
For primary bibliographic entry see Field 6E.
W78-01502

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Metcalf and Eddy, Inc., Des Plaines, IL.
For primary bibliographic entry see Field 5D.
W78-01238

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Water Pollution Control Directorate, Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W78-01249

ELECTROPLATING AND CYANIDE WASTES, (LITERATURE REVIEW),
Utah State Univ., Logan.
For primary bibliographic entry see Field 5D.
W78-01262

WORLD DATA CENTER A: GLACIOLOGY.
Geological Survey, Tacoma, WA. Water Resources Div.
Glaciological Notes, No 61, January 1976. 43 p.

Descriptors: *Glaciology, *Publications, *Information retrieval, *Indexing, *Bibliographies, Documentation, Data storage and retrieval.
Identifiers: *World Data Center A(Glaciology).

'Glaciological Notes' is a quarterly publication of World Data Center-A (WDC-A), Glaciology, listing all new accessions of the Data Center such as preprints and reprints contributed by glaciologists and other interested persons. Aerial and satellite photography, maps, and numerical data will be listed also. 'Glaciological Notes' is arranged alphabetically by author. Computer-produced geographical and subject key-word indexes provide additional access keys for information retrieval. (Woodard-USGS)
W78-01272

PAPER AND ALLIED PRODUCT, (LITERATURE REVIEW),
National Council of the Paper Industry for Air and Stream Improvement Inc., New York.
For primary bibliographic entry see Field 05D.
W78-01660

10D. Specialized Information Center Services

CONCEPT DEFINITION OF THE ARMY ENVIRONMENTAL TECHNICAL INFORMATION SYSTEM,
Operations Research, Inc., Silver Spring, MD. Space and Communications System Div.
F. S. Zusman, M. K. Harmon, B. D. Sharp, and H. J. Vandersluis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-015014, Price codes: A09 in paper copy, A01 in microfiche. Final Report prepared for U.S. Army Medical Research and Development Command, Environmental Quality Research Directorate, Sanitary Engineering Research Branch, Washington, D.C., April 1975. 172 p, 5 fig.

Descriptors: *Operations research, *Computer programs, *Environmental control, Programs, Design, Methodology, Design criteria, Data collections, Air, Water, Land, Evaluation.
Identifiers: *Information systems, Use patterns.

This report covers the concept definition phase (Phase 2) of the Army Environmental Technical Information System (AETIS). The project was based on the concept formulated by Wladimir Gulevich in Development of the Army Environmental Technical Information System (AETIS) published as an exploratory development proposal by the U.S. Army Environmental Hygiene Agency, April 10, 1974. The study objectives were to analyze the user requirements for AETIS and to develop a detailed design and an implementation plan for the system. Over 50 individuals were interviewed in 19 government agencies and offices to determine current patterns of generation and use of environmental information. An analysis of these current methods and resources is presented and a system structure is proposed that will improve the effectiveness and efficiency of the present methods for meeting the needs of the Army for environmental information. Abstracts are given of collected materials. (Bell-Cornell)
W78-01657

10F. Preparation Of Reviews

LOCAL SCOUR AROUND CYLINDRICAL PIERS,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 08B.
W78-01300

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 5
MARCH 1, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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VOLUME 11, NUMBER 5
MARCH 1, 1978

W78-01701 -- W78-02200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E.
W78-01866

2B. Precipitation

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-01909

THE VARIATION OF METEOROLOGICAL ELEMENTS WITH INCREASING ALTITUDE IN THE EASTERN BORDER MOUNTAINS OF RHODESIA,
Meteorological Service, Salisbury (Rhodesia).
J. D. Torrance.
Rhod J Agric Res. 11(2), p 181-189, 1973.

Descriptors: *Meteorology, *Climates, Climatological data, *Airstreams, *Altitude, Evaporation, Humidity, Mountains, Radiation, Rainfall, Rhodesia, Temperature.

Five meteorological sites on the John Meikle Forest Research Station on the Eastern Border of Rhodesia, with altitudes ranging from 700 m-1800 m within a distance of 11 km, can be considered to be exposed to the same airstreams. The climatological records, how covering over 3 yr, were analyzed to show the effects of altitude and how these effects vary during the course of the year. The elements analyzed include temperature, relative humidity, rainfall, evaporation and radiation.--Copyright 1974, Biological Abstracts, Inc.
W78-01918

INVESTIGATIONS OF THE METEOROLOGICAL INFLUENCES ON THE DRY MATTER INCREASE OF SPRING BARLEY AND WINTER WHEAT IN THE PANNONIAN CLIMATE AREA: II. RESULTS OF INVESTIGATIONS IN THE YEARS 1971 AND 1972, (IN GERMAN),
Hochschule fuer Bodenkultur, Vienna (Austria). Inst. fuer Pflanzenbau und Pflanzenzuechtung.
For primary bibliographic entry see Field 3F.
W78-01968

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: II. ASSESSMENT OF THE MAIN COMPONENTS OF THE WATER BUDGET,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 3F.
W78-01971

THE FLORIDA AREA CUMULUS EXPERIMENT: RATIONALE, DESIGN, PROCEDURES, RESULTS, AND FUTURE COURSE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 3B.
W78-01975

SAMPLING ERRORS IN THE MEASUREMENT OF RAIN AND HAIL PARAMETERS,
National Center for Atmospheric Research, Boulder, CO.
H. S. Gertzman, and D. Atlas.
Journal of Geophysical Research, Vol 82, No 31, p 4955-4966, October 20, 1977. 9 fig, 1 tab, 19 ref, 1 append.

Descriptors: *Rain, *Hail, *Statistics, Measurement, Sampling, Particle size, Radar, Rainfall, Analytical techniques, Meteorological data, Meteorology.
Identifiers: *Sampling errors.

All methods of measuring the integrated properties of cloud, rain, or hail populations, such as the water content, precipitation rate, kinetic energy, or distributed fluctuations of the number of particles sampled in each particle size interval and the weighted sum of the associated variances in proportion to their contribution to the integral parameter to be measured. This work generalized and extended that of Joss and Waldvogel by providing a general derivation of the fractional standard deviation (FSD) of any integrated property X such that X(D) = c(D to the n power) for any particle size distribution where D is the particle diameter. In addition, for the case of exponential size spectra, general expressions were derived for the FSD of all integral parameters for sampling devices of constant volume or for (area x time) devices in which sampling volume is a function of particle fall speed. Also presented was a set of universal curves applicable to such parameters from n = 0, which corresponds to the measurement of total number concentration, to n = 6, which corresponds to the radar reflectivity factor. Equations and curves also were provided to permit corrections for finite upper limits to the size spectrum and, in the case of rain, for a realistic fall speed law. Examples were included to illustrate the magnitude of the expected FSD for a variety of rain and hailfall parameters with sampling instruments now in use. A comparison was made with observed rainfall data to illustrate the methods presented in this paper and some of the difficulties in distinguishing fluctuations of physical and statistical origin. (Sims-ISWS)
W78-01992

LASER ABSORPTION TECHNIQUES FOR THE MEASUREMENT OF ATMOSPHERIC WATER VAPOR CONCENTRATION,
University of Western Ontario, London. Dept. of Physics.
E. Brannen, and Z. Kucerovsky.
Journal of Applied Meteorology, Vol. 16, No. 10, p 1072-1076, October 1977. 2 fig, 1 tab, 14 ref.

Descriptors: *Water vapor, *Atmosphere, *Instrumentation, *Analytical techniques, *Measurement, Gases, Precipitable water, Condensation, Meteorology, Vapor pressure, Water types, Spectroscopy.
Identifiers: *Laser absorption techniques, *Water vapor laser, *Lasers, *Laser absorption spectroscopy, Atmospheric constituents, Raman spectroscopy.

A sensitive laser method with fast response time was developed which is suitable for measuring atmospheric water vapor concentration. The method utilizes the absorption of 33.02 and 27.972 micrometer radiation from a water vapor laser. Experiments were carried out in a 2 m controlled atmosphere absorption cell at conditions corresponding to ground-level to high-altitude atmospheric pressures. Typically, an absorption of 1% was produced in a 1 m path length by a water vapor pressure of 1.1 Pa at ground level and 2.2 Pa at 5 km using 33.02 micrometer laser radiation. With 27.972 micrometer laser radiation, the absorption is about a factor 50 less and can be used when higher concentrationds of water vapor are encountered. The response time of the detecting apparatus can be less than a second and still achieve these sensitivities. Possibilities of building an airborne instrument for measuring water vapor concentration were discussed. (Henley-ISWS)
W78-01997

TREE-RING-DROUGHT RELATIONSHIPS IN THE HUDSON VALLEY, NEW YORK,
Lamont-Doherty Geological Observatory, Palisades, NY.
E. R. Cook, and G. C. Jacoby, Jr.
Science, Vol. 198, No. 4315, p 399-401, October 28, 1977. 3 fig, 15 ref. NSF ATM75-21226.

Descriptors: *Dendrochronology, *Precipitation(Atmospheric), *Air temperature, *New York, Climatology, Rainfall, Temperature, Evaporation, Evapotranspiration, Correlation analysis, Trees, Oak trees, Pine trees, Hemlock trees, Weather, Vegetation, Meteorology.
Identifiers: *Hudson River Valley(NY).

Annual tree-ring chronologies from certain well-drained sites in the Hudson Valley of New York record past changes in temperature and precipitation. This information accounts for much of the July variation in Palmer drought severity indices during the period 1931 to 1970 and is used to develop a preliminary reconstruction of drought as long ago as 1728. (Sims-ISWS)
W78-01999

THE CLIMATE AND VEGETATION ON TENERIFE WITH SPECIAL REGARD TO FOG PRECIPITATION, (IN GERMAN),
Goettingen Univ. (West Germany). Systematisch-Geobotanisches Inst.
F. Kaemmer.
Scr Geobot. 7, p 1-78, 1974.

Descriptors: *Fog precipitation, Anagyris-latifolia, Ardisia-bahamensis, *Canary Islands, Climate, Cloud, Cover, Cytisus-tener, Dracaena-draco, Fog, Ilex-perado, Juniperus-cedrus, Laurel, Lichen, Moss, Ocotea-foetens, Pinus-canariensis, Pulmonaria, Radiation, Rhamnus-integrifolia, Sideroxylon-marmulano, Spain, Tenerife, Usnea, Vegetation, Visnea-mocanera, Wind.

On Tenerife (Canary Island) measurements of precipitation (according to Hellmann) and of fog precipitation (according to Grunow) were carried out at 25 stations from summer 1970-spring 1972. Measurements of precipitation were also made with numerous small raingauges inside and outside of forest stands. Flora, vegetation and site conditions were likewise studied. Frequent and intense fog precipitation occurs on Tenerife, especially along mountain crests lying perpendicular to the direction of the prevailing cloud-carrying winds. During winter, fog precipitation is possible in nearly all altitudes. In summer it is mainly restricted to between 700-800 and 100-1200 m, due to the sinking of the upper limit of the clouds. The seasonal distribution of fog precipitation is similar to that of the normal precipitation. The seasonal sequence of periods of normal precipitation and dryness are decisive factors for the distribution of vegetation types on the Canary Islands. The cloudiness, the saturation deficit of the air and the radiation, which increases above approximately 1000 m altitude, are important for the altitudinal zonation of the vegetation on the Canary Island, especially for the upper limits of laurel forests and of Pinus canarinsis forests. Fog precipitation influences laurel forests less than previously supposed. In the mixed P. canariensis-laurel forests and in the pure P. canariensis forests in higher altitudes the additional precipitation can amount locally to at least 2500 mm/yr. These forest types are affected by the summer drought, because they are situated normally above the cloud cover. The distribution of laurel forests or of other foresrt types is not clearly influenced by the intensity and the seasonal distribution of fog precipitation. Fog precipitation and its climatic conditions favor epiphytic mosses and lichens of the Pulmonaria type. Lichens of the Usnea type are restricted to foggy forests, where the fog is moved slowly or not at all by the wind. The intensity of fog precipitation caused by a given plant species is

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primarily dependent on its height and exposure to wind and clouds. The stucture and size of its foliage is less important. A brief description of forest types and of their altitudinal zonation and distribution maps of 10 woody species (Visnea mocanera, Ardisia bahamensis, Ocotea foetens, Sideroxylon marmulano, Dracaena draco, Anagyris latifolia, Juniperus cedrus, Rhamnus integrifolia, Ilex perado, Cytisus tener) on Tenerife are given. –Copyright 1975, Biological Abstracts, Inc.
W78-02015

TOTAL WATER CONTENT INSTRUMENT,
Office of the Secretary (Air Force), Washington, DC. (Assignee).
For primary bibliographic entry see Field 7B.
W78-02140

2C. Snow, Ice, and Frost

GREAT LAKES ICE THICKNESS PREDICTION,
National Oceanic Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
R. A. Assel.
Journal of Great Lakes Research, Vol. 2, No. 2, p 248-255, December 1976. 2 fig, 2 tab, 11 ref.

Descriptors: *Lake ice, *Great Lakes, *Air temperature, *Regression analysis, Temperature, Ice, Ice cover, Correlation analysis, Forecasting, Weather, Lakes, Freezing.
Identifiers: *Ice thickness, Freezing degree days, Thawing degree days.

Weekly ice thickness data, collected from 24 bay, harbor, and river sites on the Great Lakes, were correlated with freezing degree-day accumulations to develop regression equations between ice thickness and freezing degree-days. The data base at ice measurement sites was 3 to 8 winters in length. The standard error of estimate varied for individual regression equations and averaged between 7 and 8 cm for five forms of regression equations. Because the regression equations are empirical, the range of input data used to predict ice thickness should be limited to the range of values used in the derivation. (Sims-ISWS)
W78-01983

A VISCOUS SEA ICE LAW AS A STOCHASTIC AVERAGE OF PLASTICITY,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
W. D. Hibler.
Journal of Geophysical Research, Vol 82, No 27, p 3932-3938, September 20, 1977. 7 fig, 1 tab, 17 ref.
NOAA 04-3-022-33.

Descriptors: *Sea ice, *Plasticity, *Model studies, Mathematical models, Stochastic processes, Viscosity, Ice, Stress, Strain, Mechanical properties, Equations, Simulation analysis, Oceans, Oceanography.
Identifiers: *Sea ice deformation.

Over the last several years the applicability of viscous constitutive laws to sea ice on the geophysical scale has been questioned because the local characteristics of sea ice deformation appear to be plastic in nature. In order to provide a more fundamental physical basis for a viscous law, this paper demonstrated that if time and/or length scales are chosen large enough, then stochastic variations in sea ice deformation rates can cause the average stress-strain rate relationship on these scales to take on viscous characteristics, even though the nonaveraged relationship is plastic in character. In particular, when a two-dimentsional plasitc model with an elliptical yield curves is used, the stochastically averaged stress-strain rate relationship takes the form of a viscous law with a pressure term. Examination of actual sea ice deformation time series and deformation rates simulated by red noise suggests that minimal time scales for the application of such averaging arguments can be as short as 1 day. The calculations also yield an empirical ratio between the plastic strength of the ice and the viscous parameters. It was concluded that the viscous law, with the inclusion of a bulk viscosity and pressure term, is applicable to sea ice modelings. (Sims-ISWS)
W78-01990

A STUDY OF THE STABILITY OF A MODEL CONTINENTAL ICE SHEET SUBJECT TO PERIODIC VARIATIONS IN HEAT INPUT,
Northwestern Univ., Evanston, IL. Dept. of Geological Sciences; and Northwestern Univ., Evanston, IL. Engineering Sciences and Applied Mathematics.
G. E. Birchfield.
Journal of Geophysical Research, Vol 82, No 31, p 4909-4913, October 20, 1977. 5 fig, 8 ref.

Descriptors: *Glaciers, *Ice, *Model studies, Mathematical models, Snow, Ice, Glaciation, Ice loads, Ice cover, Solar radiation, Climatology, Paleoclimatology, Glaciology.
Identifiers: *Continental ice sheets.

A study was presented of the general response of an ice age ice sheet model recently developed by Weertman. The model was subjected to fluctuating insolation on time scales of the order of the variations in the earth's orbital parameters, which happen also to be the characteristic internal time scales of the model displays a wide range of behavior for reasonable parameter values, ranging from periodic growth and decay of ice sheets alternating with interglacial intervals to growth of large permanent ice sheets alternating with interglacial intervals to growth of large permanent ice sheets of periodically fluctuating size. The model displays nonlinear behavior analogous to a rectifier; as a consequence, a possible explanation of the 100,000-year cycle observed in geological climate time series was suggested. (Sims-ISWS)
W78-01991

METHOD OF MOVING A FLOATING BODY INTO A PREDETERMINED FLOAT PATH,
Atlantic Richfield Co., Los Angeles, CA. (Assignee).
L. E. Wilson.
U.S. Patent No. 4,030,305, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 997, June 21, 1977.

Descriptors: *Patents, Density, Density currents, Floating, Ice bergs, Sea water, Navigation, Float path.

This invention is described in terms of an iceberg floating in an ocean or sea of salt water. However this invention broadly applies to any body floating in a liquid wherein it is desired to redirect the floating body from its natural drift path to a different predetermined float path. The invention is particularly desirable for the redirection of exceedingly large, ponderous floating bodies which are not easily moved by physical means. A method is provided for moving a body in a predetermined float path which is different from the body's natural dirft path without the use of brute force to redirect the body. This is accomplished by reducing the density of the liquid in which the body is floating, the reduction in density being achieved generally in the direction of the predetermined float path. The area of liquid which is reduced in density thereby provides a path of lesser resistance for travel than the surrounding liquid which is of normal density so that the body will tend to tumple toward and/or sink deeper toward the less dense liquid. Any floating body in any liquid can be led in the manner contemplated by the concept of this invention utilizing any desired liquid density reduction means. More specifically a ship having an air compressor which is connected to a hose carrying a submerged nozzle with aeration jets can bubble air into the area and thereby reduce the density of the sea water in the area relative to the rest of the water. (Sinha-OEIS)
W78-02126

2D. Evaporation and Transpiration

A SIMPLE MODEL FOR ESTIMATING THE EVAPORATION FROM A SHALLOW WATER RESERVOIR,
Freie Univ. Berlin (West Germany). Inst. fuer Meteorologie.
K. Fraedrich, A. Behlau, G. Kerath, and G. Weber.
Tellus, Vol. 29, No. 5, p 428-434, October 1977. 2 fig, 7 ref.

Descriptors: *Model studies, *Evaporation, *California, Reservoirs, Latent heat, Energy, Energy-gradient, Mass, Heating, Hydrologic properties, Temperature.
Identifiers: *Salton Sea, *Shallow water reservoir, Energy fluxes, Mass budget, Heating process, Hydrological forcing, Time scales, Latent heat fluxes.

A simple model of the energy fluxes of a well-mixed water reservoir was presented based upon its energy and mass budget. The heating processes due to atmospheric-radiative and hydrological forcing were separated and parameterized in terms of 2 characteristic temperatures. Accordingly, 2 related time scales were deduced which describe the energetical response of the reservoir on the 2 forcing mechanisms. Three different approximations for the latent heat fluxes were introduced. The model, which included the complete energy balance, was applied to the Salton Sea, California, and showed good agreement with the observations. (Roberts-ISWS)
W78-01998

2E. Streamflow and Runoff

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W78-01822

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W78-01823

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01873

MAGNITUDE AND FREQUENCY OF FLOODS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
A. O. Waananen, and J. R. Crippen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 510, Price codes: A06 in paper copy, A01 in microfiche.
Water-Resources Investigations 77-21, June 1977. 96 p, 15 fig, 6 tab, 32 ref.

Descriptors: *Flood frequency, *Peak discharge, *Streams, *California, *Flood data, Small watersheds, Streamflow, Flow rates, Regression analysis, Equations, Rainfall-runoff relationships, Regional analysis, Urban runoff, Environmental effects, Evaluation.

The magnitude and frequency of floods from gaged and ungaged drainage areas in California, for any recurrence interval from 2 to 100 years, can be estimated by use of the method presented. Equations relating flood magnitudes of selected frequency to basin characteristics such as drainage area, precipitation, and altitude were developed for six regions in the State. Nomographs are included for solution of the equations. Annual peak discharges for more than 700 streamflow stations, including more than 340 stations on streams with basins smaller than 10 square miles, were included in the analysis. Maximum known peak discharges are shown and their relation to drainage areas defined. Data on basin characteristics used in the regression analyses are tabulated. Some adjustments for urbanization effects based on flood-peak ratios for developed and undeveloped areas are suggested. (Woodard-USGS)
W78-01874

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
L. C. Guetzkow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 509, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-31, May 1977. 33 p, 6 fig, 4 tab, 11 ref.

Descriptors: *Flood frequency, *Frequency analysis, *Flood forecasting, *Regression analysis, *Minnesota, Streamflow, Rainfall-runoff relationship, Flow characteristics, Peak discharge, Statistical methods, Regional analysis, Estimating equations, Hydrologic data, Natural flow, Flood recurrence interval, Ungaged watersheds.

Estimating relations have been developed to provide engineers and designers with improved techniques for defining flow-frequency characteristics to satisfy hydraulic planning and design requirements. The magnitude and frequency of floods up to the 100-year recurrence interval can be determined for most streams in Minnesota by methods presented in this report. By multiple regression analysis, equations have been developed for estimating flood-frequency relations at ungaged sites on all natural flow streams which are not significantly affected by man-made regulation, diversion, or urbanization. Eight distinct hydrologic regions are delineated within the State with boundaries defined generally by river basin divides. Regression equations are provided for each region which relate selected frequency floods to significant basin parameters; such as, drainage area, slope, and storage. For main-stem streams, which traverse regional divides and which may be affected by regulation, graphs are presented showing floods for selected recurrence intervals plotted against contributing drainage area. Flow-frequency estimates for intervening sites along the Minnesota River, Mississippi River, and the Red River of the North can be derived from these graphs. Flood-frequency characteristics are tabulated for 201 gaging stations having 10 or more years of record. (Woodard-USGS)
W78-01875

FLOOD EFFECTS ON STREAM ECOSYSTEMS,
Soil Conservation Service, Little Rock, AR.
R. A. Grizell.
Journal of Soil and Water Conservation, p 283-285, November-December, 1976. 1 tab, 23 ref.

Descriptors: *Floods, *Flood damage, *Ecosystems, *Streams, *Sedimentation, Runoff, Erosion, Ecology, Aquatic habitats, Spawning.

Floods affect entire ecosystems by increasing stream sediment loads, covering croplands with sand and gravel, damaging vegetation, ditrupting riffles, killing animals and destroying habitats. Sedimentation, one of the most serious results, is the major water pollutant in the United States. Suspended solids in streams are estimated to be 700 times the sewage loadings. Sediment carries pollutants and reduces photosynthesis, oxygen content in water, and the survival rate of invertebrate and fish eggs. It seriously interferes with the food-finding activities of many valuable predator fish, and damages spawning grounds. Floods flush streams enough to temporarily reduce concentrations of sulphates and chlorides. The scouring action of floods often devastates plant life in or near streams (including overhanging trees and shrubs); epilithic plants and phytoplankton may be dramatically reduced. Seasonal floods can affect fish spawning; for example, eggs of fall-spawning brook trout were decimated by winter floods, and the survival rate of spring-spawned rainbow fry increased due to reduced competition from young brook trout. Such changes in species composition may endure for years. (Lynch-Wisconsin)
W78-01919

2F. Groundwater

SETTLEMENT OF VENICE AND GENERAL ESTUARINE DEPOSITS,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 2L.
W78-01829

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA,
Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center.
For primary bibliographic entry see Field 5B.
W78-01848

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01863

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER,' JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01868

GEOELECTRIC SOUNDING FOR ESTIMATING AQUIFER HYDRAULIC CONDUCTIVITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
W. E. Kelly.
Ground Water, Vol 15, No 6, p 420-425, November-December 1977. 5 fig, 3 tab, 17 ref. NSF GK-42130.

Descriptors: *Hydraulic conductivity, *Resistivity, *Electrical resistance, *Rhode Island, On-site investigations, Aquifers, Pump testing, Hydrologic properties, Permeability, Conductivity, Measurement, Equipment, Data processing, Regression analysis, Groundwater, Hydrology.

The objective of this study was to develop surface electrical resistivity methods for estimating hydraulic conductivities in glacial outwash materials. Aquifer electrical resistivities were determined from the results of Schlumberger electrical soundings at six sites in southern Rhode Island where pumping tests has previously been made. Hydraulic conductivities and transmissivities determined from pumping tests then were correlated with resistivities obtained from electrical soundings. Results indicated that electrical resisitivities determined from soundings can be used to preduct aquifer hydraulic conductivities; an empirical was developed. A semiempirical relation between aquifer formation factor and hydraulic conductivity also was developed. (Sims-ISWS)
W78-01994

CLEAT ORIENTATION AND AREAL HYDRAULIC ANISOTROPY OF A WYOMING COAL AQUIFER,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 4B.
W78-01995

THE SIGNIFICANCE AND PREDICTION OF OBSERVATION WELL RESPONSE DELAY IN SEMICONFINED AQUIFER-TEST ANALYSIS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
J. H. Black, and K. L. Kipp, Jr.
Ground Water, Vol. 15, No. 6, p 446-451, November-December 1977. 4 fig, 1 tab, 10 ref.

Descriptors: *Observation wells, *Water levels, *Aquifer testing, *Graphical analysis, *Curves, Aquifers, Pumping, Equations, Leakage, Aquitards, Aquicludes, Drawdown, Transmissivity, Storage coefficient, Hydraulic conductivity.
Identifiers: *Leaky aquifers, *Slug test, *Type curves, Response, Delay.

The concept of the observation well as a measuring instrument with its own response characteristics was developed, and a method for response evaluation was derived based on methods of slug-test analysis. The effect of well response time upon the results of semiconfined aquifer tests was calculated, and a series of type curves was produced. The ambiguity of observation well response affected leaky aquifer tests was demonstrated. A method for calculating well response time based on estimates of aquifer parameters and observation well dimensions also was presented to aid the proper design of aquifer tests. It was recommended that a slug test should be performed on every observation well used in confined or semiconfined aquifer tests. (Visocky-ISWS)
W78-01996

HYDROLOGY OF THE WAIKOROPUPU SPRINGS: A MAJOR TIDAL KARST RESURGENCE IN NORTHWEST NELSON (NEW ZEALAND),
University of Auckland (New Zealand). Dept. of Geography.
P. W. Williams.
Journal of Hydrology, Vol. 35, No. 1/2, p 73-92, October 1977. 8 fig, 1 tab, 30 ref.

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Descriptors: *Springs, *Spring waters, *Discharge(Water), On-site investigations, Tides, Tidal effects, Coasts, Groundwater, Groundwater movement, Rivers, Infiltration, Recharge, Water quality, Saline water intrusion, Karst, Karst hydrology, Geology, Hydrogeology, Hydrology.
Identifiers: *New Zealand, *Waikoropupu Springs(New Zealand).

The Waikoropupu Springs with an average discharge of about 14 cu m/s are the largest springs in New Zealand. Water issues from 3 main sites at 14-17 m above sea level within a radius of 130 m of each other, the collected flow sustaining the Springs River. Previous study of their hydrology has been at reconnaissance level only. The Springs are karstic, tidal, brackish, and artesian in character, tritium data indicating a mean flow-through time of 3-4 years. The principal source of the Springs was demonstrated by pulse-train analysis to be the upper Takaka River that sinks into its gravelly bed 16-18 km to the south of the Springs and at 46-58 m above sea level. A mainly phreatic system is indicated because of the very low average gradient of the system, the descent of overlying confining beds to about sea level, and a rapid pulse-through time of 10 h for 20-km straight-line flow. The slightly saline waters of the Springs indicate a subterranean marine connection that is supported by the presence of submarine springs 1-5 km offshore, although the alternating double-amplitude tidal oscillation at the Waikoropupu Springs is more compatible with earth-tide influence. High tide at the Springs precedes high tide at sea by 0.5-1.5 h. Water discharge from the Waikoropupu Springs comes from four main sources: conduit flow of freshwater through cavernous marble, diffuse percolation flow through marble, diffuse flow from overlying thick sands and gravels, and seawater intrusion. (Sims-ISWS)
W78-02000

2G. Water In Soils

STRUCTURAL INDICES OF IRRIGATED CALCAREOUS CHERNOZEM, (IN RUSSIAN),
Kishinev Agricultural Inst. (USSR).
V. S. Snegovol.
Pochvovedenie 10, p 1320136, 1976.

Descriptors: *Soil moisture, Soil aggegates, *Calcareous soils, *Chernozems, Irrigated lands, Lucerne, Plowing, *Winter wheat.

The content of water-stable aggregates in the seed layer of soil was less than in the plowed layer. Structure coefficients of the soil were slightly higher in plowed soil than in surface tilled soil, after all forecrops (including winter wheat) except Lucerne. During the growing season soil structure improved.--Copyright 1977 Biological Abstracts, Inc.
W78-01705

SOME ASPECTS OF MOISTENING SURFACE FORMATION DURING SPRINKLING (SIMULATED TESTS), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
E. A. Dmitriev.
Pochvovedenie 10, p 37-46, 1976.

Descriptors: *Soil moisture, *Sands, Moisture content, Rainfall, *Testing, *Sprinkling, Surface, Tests, Time.

In sands with particle size from 20-30 to < 70 mesh the imbibition of moisture occurs mainly through the pores, when sprinkling has an intensity up to 11 mm/min. The formation of tongues along the moistening front is connected with the variation of capillary pressure on the moistening surface. the amplitude of the depth of moistening grows with the increase of heterogeneity in the constitution of the material, the decrease of its particle size, the lowering of rain intensity and the increase of the time of sprinkling.--Copyright 1977, Biological Abstracts, Inc.
W78-01706

DEVICE FOR MEASURING AMOUNT OF SOIL SPLASHED BY RAINDROPS, (IN RUSSIAN),
G. K. Gorchichko.
Pochvovedenie 9, p 121-124, 1976.

Descriptors: Soils, Measurement, Rain, *Impact(Rainfall), Instrumentation, *Soil splashing, *Raindrops.

The construction and principles of a device measuring the total amount of soil splashed by raindrops are described. The device can be used to determine the amount of soil splashed up and down a slope and the height of soil particle flight.--Copyright 1977, Biological Abstracts, Inc.
W78-01709

MINERALOGICAL COMPOSITION OF THE COARSE-DISPERSED FRACTION IN HYDROMORPHIC SOILS OF THE DESERT ZONE, (IN RUSSIAN),
Tashkent Univ. (USSR).
L. Tursunov, Kh. Tursunov, and A. Rasulov.
Probl Osvo Pustyn' 5, p 30-38, 1976.

Descriptors: Deserts, Feldspar, *Hydromorphic soils, Irrigation, Rock, *Soils, USSR(Uzbek), *Mineralogy.

Relative accumulation of dusty fraction occurs during soil-forming processes in the Khorezm oasis (Uzbek, SSR, USSR) chronically exposed to irrigation and a complex of natural factors. Occurrence of finely dispersed particles is the result of destruction of elastic rocks, feldspars, micas (biotite and muscovite) and other minerals referring to coarse-dispersed fraction of soils.--Copyright 1977, Biological Abstracts, Inc.
W78-01710

PRINCIPLES, METHODS AND RESULTS OF DEFINING WATER-PHYSICAL PROPERTIES OF IRRIGATED SOIL IN ROMANIA, (IN RUSSIAN),
Institutul de Cercetari pentru Pedologie si Agrochimie, Bucharest (Rumania).
A. Kanarake, and R. Dumitriu.
Pochvovedenie 9, p 79-86, 1976.

Descriptors: *Soil physical properties, *Methodology, *Irrigated lands.
Identifiers: Cartograms(Soils), *Distribution, *Romania, Soils, Statistical methods.

A program and methods for characterizing water and physical soil properties on irrigated areas are presented. The data include: cartograms and tables of soil properties, grouped according to genetic types and subtypes, mechanical composition and physio-geographical distribution; correlations between studied properties; and some aspects of statistical data processing.--Copyright 1977 Biological Abstracts, Inc.
W78-01711

SETTING UP CROP ROTATION ON HYDROMORPHIC SOILS IN A MOIST CLIMATE, (IN GERMAN),
Zagreb Univ. (Yugoslavia). Zavod Opcu Proizvode Bilja.
For primary bibliographic entry see Field 3F.
W78-01712

UNDERGROUND PART OF THE GRASS MIXTURE IN IRRIGATED PASTURES OF THE HILLY RELIEF IN THE LITHUANIAN SSR, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
For primary bibliographic entry see Field 3F.
W78-01713

ZOOLOGICAL CHARACTERISTICS OF PRIMITIVE SOILS IN DRAINED ZONES OF SALT LAKES IN SOUTH SIBERIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
V. G. Mordkovich.
Zool Zh. 52(9), p 1321-1329, 1973.

Descriptors: *Salt lakes, Soils, Drainage, Salts, Seasonal, Aeration, Ecology, Insects, Inundation, Lakes, Plant populations, *USSR(South Siberia), *Drained soils.

The initial stages of succession in the drained zones of Siberian (USSR) lakes proceed at a tremendous rate. The density of animal population, its systematic composition and the character of its influence on soil drastically change during 1 season. Communities of different age arise on the territory gradually freed from water during 1 season. Amphibionts-saprophaga occurring in the lake residues predominate at the water edge. The terrestrial fossorial insects predominate in the drained zone remote from the water. They aerate the lifeless saline soil thus promoting the development of plant cover. Unequal effects of fossorial insects on different regions of the drained zone serve as a basis for microcomplexes of soil-plant cover. There are many common systematic, morphological, autecological and synecological features of the population of drained zones in salt lakes of remote regions of Siberia and outer seas. This is due to past connections between basins and the conservative leveling effect of voermoistening, periodic inundation and salinization. Regional differences appear only at the last stages of saline soil development in drained zones.--Copyright 1974, Biological Abstracts, Inc.
W78-01917

PRACTICAL ASPECTS OF STRUCTURE DETERIORATION DUE TO AIR EXPLOSION,
Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fertilizers.
F. F. R. Koenigs.
Meded Fac Landbouwwet Rijksuniv Gent. 37(3), p 1086-1094, 1972.

Descriptors: *Soil aggregates, *Porosity, *Air pressure, Pores, *Tensile strength, Occlusion.

The maximum air pressure occurring during wetting of dry soil aggregates is highly dependent on water occlusion of soil areas with small air-filled pores. In the field explosion does not occur if the rain intensity and duration are not greater than the sorptivity of the fine pores. Very small aggregates may be saturated by a single drop of water and explode while larger aggregates tend to be more stable. Tensile strength of aggregates approaching saturation is important.--Copyright 1974, Biological Abstracts, Inc.
W78-01940

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN),
Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung.
For primary bibliographic entry see Field 2I.
W78-02013

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL,
Utah Center for Water Resources Research, Logan.; and Consortium for International Development, Logan, UT.

For primary bibliographic entry see Field 3C.
W78-02018

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIPARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA),
For primary bibliographic entry see Field 5B.
W78-02056

OXYGEN UTILIZATION IN SOILS FLOODED WITH SEWAGE WATER,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 5B.
W78-02194

2H. Lakes

ON THE BIOLOGY OF THE CLADOCERAN HOLOPEDIUM GIBBERUM ZADDACH IN WINDGFAELLWEIHER (BLACK FOREST) (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
W. Lampert, and K. Irmgard.
Arch Hydrobiol Supplementb 48(2), p 262-286, 1976.

Descriptors: Biomass, Lakes, *Crustaceans, Biology, Seasonal, Plankton, *Sampling, *Black Forest(West Germany), *Dystrophic lakes, *Holopedium-gibberum, *Windfaellweiher(W Germany).

The annual population cycle of H. gibberum was studied by quantitative plankton sampling in Windgfaellweiher, a small dystrophic lake in the Black Forest (West Germany). The maxima for abundance and biomass were found in June, reaching 152,000 Ind.(indivifuals)/m2 or 520 mg C/m2, respectively. A relationship between length and C of preserved Holopedium is presented. The seasonal cycle was unusual in that the animals had 2 periods of resting egg production in June and Oct. A notable percentage of males appeared only during the autumn. As a consequence of the fact that in June, 90% of all eggs were resting eggs, the instantaneous birth rate decreased markedly and the population size dropped at the end of July. This was clearly seen from the detailed size frequency distribution of the population. In early spring the abundance of resting eggs on the lake bottom was investigated by quantitative sampling. The maximum was 290 eggs/cm2 in the center of the lake. Resting eggs isolated from the sediment developed quickly. Hatching rates of up to 80% could be obtained.--Copyright 1977, Biological Abstracts, Inc.
W78-01703

UTILIZATION OF MANGROVES: I, (IN FRENCH),
B. Rollet.
J Agric Trop Bot Appl 22(7-9), p 203-235, 1975.

Descriptors: Agriculture, *Ecology, Fishery, Food, *Mangroves, Medicine, *Bibliographies.

An analysis was made of a large unpublished bibliography on the uses of various mangroves and their ecological systems. This part discusses the present and former uses as food, as medicine, in agriculture, in horticulture, and in fishery; miscellaneous applications are also given.--Copyright 1977, Biological Abstracts, Inc.
W78-01708

POSSIBILITY OF USING AMMONIUM PERCHLORATE FOR ACCELERATING GROWTH OF CARP IN PONDS, (IN RUSSIAN),
F. P. Chorik, A. M. Zelenin, G. I. Blik, and E. V. Kozhokaru.
Izv Akad Nauk Mold SSR SER Biol Khim Nauk 2, p 54-57, 1975.

Descriptors: Fish reproduction, Fisheries, *Ammonium perchlorate, Animal growth, Aquarium, *Carp, *Growth rates, Metab-drug, Ponds.

The results of using ammonium perchlorate (APC) as an additive to mixed feed for carp are presented. The experiments were carried out in aquariums and ponds. APC has biological activity on fish, just as on other animals. Feeding fish with an addition of APC at a rate of 60 g/ton of mixed feed increased the weight gain of the carp by at least 25% with a simultaneous 15% decrease of the consumption of feed per unit weight gain. The use of APC in carp fishery will make it possible to increase the fish production of ponds by 150-200 kg/ha.--Copyright 1976, Biological Abstracts, Inc.
W78-01723

FECUNDITY IN CHOSEN FISH SPECIES FROM A FEW MAZURIAN LAKES PREPARED FOR EXPERIMENTAL FERTILIZATION, (IN POLISH),
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland). Zaklad Gospodarki Jeziorowej.
W. Bialokoz.
Rocz Nauk Roln Ser H Rybactwo 95(4), p 7-34, 1974.

Descriptors: Lakes, *Mineralogy, Abramis brama, Alburnus alburnus, Esox lucius, Fecundity, *Fertilization, Fish, Leucaspius delineatus, Mazurian, Perca fluviatilis, *Poland(Magurian lakes), Rutilus.

Six fish species (Abramis broma, Rutilus rutilus, Esox lucius, Perca fluviatilis, Leucaspius delineatus, Alburnus alburnus) from 5 lakes of the Mazurian Lake District (Poland) were investigated. The lakes had been prepared for experimental mineral fertilization. Fish populations were tested immediately prior to fertilizing the lakes. Individual fecundity both absolute and relative was determined. The highest absolute fecundity was found in the fish from Lake Czarna Kuta, and the lowest in those from Lakes Smolak and Piecek.--Copyright 1976, Biological Abstracts, Inc.
W78-01734

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).
For primary bibliographic entry see Field 6E.
W78-01748

FISH PRODUCTIVITY OF VOLGA RESERVOIRS AND WAYS TO INCREASE IT UNDER COMPLEX UTILIZATION OF WATER RESOURCES, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-01777

KEY TO THE CHAROPHYTES OF SOUTH AFRICA,
Rhode Island Univ., Kingston. Dept. of Botany.
R. D. Wood.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 47-49, 1976. 4 ref.

Descriptors: Species identification, Aquatic plants, Taxonomy, Submerged aquatic vegetation, Freshwater algae, Lakes, Lagoons, *Charophyceae, Characeae, Chara, Lamprothamnium, Tolypella, Nitella, Wilderness lakes, *South Africa.

Charophytes occur commonly in the less polluted vleis, dams, lagoons, and streams in South Africa. They form large populations in certain vleis such as in the Wilderness area, C.P. Many historically rich collecting areas, however, have been levelled through urbanization. A key for the identification of fresh and preserved specimens is given. (So African Water Info Center)
W78-01825

SOME LIMNOLOGICAL PROPERTIES OF AN EPHEMERAL WATERBODY AT SOSSUS VLEI, NAMIB DESERT, SOUTH WEST AFRICA,
Orange Free State Univ., Bloemfontein (South Africa). Inst. of Environmental Science.
J. U. Grobbelaar.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 51-54, 1976. 2 tab, 3 fig, 11 ref.

Descriptors: *Limnology, *Ephemeral streams, Hydrochemistry, Water analysis, Primary production, Biota, Chemical composition, Phytoplankton, Species diversity, Climatic data, Standing water, Calcium, Sodium, Groundwater, Ionic composition, Chemical properties, Colorimetry, Atomic absorption, *Sossus Vlei, *South West Africa, Namib Desert, South Africa, Spirogyra, Kuiseb River, Tsauchab River.

Sosus Vlei (24 degrees 45'S, 15 degrees 20'L), which is situated 55 km from the coast at the river-ending of the Tsauchab River, consists mainly of old river sediments covered by south-north moving sand dunes, which have blocked the river course and divided the vlei up into several arms or lobes. The present day vlei has an area of about 15 km2 and although sparsely vegetated the vlei appears lush between the seemingly barren dunes. Acaia giraffae, scrubby halophytic Chenopodiaceae, spiny Stipagrostis grasses and the endemic scrub narras (Acanthosicyos horida) are some of the plants that vegetate the vlei. Although the head-waters of the Tsauchab River are in the Naukluft Mountains, where the maximum annual rainfall is approximately 200 mm, water reaches Sossus Vlei only after exceptionally heavy rainfall periods. Open water is relatively rare in the vlei and soon disappears. The only standing water at the Vlei during the visits, was a shallow (maximum depth of 0.35 m) pond with a surface area of approximately 20 000 m2. This pond is surrounded by high sand dunes, except to the south where it links with the vlei. The bottom sediments are soft and clayey, leaving extensive mudcrack areas where the water has retreated. Aspects of the water chemistry, primary production and biota were studied. The chemical composition of the water was dominated by NaHCO3 and an edaphic rather than an oceanic origin is shown, where the source water had lost its Ca through precipitation of CaCO3 due to a pH shift. The phytoplankton was dominated by Spirogyra spp. which settled to the bottom during calm conditions, rendering low primary production values of the water column. A small species diversity exists, which is attributed to the isolation and temporariness of the pond. (So African Water Info Center)
W78-01826

VARIATION OF 'GILL' SIZE IN LARVAE OF THE AFRICAN MIDGE CHIRONOMUS TRANSVAALENSIS KIEFFER,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
A. J. McLachlan.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 55-56, 1976.

Descriptors: *Aquatic insects, *Insect larvae, Limnology, Gills, Salinity, Species identification, Water quality, Water pollution, Morphological changes, *Midges, *Septematics, *Chironomus transvaalensis, Chironomidae, *Africa, South Africa.

Larvae of Chironomus are common inhabitants of newly flooded lakes and polluted and temporary waters in Africa. These habitats characteristically undergo wide variations in the content of dissolved salts. The so-called 'gills' (comprising conspicious anal papillae and abdominal tubuli) are proving to be attractive to African tazonomists as characters of separation of species. Evidence from laboratory experiments is presented to show that in one common species, Chironomus transvaalensis Kieffer, both types of 'gill' vary in size depending upon the concentration of inorganic ions in the water. The variation is such as to cast serious doubt on the taxonomic value of the 'gills'. (So African Water Info Center)
W78-01827

ON THE SIZE REACHED BY CLARIAS GARIEPINUS,
Institute for Freshwater Studies , Ubombo (South Africa). Lake Sibaya Research Station.
M. N. Bruton.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 2, p 57-58, 1976. 2 tab, 23 ref.

Descriptors: Freshwater fish, *Fish populations, Food chains, Body size, Body length, Body weight, Predator-prey relationships, *Clarias gariepinus, *Siluroidea, *South Africa.

The suborder Siluroidea includes some of the largest freshwater fishes in the world. Among them are the wels Siluris glanis from eastern Europe and western Russia which exceeded 400 cm and 270 kg and Amazonian catfish Arapaima gigas and Brachyplatystoma spp., which exceed 300 cm and 100 kg. Two giant catfish occur in southern Africa. The largest is the vundu Heterobranchus longifilis Cuvier and Valenciennes, 1840, which is distributed from the Nile and Congo basins southwards to the Zambezi river and reaches 47 628 kg. Vundu commonly exceed 30 kg and there are unconfirmed reports of specimens weighing over 100 kg. The second largest is the sharptooth catfish Clarias gariepinus distributed from the Zambezi to the Umtamvuma rivers, which is the Republic of South Africa's largest freshwater fish. The size reached by Clarias gariepinus, both past and present, is reviewed from available records. The sharptooth catfish is the Republic of South Africa's largest freshwater fish and may reach its greatest size in rivers and dams with a plentiful supply of fish prey to adults. (So African Water Info Center)
W78-01828

THE BIOLOGY OF BARBERSPAN, WITH SPECIAL REFERENCE TO THE AVIFAUNA,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
For primary bibliographic entry see Field 6G.
W78-01832

CHANGES IN SOME BIOCHEMICAL INDICES OF BREAM KEPT IN RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
A. Kangur, and A. Kirsipuu.
Eesti Nsv Tead Akad Toim Biol 25(3), p 176-187, 1976.

Descriptors: *Bioindicators, *Biochemical indices(Fish), *Bream, *Metabolism(Fish), Reservoirs, Seasonal.

According to data collected during 1964-1973, the manner of catching, the injuries caused by catching and the conditions of maintenance affect the biochemical indices of the muscle, blood and liver. In the period of low activity Jan.-Feb., keeping the fish for a short time in warm water in a reservoir affects the biochemical indices very little. But in the period of intensified activity (in summer) even a brief period of unfavorable conditions causes remarkable deviations in the metabolic cycle. During reorganization of metabolic processes (spring and autumn), the conditions either accelerate or inhibit the natural course of metabolic processes. The remarkable variability of the biochemical indices in the fish kept in a reservoir or in a live-box shows that the process of adaptation is of an individual nature. Complete adapation of the bream requires no less than 5-7 days.--Copyright 1977, Biological Abstracts, Inc.
W78-01891

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-01907

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-01909

ZOOPLANKTON IN FRY PONDS IN THE LUBLIN VOIVODSHIP, (IN POLISH),
Akademia Rolnicza, Lublin (Poland). Inst. Biol. Rodstaw Prod. Zwierzecej.
B. Jarzynowa.
Rocz Nauk Roln Ser H Rybactwo 95(4), p 69-84, 1974.

Descriptors: Crustaceans, Fisheries, Fry, Plankton, *Poland(Voivodship), Ponds, *Zooplankton.

The results of zooplankton testing in the nursery ponds of a State Fish Farm, in the Voivodship of Lublin (Poland) are given. The ponds were tested for qualitative and quantitative occurrence of zooplankton. In experiments conducted for several years, the fauna in the same ponds were analyzed. Peculiar attention was paid to Cladocera.--Copyright 1976, Biological Abstracts, Inc.
W78-01914

ZOOLOGICAL CHARACTERISTICS OF PRIMITIVE SOILS IN DRAINED ZONES OF SALT LAKES IN SOUTH SIBERIA, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
For primary bibliographic entry see Field 2G.
W78-01917

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER,
Southwest Texas State Univ., San Marcos. Aquatic Station.
For primary bibliographic entry see Field 5C.
W78-01920

THE EXPLOSIVE OCCURRENCE OF THE FRESHWATER MEDUSA, LIMNOCNIDA TANGANYICAE GUNTHER, IN LAKE KARIBA DURING 1972,
Rhodesia Univ., Salisbury. Div. of Biological Sciences.
M. L. Mills.
Arnoldia Rhod. 6(14), p 1-8, 1973.

Descriptors: Lakes, Limnocnida tanganyicae, *Medusa, *Rhodesia(Lake Kariba).

A brief outline of the history of the medusa is given. The present lines of thought on species distinction are mentioned. A report is given of a shortlived population 'explosion' of the medusa, seemingly with a single focus of origin in the Sinamwenda area of Lake Kariba, Rhodesia.--Copyright 1974, Biological Abstracts, Inc.
W78-01936

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN 1. EFFECTS OF PHYTOPLANKTON,
Saint Andrews Univ. (Scotland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01942

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-01947

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01954

THE RELATIONSHIP BETWEEN PLANKTONIC ALGAE AND BACTERIA IN SMALL LAKE,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01960

OXYGEN DEFICITS, CLARITY, AND EUTROPHICATION IN SOME MADISON LAKES,
State Univ. of New York at Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-01966

TOXIC EFFECTS OF CADMIUM ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTIMALIS),
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-01969

LAKE TAHOE GEOCHEMICAL STUDY. 1. LAKE CHEMISTRY AND TRITIUM MIXING STUDY,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-01978

OBSERVED RESULTANT CIRCULATION OF LAKE ONTARIO,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
R. L. Pickett, and S. Bermick.
Limnology and Oceanography, Vol. 22, No. 6, p 1071-1076, November 1977. 4 fig, 1 tab, 13 ref.

Descriptors: *Water circulation, *Currents(Water), *Lake Ontario, *Great Lakes, Winds, Summer, Winter, Flow, Lakes, Circulation, Frequency analysis, Energy, Data processing, Limnology.
Identifiers: Gyres.

Vector-averaged current data from June-October 1972 suggested that Lake Ontario's resultant circulation during the stratified period consists of a dominant counterclockwise gyre together with a small clockwise gyre in the northwest portion of the lake. Current speeds are lowest in spring and have maximum vertical shear in early autumn. Spectra comparing summer and winter winds and currents showed more high frequency energy in summer winds and currents and more low frequency energy in winter winds and currents. (Sims-ISWS)

W78-01979

THE THERMAL STRUCTURE OF THE DEAD SEA,
Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Applied Mathematics.
Z. Ben-Avraham, R. Hanel, and G. Assaf.
Limnology and Oceanography, Vol. 22, No. 6, p 1076-1078, November 1977. 1 fig, 1 tab, 8 ref.

Descriptors: *Thermal properties, *Physical properties, Geothermal studies, *Water temperature, *Thermal stratification, Properties, Thermometers, Instrumentation, Saline water, Surface water, Analytical techniques.
Identifiers: *Dead Sea, *Thermal structure, *Israel, *Thermal profile.

The thermal structure of the Dead Sea was measured with a sensitive probe (0.002C accuracy). The Dead Sea displays a horizontal uniformity below a depth of about 100 m. An adiabatic temperature distribution was found from the bottom (335 m) to a depth of 185 m. (Henley-ISWS)
W78-01980

GREAT LAKES ICE THICKNESS PREDICTION,
National Oceanic Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2C.
W78-01983

NEARSHORE SEDIMENTS OF THE ILLINOIS SHORE OF LAKE MICHIGAN,
Illinois Univ. at Urbana-Champaign. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-01984

SEDIMENTATION RATES AND A SEDIMENT BUDGET FOR LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-01985

CALCULATION OF STEADY CURRENTS IN LAKE ONTARIO WITH VARIABLE EDDY VISCOSITY,
Oak Ridge National Lab. TN.
A. J. Witten, and J. H. Thomas.
Journal of Great Lakes Research, Vol. 2, No. 2, p 357-363, December 1976. 6 fig, 1 tab, 10 ref. NSF DES72-01338 A03.

Descriptors: *Currents(Water), *Lake Ontario, *Model studies, *Great Lakes, Mathematical models, Winds, Circulation, Water circulation, Lakes, Flow, On-site data collections, Limnology.
Identifiers: Eddy viscosity, Lake circulationn.

A theory of steady wind-induced currents with depth dependent eddy viscosity was applied to Lake Ontario with accurate topographic representation. In this theory, the eddy viscosity has the form v = (v sub o) e to the az power, where v sub o and a are constants, and z is the vertical coordinate measured upward from the undisturbed free surface. Results were presented for a uniform wind from the west and were compared with previous results for a constant eddy viscosity as well as current measurements made in Lake Ontario during IFYGL. The study showed that, while the vertically integrated mass flux is insensitive to variations in the eddy viscosity, the three-dimensional currents are sensitive to the variations. Although the irregular bottom topography of Lake Ontario strongly influences the current pattern, the nature of the coastal jets, return flow, and upwelling and downwelling are characteristic of the exponential eddy viscosity. (Sims-ISWS)
W78-01987

TURBIDITY SOURCES IN LAKE SUPERIOR,
Minnesota Univ.-Duluth. Dept. of Physics.
For primary bibliographic entry see Field 2J.
W78-01988

CURRENTS AND CONTAMINANT DISPERSION IN THE NEARSHORE REGION AND MODIFICATION BY A JETPORT,
Case Western Reserve Univ., Cleveland, OH Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W78-01989

THERMAL DISCHARGE FROM A NUCLEAR POWER PLANT: PREDICTED EFFECTS ON LAKE ERIE FISH,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W78-02002

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: II. ADDITIONAL FEATURES OF THE CHEMISTRY OF MACQUARIE ISLAND LAKES AND TARNS,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 2K.
W78-02004

TULAREMIA EPIZOOTICS IN THE FLOOD PLAIN-SWAMP FOCI OF WEST SIBERIA AND COMPARATIVE ESTIMATION OF DIFFERENT METHODS OF THEIR STUDY, (IN RUSSIAN),
Akademiya Meditsinskikh Nauk SSSR, Moscow. Dept. of Nature and Focus Infection.
For primary bibliographic entry see Field 2I.
W78-02009

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN,
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-02017

THE LAKE CHELAN CASE--ANOTHER VIEW,
Washington State Bar Association, Seattle.
For primary bibliographic entry see Field 6E.
W78-02098

WISCONSIN DESMIDS. III. DESMID COMMUNITY COMPOSITION AND DISTRIBUTION IN RELATION TO LAKE TYPE AND WATER CHEMISTRY,
Wisconsin Univ.-Madison. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-02122

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 5C.
W78-02183

COMPETITIVE INHIBITION FOR AMINO ACID UPTAKE BY THE INDIGENOUS MICROFLORA OF UPPER KLAMATH LAKE,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 5C.
W78-02187

THE INTERACTION OF COMPONENTS CONTROLLING NET PHYTOPLANKTON PHOTOSYNTHESIS IN A WELL-MIXED LAKE (LOUGH NEAGH, NORTHERN IRELAND),
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.
For primary bibliographic entry see Field 5C.
W78-02195

PRIMARY PRODUCTIVITY AND FISH YIELDS IN TROPHICAL LAKES,
Duke Univ., Durham, NC. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-02199

2I. Water In Plants

RELATIVE ABUNDANCE OF WATERFOWL IN THE ORANGE FREE STATE,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Nature Conservation.
For primary bibliographic entry see Field 6G.
W78-01843

VEGETATION PATTERNS ON A SOUTHERN APPALACHIAN WATERSHED,
Old Dominion Univ., Norfolk, VA. Dept. of Biology.
F. P. Day, Jr.
Ecology. 55(5), 1064-1074, 1974.

Descriptors: Forests, *Forest management, Acer rubrum, *Appalachian Mountain region, Betula lutea, Biomass, Blight, Carya glabra, Chestnut, Cornus florida, Hamamelis virginiana, Kalmia latifolia, Liriodendron tulipifera, Moisture, Nyssa sylvatica, Oxydendrum arboreum, Quercus coccineus, Quercus prinus, Rhododendron maximum, Soils, Topography, Tsuga canadensis, *Vegetation, *Watersheds(Basins).

The vegetation on a relatively undisturbed hardwood forest watershed at Coweeta Hydrologic Laboratory, Franklin, North Carolina was sampled, and estimates of density, basal area and above-ground biomass were computed. These vegetational parameters and 5 topographic variables (elevation, aspect, slope angle, distance from stream channel, and distance from water divide) were used to analyze site-species relationships on the watershed. The primary analytical techniques used were correlation analysis and principal components ordination. Major changes in the vegetation since the introduction of chestnut blight were also examined. The vegetation on the watershed was found to be dominated by oaks, though considerable change had occurred in the vegetation composition since the appearance of chestnut blight. Total basal area on the watershed was 25.6 m2/ha and the total aboveground biomass was 139, 900 kg/ha. Significant correlations were found between 13 major species (Quercus prinus, Q. coccineus, Carya glabra, Liriodendron tulipifera, Betula lutea, Tsuga canadensis, Acer rubrum, Oxydendrum arboreum, Kalmia latifolia, Rhododendron maximum, Cornus florida, Nyssa sylvatica, Hamamelis virginiana) and one or more of the topographic variables. The ordination results revealed species groupings related to the correlation results. Distance from the stream, distance from the water divide and elevation, which produce a soil moisture gradient, were the important topographic factors determining species distribution at Coweeta.--Copyright 1975, Biological Abstracts, Inc.
W78-01943

ESTIMATION OF THE TOTAL POPULATIONS OF LARVAE OF AEDES (O.) CATAPHYLLA DYAR 1916 (DIPTERA, CULICIDAE): II. METHOD USING THE 'SCOOP WITH THE LADLE' OR 'DIPPING', (IN FRENCH),
Montpellier-1 Univ. (France). Faculte de Medecine.
B. Papierok, H. Croset, and J. A. Rioux.

Cah O R S T O M Ser Entomol Med Parasitol. 13(1), p 47-51, 1975.

Descriptors: Estimating, Biological communities, Biocontrol, Methodology, *Aedes-cataphylla, *Culicidae, *Dipping method, *Diptera, Larvae.

A larval population of Aedes (Ochlerotatus) cataphylla Dyar, 1916 was counted using the dipping method. Using according to an accurate protocol, dipping gives results similar with those obtained by the mark-recapture method so that it is possible to consider the dipping as an absolute sampling method. This easy to apply method opens numerous possibilities for the study of the dynamics of culicid populations, preliminary to the promotion of biological control methods.–Copyright 1976, Biological Abstracts, Inc.
W78-01950

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY,
Massachusetts Univ., Boston. Dept. of Biology.
B. A. Menge.
Ecological Monographs, Vol 46, No 4, p 355-393, 1976. 17 fig, 16 tab, 71 ref, 2 append. NSF GA-35617 and DES72-01578 A01.

Descriptors: *Ecology, *Intertidal areas, *Biological communities, *Predation, *Competition, *Heterogeneity, New England, Maine, Massachusetts, Gastropods, Mussels, Ecosystems, Aquatic habitats, Habitats, Algae.
Identifiers: Community structure, Balanus balanoids, Mytilus edulis, Thais lapillus, Fucus, Barnacles, Fucoid algae.

Community structure at six sites along the rocky intertidal shores of Maine and Massachusetts was studied from 1972-75 using a combined comparative and experimental approach. The roles of competition for space, predation, and substratum inclination and heterogeneity were examined, as well as factors responsible for the distinct species zoning patterns and the effects of disturbances by fucoid alage and herbivorous snails. Numerically dominant species in these simple communities include barnacles (Balanus balanoids), mussels (Mytilus edulis), herbivorous gastropods (Littorina saxatilis, L. obtusata, L. Littorea, and Acmae testudinalis), carnivorous snails (Thais lapillus), and fucoid algae (Fucus distichus, F. vesiculosis, and Ascophyllum nodosum). Community structure in the high intertidal zone (3.7-1.8 m above mean low water) is a function of Balanus population dynamics. Balanus space utilization is affected most by intraspecific competition, wave shock, and disiccation, rather than by Thais predation or competition with Mytilis, except in protected areas. The structure of the mid-intertidal (1.8-0.6 m above low water) is a complex function of predation, competition, structural heterogeneity, biological disturbance from the fucoid canopy, and wave shock. Competition between Mytilus and Balanus is the major factor; substratum inclination affects their relative density. With decreasing wave shock, predation on Mytilus and Balanus increases and interspecific competition decreases. (Lynch-Wisconsin)
W78-01952

CONTRIBUTION TO THE KNOWLEDGE OF THE BIOLOGY OF FISHES OF AMAZONIA: II. FOOD HABITS OF THE TAMBAQUI, COLOSSOMA BIDENS (SPIX), (IN PORTUGUESE),
Institute Nacional de Pesquisas de Amazonia, Manaus (Brazil).
E. M. S. Honda.
Acta Amazonica. 4(2), p 47-54, 1974.

Descriptors: *Fish biology, *Food habits(Fish), Seasonal, *Brazil(Amazonia), Byrsonima sp, Cladocera, *Colossoma bidens, Copepods, Duroia duckei, Gustavia augusta, Hevea brasiliensis, Hevea spruceana, Mabea caudata, Ostracod, Plankton, Simaba guianensis, Tabebuia sp, *Tambaqui.

The results of qualitative and quantitative analysis of the stomach contents of tambaqui, C. bidens (Spix), collected in Lago do Castanho, Amazonas (Brazil), were related to standard length of the specimens and to the months of the year. There is a periodic variation in the alimentation of this fish. Fruits are constantly present during the high water season, but are increasingly rare as the volume of water decreases. The following fruits occur most frequently: araca, Duroia duckei Huber; cajurana, Simaba guianensis (Aubl.); capitari, Tabebuia sp.; murrao, Gustavia augusta L.; muruxi, Byrsonima sp.; seringa, Hevea brasiliensis M. Arg.; seringa barriguda, H. spruceana M. Arg.; and taquari, Mabea caudata, P. et H. Planktonic crustaceans are another common food of tambaqui, predominantly during the dry season. Cladocerans, copepods and ostracods occur most frequently. In regard to fish size, the presence of fruit in the stomach was greater in individuals of more than 600 mm and the micro-crustaceans were found in all of the specimens examined. An examination of the branchial structure of tambaqui showed the fish to be adapted for feeding on plankton. The strong teeth also indicated the capacity to break the stones of fruit. These findings indicate that the tambaqui is omnivorous.–Copyright 1975, Biological Abstracts, Inc.
W78-01953

TROPICAL BLACKWATER RIVERS, ANIMALS, AND MAST FRUITING BY THE DIPTEROCARPACEAE,
Michigan Univ., Ann Arbor. Dept. of Zoology.
D. H. Janzen.
Biotropica. 6(2), p 69-103, 1974.

Descriptors: *Toxicity, *Animals, Asia, *Blackwater rivers, Climates, *Dipterocarpaceae, *Mast fruiting, Nutrition, Primary productivity, Rivers, Sarawak, Seeds, Trees, Tropical, Vegetation.

It is proposed that tropical nutrient-poor white sand soils produce blackwater rivers, rivers that are rich in humic acids and poor in nutrients, because the vegetation growing on these soils is exceptionally rich in secondary compounds. While the water and the soil (including litter) may be expected to have a low productivity and animal biomass solely on the basis of its low nutrient content, it is possible that large amounts of secondary compounds are also debilitating to the animal community. An exceptionally high concentration of secondary compounds is expected in the vegetation growing on white sand soils for 2 reasons. First, this is an expected outcome in habitats where the loss of a leaf to an herbivore or through deciduous behavior is a relatively greater loss than on nutrient-rich soils. Second, the plants belong for the most part to families rich in secondary compounds. The small amount of data that is available from Sarawak white sand habitats shows that the carrying capacity for animals is very greatly reduced. The postulated cause of reduced primary productivity and/or much of the productivity being used by the plant for secondary compounds (unharvestable productivity), or stored for seed crops at very long intervals (unavailable productivity). Mass fruiting at the community level, as displayed by trees in the Dipterocarpaceae, is a mechanism of escape from seed predators that is unique to S.E. Asia because this area has reduced animal communities and because the climate is sufficiently uniform for such an intra- and inter-population cueing system to evolve. Without experimentation, it is impossible to know if the animal community is reduced solely due to overall lowered primary and harvestable productivity, or as well to the inevitable reduction in animal numbers when many of the trees in a habitat wait more than a few years for their highly synchronized seed crops. The occurrence of numerous tropical habitats with a very low diversity of trees violates the dogma that diversity is mandatory for stability in tropical habitats. The trees in such monotonous habitats are exceptionally well-protected chemically with respect to foliage, and have either very toxic seeds or well-developed mast cycles.–Copyright 1974, Biological Abstracts, Inc.
W78-02006

TULAREMIA EPIZOOTICS IN THE FLOOD PLAIN-SWAMP FOCI OF WEST SIBERIA AND COMPARATIVE ESTIMATION OF DIFFERENT METHODS OF THEIR STUDY, (IN RUSSIAN),
Akademiya Meditsinskikh Nauk SSSR, Moscow. Dept. of Nature and Focus Infection.
B. P. Dobrokhotov, and I. S. Meshcheryakova.
Zool Zh 53(11), p 1686-1696, 1974.

Descriptors: *Flood plains, Allactaga-bullata, Allactaga-elator, Allactaga-euphratica, Allactaga-jaculus, Allagataga-saltator, Allactaga-severtzovi, Allactagulus-acontion, Allactodipus-bobrinskii, Birds, *Epizootics, Floods, Lophocricetus, Novosibirsk, Oblast, Omsk, Protolactaga, Pygerethmus-platyurus, Sicista, *Swamps, *Tularemia, *USSR(West Siberia).

During the regular mass reproduction of water voles (Lophocricetus) in West Siberia (Novosibirsk and Omsk Oblasts, USSR) in summer 1971, epizootics of tularemia appeared and assumed a continuous pattern in 1972. A study of blood sera from wild animals little susceptible and non-sensitive to tularemia (Allactodipus bobrinskii, Allactaga jaculus, A. severtzovi, A. saltator, A. bullata, A. elator, A. euphratica, Allactagulus acontion, Pygerethmus platyurus, Sicista, Protalactaga) showed the territorial distribution of the epizootic in the focus. The presence of hemagglutinating antibodies against the tularemia causative agent in the blood of 0.3-0.9% of water voles suggested the non-lethal course of infection in this species. It is necessary to decipher the mechanism of this phenomenon and the role of such specimens in the epizootic process. The method of epizootial detection by examining pellets of birds and excrement of predatory mammals can be successfully utilized in the flood plain-swamp foci of tularemia; this method enables more detailed characteristics of the spizootic process to be obtained at relatively small expenses of labor. The boundaries and intensity of even weak epizootics were established. The wide involvement of common voles in the circulation of the causative agent in the flood plain-swamp tularemia foci calls for more detailed study of their role in the maintenance of such foci.–Copyright 1975, Biological Abstracts, Inc.
W78-02009

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN),
Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung.
K. Dierssen.
Res Inst Nedri As Hveragerdi Icel Rep. 13, p 1-30, 1973.

Descriptors: *Mosses, *Iceland, *Peat soils, Aulacomnium-palustre, Ceratodon-purpureus, Foodstuff, Funaria-hygrometrica, Hay, Leptobryum-piriforme, Limestone, Nitrogen, Peat, Peltigera, Phosphorus, Pleurozium-schreberi, Pogonatum-urnigerum, Pohlia-cruda, Polytrichum-alpinum, Psilopilum-laevigatum.

Bryophyte communities forming pioneer vegetation on peat soil in Iceland are classified by phytosociological methods. The Psilopilum laevigatum-union grows on peat containing little of mineral matter. The Pogonatum urnigerum-union is mainly to be found on loessial deposits or wind-transported mineral dusts in the peat, while the Funaria hygrometrica-community grows on layers

of volcanic ash (tephra) in the peat. In the agricultural field research institute at Hvanneyri, W. Iceland, investigations were undertaken to show relationships between bryophyte communities and the use of different fertilizers (N,P, limestone). Taking into account the concurrences between the Bryophytes and the herb layer, the mosses are direct indicators of the soil conditions and therefore can be used as mapping units for hayfields quality. Characteristic groups are easier to be found in the field by working out spectra of genera than by the single species without losing the characteristic relevance of the groups. It is even possible to point out relationships between the number of species in the different samplings and hay-production. The possibility of indicating chemical and physical soil conditions (such as water capacity, base saturation, fertilizer use, etc.) by the bryophyte vegetation is proposed. In agreement with Tuxen (1958), one can say that the bryophyte-units can be used not only as indicators, but also for quantitative measurements of factor complexes in the places under study. They may help to clear up cultivation problems in the Icelandic hayfields. An indicator for good drainage and high amount of nitrogen in the soil may be Ceratodon purpureus, but large populations indicate the possibility of damage by winter killing (kal). A relatively good base saturation is shown by Funaria hygrometrica, Poblia cruda and Leptobryum piriforme. Soils with less N are characterized by different species of the lichen genus Peltigera, and also by Aulacomnium palustre, Pogonatum urnigerum, Polytrichum alpinum and Pleurozium schreberi. Bad base saturation and insufficient physical soil conditions are to be found where Psilopilum laevigatum is present in large quantities.–Copyright 1974, Biological Abstracts, Inc.
W78-02013

GROWTH AND DEVELOPMENT OF JUGLANS REGIA IN FOREST-ORCHARDS AND IN PLANTATIONS, (IN RUSSIAN),
V. M. Zhadan.
Tr Kishinev S-Kh Inst. 63, p 81-90, 1970.

Descriptors: Arid lands, Dogwood, *Forests, *Growth rates, *Juglans-Regia, Moisture content, Nutrition, Orchards, Plantations, Roots, Shrubs, Steppe, Transpiration, *USSR(Moldavia), *Walnut.

Under the conditions of Moldavia (USSR), Juglans regia trees planted in pure rows grow better than the stands with an admixture of shrubs. In order to clarify the causes of the poor growth and development of walnut in the latter, root systems (RS) were dug out in walnut trees and in dogwood (D) shrubs in the 6-yr-old plantations of the Yargara Forest Farm. Average weight of RS in walnut trees in 1769 kg (including 0.109 kg of roots < 3 mm), in D 2649 and 0.325 kg, respectively. In the 0-80 cm layer, 91.3% of walnut roots are concentrated, and 94.4% of D. In comparison with D, roots of walnut penetrate 120 cm deeper and reach the depth of 280 cm (1.8% by weight). Average weight of the epigeal part (the stem) of walnut is 2470 kg, that of D-4615 kg; fresh weight of walnut leaves is 788 g with a total surface of 3.76 m2, whereas in D it is 1982 g and 13.85 m2, respectively. Though transpiration intensity in D is condsiderably lower than in walnut, the total water expenditure on transpiration was higher in D. In all soil layers (except of 0-10 cm) moisture content provision was considerably higher when D was cut out. Therefore, the unsatisfactory growth of walnut is explained first of all by the deficiency of moisture, which is intercepted by a more developed dibrous RS of D. In a pure plantation of the same age, established under the same conditions by the plantation method, fresh weight of the epigeal part of walnut tree was 60 kg, weight of the RS was 16.25 kg, whereas the fruit yield was 200 kg/ha. The great difference between the growth and development of walnut in stands with the admixture of D, and in pure plantations is explained by the difference in the nutrition area; in the 1st case it was 1.5 m2, whereas in the 2nd case it was 24 m2. Also discussed is the problem of the principle of establishing forest plantations on arid steppes. The introduction into forest-orchards of soil-shading undergrowth did not justify itself and the expenses for creating walnut plantations are only 36.2% of the cost of creating forest walnut plantations. In plantations one may expect an income as early as in the 1st years by growing tilled crops in the interrows, and by the age of 10-15 yr, walnut fruit in an amount not less than 500-600 kg/ha. --Copyright 1974, Biological Abstracts, Inc.
W78-02014

STUDIES ON THE BROODING POPULATION OF LIMICOLAE IN THE LOWER HAVEL RIVER, (IN GERMAN),
J.-J. Seeger.
Beitr Vogelkd. 20(5), p 421-426, 1974.

Descriptors: Europe, *Brooding, Charadrius-dubius, *East Germany(Lower Havel River), Gallinago-gallinago, Haematopus-ostralegus, *Limicolae, Limosa-limosa, Numenius-arquata, Philomachus-pugnax, Rivers, Tringa-hypoleucos, Tringa-totanus, Vanellus-vanellus.

Between 1969-1972 broods of Vanellus vanellus, Charadrius dubius, Gallinago gallinago, Numenius arquata, Limosa limosa, Tringa totanus and Philomachus pugnax were reported and T. hypoleucos and Haematopus ostralegus probably also breed in the lower Havel valley (East Germany). During spring floods large numbers of V. vanellus, L. limosa, T. totanus and P. pugnax brood and low spring flood levels reduce the number of brooding pairs. Polders in the area which have artificially induced extremely low water levels limit the breeding grounds of the lower Havel valley.–Copyright 1975, Biological Abstracts, Inc.
W78-02158

2J. Erosion and Sedimentation

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5G.
W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE,
Miami Univ., FL.
For primary bibliographic entry see Field 5G.
W78-01779

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 2L.
W78-01834

DISTRIBUTION OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geology.
For primary bibliographic entry see Field 2L.
W78-01836

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geochemistry.
For primary bibliographic entry see Field 2L.
W78-01842

RECONNAISSANCE OF SEDIMENTATION IN THE RIO PILCOMAYO BASIN, MAY 1975, ARGENTINA, BOLIVIA, AND PARAGUAY,
Geological Survey, Harrisburg, PA. Water Resources Div.
J. R. Ritter.
Open-file report 77-327, 1977. 34 p, 20 fig, 1 plate, 2 tab, 9 ref.

Descriptors: *Sediment transport, *Sedimentation, *Sediment distribution, *Sedimentation rates, *Foreign countries, Streamflow, Sediment discharge, Data collections, Preimpoundment, Dams, Irrigation design, Design criteria, *Argentina, *Bolivia, *Paraguay, *Rio Pilcomayo basin.

The Rio Pilcomayo 'Alto' (Bolivia) and 'Superior' (Bolivia, Argentina, and Paraguay) transport large quantities of sediment for the size of the basin. The Rio Pilcomayo 'Inferior' (Argentina and Paraguay) carries little sediment. The large loads of the 'Alto' and 'Superior' must be considered before dams or irrigation projects are started. The shifting channel and flooding of the Rio Pilcomayo 'Superior' also are problems to be considered before development. The Rio Pilcomayo 'Alto' basin has relatively little sediment deposition whereas the 'Superior' basin has considerable deposition. A part of the 'Superior' channel is filled with sediment to the top of its banks. The upstream limit of filling is moving farther upstream each year causing the place of overbank flooding to move upstream also. (Woodard-USGS)
W78-01862

1976 BEDLOAD MEASUREMENTS, EAST FORK RIVER, WYOMING,
Geological Survey, Berkeley, CA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
L. B. Leopold, and W. W. Emmett.
In: Proceedings of the National Academy of Sciences, Vol 74, No 7, p 2644-2648, July 1977. 3 tab, 1 ref.

Descriptors: *Sediment transport, *Bed load, *Fluvial sediments, Sedimentation rates, Geomorphology, Channel morphology, Sediment distribution, Analytical techniques, Measurement, Flow rates, *East Fork River(Wyo), *Bedload-transport rate.

Quantitative measurements of bedload-transport rate in the East Fork River, Wyoming, show large spatial and temporal variations in traction load. The standard deviation for 1-minute increments of the mean transport rate is commonly 50-100 percent of the mean transport rate. The transport rates measured individually over 8 equal-length increments of channel width indicate greater than 10-fold variations in transport rates from subwidth sections of minimum transport to subwidth sections of maximum transport. (See also W78-01871) (Woodard-USGS)
W78-01870

BEDLOAD MEASUREMENTS, EAST FORK RIVER, WYOMING,
Geological Survey, Berkeley, CA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
L. B. Leopold, and W. W. Emmett.
In: Proceedings of the National Academy of Sciences, Vol 73, No 4, p 1000-1004, April 1976. 1 fig, 2 tab, 2 ref.

Descriptors: *Sediment transport, *Bed load, *Sedimentation rates, *Snowmelt, *Wyoming, Measurement, Analytical techniques, Drainage area, Channel morphology, Flow rates, Evaluation, *East Fork River(Wyo), *Bedload-transport rate.

A bedload trap in the riverbed provided direct quantitative measurement of debris-transport rate

in the East Fork River, Wyoming, a basin of 466-square-kilometer drainage area. Traction load moves only during the spring snowmelt season. Data collected in three spring runoff seasons during which a peak flow of 45 cubic meters per second occurred, showed that transport rate is correlated with power expenditure of the flowing water and at high flows becomes directly proportional to power as suggested by Bagnold. (See also W78-01870) (Woodard-USGS)
W78-01871

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-01907

FLOOD EFFECTS ON STREAM ECOSYSTEMS,
Soil Conservation Service, Little Rock, AR.
For primary bibliographic entry see Field 2E.
W78-01919

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W78-01935

NEARSHORE SEDIMENTS OF THE ILLINOIS SHORE OF LAKE MICHIGAN,
Illinois Univ. at Urbana-Champaign. Dept. of Geology.
J. B. Graf.
Journal of Great Lakes Research, Vol. 2, No. 2, p 283-293, December 1976. 8 fig, 15 ref.

Descriptors: *Sediments, *Shores, *Lake Michigan, *Illinois, *Great Lakes, Sediment distribution, Bottom sediments, Lake sediments, Lakes, Particle size, Sampling, Surveys, Sedimentology, Limnology.
Identifiers: *Zion(Ill), *Waukegan(Ill).

Sediment sampling and a bathymetric survey of the nearshore zone of Lake Michigan between Waukegan and Zion, Illinois, provided a detailed description of the area and a basis for comparison to models of textural variation in nearshore zones. The survey, made 15-30 June 1973, yielded evidence that the breaker zone along the shoreline extends to depths of about 6 m (20 ft), that waves significantly affect the bottom to depths of 6 to 8 m (20 to 25 ft), and that some agent, probably wave action, is able to move silt and clay-sized sediment at the greatest depths of the study (15 m or 50 ft). Although the field area is composed dominantly of fine, well-sorted sands, an area of bedforms composed of coarser, more poorly sorted sediments was found within the area. Sediments on the crests of the bedforms, now at depths of 12 to 15 m (40 to 50 ft), have characteristics in common with sediments forming the crests of longshore bars and may represent deposits of a lower-than-present lake level. (Sims-ISWS)
W78-01984

SEDIMENTATION RATES AND A SEDIMENT BUDGET FOR LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, and N. S. Harper.
Journal of Great Lakes Research, Vol. 2, No. 2, p 324-340, December 1976. 4 fig, 3 tab, 47 ref.

Descriptors: *Sedimentation rates, *Lake Ontario, *Lake sediments, *Pollen, *Great Lakes, Sediments, Bottom sediments, Sediment load, Sediment transport, Sediment distribution, Lakes, Erosion, Sediment discharge, Dating, Sampling, Surveys, Data processing, Sedimentology, Limnology.
Identifiers: Sediment sources.

Present-day sedimentation rates of fine-grained sediment were determined at 39 offshore locations in Lake Ontario. The sedimentation rates were calculated by averaging the weight of sediment deposited above the ragweed pollen horizon, dated at 1850. The rates are variable, ranging from a low of 85 g/sq m/yr (0.3 mm/yr) to a maximum of 1225 g/sq m/yr (2.2 mm/yr). Rates are highest at the eastern and western extremes of the main basin of the lake and appear to be related to littoral drift patterns. Mean sedimentation rates of 435, 260, 550, and 530 g/sq m/yr were calculated for the Niagara, Mississauga, Rochester, and Kingston Basins, respectively. A total of 4.8 million tons of fine-grained sediment is deposited annually in the lake. River inputs are the major source of the fine grained sediments with the Niagara River accounting for 50% of all incoming material. Most of the suspended materials are deposited in the Rochester and Kingston Basins (38%) or are carried out of the lake via the St. Lawrence River (36%). This reflects the general eastward movement of the materials and their deposition either towards the outlet or their movement out of the lake. (Sims-ISWS)
W78-01985

TURBIDITY SOURCES IN LAKE SUPERIOR,
Minnesota Univ.-Duluth. Dept. of Physics.
K. Stortz, R. Clapper, and M. Sydor.
Journal of Great Lakes Research, Vol. 2, No. 2, p 393-401, December 1976. 7 fig, 2 tab, 11 ref.

Descriptors: *Turbidity, *Lakes, *Lake Superior, *Wisconsin, Suspended solids, Runoff, Suspended load, Hydraulics, Profiles, Mathematical studies, Mathematics, Beach erosion, Erosion, Bottom sediments.
Identifiers: *Turbidity sources, Turbidity profiles, Turbidity plumes, Bottom sediment resuspension.

LANDSAT data and measurements of turbidity profiles with depth, suspended solids, and particle sizes were used in analysis of red clay turbidity plumes in western Lake Superior for a variety of wind conditions. The measurements allow for an estimate of the relative contribution to lake turbidity arising from shore erosion, runoff, and bottom sediment resuspension. The major source of turbidity is erosion, yielding as estimated 2,300,000 metric tons of material removed per year from the shores of Douglas County, Wisconsin. This is equivalent to a shore recession rate of nearly 1.2 m/year. During the months of May through November when all three turbidity sources contribute, 70% of the total suspended load observed in the lake is due to shore erosion, 10% is due to precipation runoff from the rivers (with major input in this category coming from the Nemadji River), and 20% of the load is due to resuspension. (Lee-ISWS)
W78-01988

THE RATE OF SILT ACCUMULATION IN THE LOWER PEEL RIVER, NORTHWEST TERRITORIES,
Department of Indian Affairs and Northern Development, Ottawa (Ontario). Northern Natural Resources and Environmental Branch.
R. M. Strang.
Can J For Res. 3(3), p 457-458, 1973.

Descriptors: *Silting, *Rivers, *Radioactive dating, Root systems, Detritus, Sediments, Conifers, Canada, Radiocarbon dating, Peel River.

Estimates of the rates of silt accumulation in the lower Peel River (Northwest Territories, Canada) were derived from excavated root systems of white spruce (Picea glauca (Moench) Voss) and from radiocarbon dating of buried detritus. Average annual accumulation is of the order of 1 cm.--Copyright 1974, Biological Abstracts, Inc.
W78-02152

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A.
W78-02192

2K. Chemical Processes

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W78-01822

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. Steinberg, and V-D. Dang.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL 20535-R, Price codes: A03 in paper copy, A01 in microfiche. Presented at 'A Symposium on U.S. Lithium Resources and Requirements by the year 2000,' U.S. Geological Survey, Denver, Colorado, January 22-24, 1976. September 1975. 34 p, 3 fig, 9 tab, 37 ref. BWL 20535-R.

Descriptors: *Sea water, *Separation techniques, Extraction, *Ion exchange, Nuclear reactors, *Solar distillation, *Electrolysis, Evaporation, *Lithium, Lithium chloride, Thermonuclear reactor, Nuclear powerplants.

Extraction of lithium from seawater is discussed in the framework of literature data projections on the future demand for lithium, concern for lithium availability in a growing controlled thermonuclear reactor (D-T fuel cycle) economy, and estimated reserves of lithium in seawater. The process features evaporation of seawater by solar energy to increase the concentration of lithium and to decrease the concentration of other cations. After cations are separated, lithium ions are eluted with dilute hydrochloric acid to form aqueous lithium chloride. Lithium metal is then formed by electrolysis of the concentrated lithium chloride. The energy requirement for lithium extraction is relatively small when compared to the energy produced from the use of lithium in a controlled thermonuclear reactor, and the production cost of the process is estimated as 2.2 to 3.2 cents/gram lithium. It is recommended that (1) a thorough phase equilibria study of the solid-liquid crystallization processes of seawater be conducted to obtain a more definitive basis for the process design relative to the operation of solar ponds, (2) a laboratory search be undertaken for a highly selective adsorbent or extractant for lithium, and (3) trials should be made of other physical separation processes. (Wares-IPA)
W78-01849

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
For primary bibliographic entry see Field 5A.
W78-01854

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.

W78-01864

BIOLOGICAL ELECTRODES SPECIFIC FOR PHOSPHATE AND NITRITE IONS,
New Orleans Univ., LA.
For primary bibliographic entry see Field 5A.
W78-01885

NITRATE INTERFERENCE IN TOTAL KJELDAHL NITROGEN DETERMINATIONS AND ITS REMOVAL BY ANION EXCHANGE RESINS,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-01886

THE ECOLOGY OF A HIGH MOUNTAIN STREAM IN THE PYRENEES: II. CHEMICAL CONDITIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
P. Lavandier, and C. Mur.
Ann Limnol. 10(3), p 275-310, 1974.

Descriptors: *Water chemistry, Rivers, Conductivity, *Ecology, *France(River Estaragne), *High mountain streams, Plant growth, Streams, Snowmelt.

The chemical features of the River Estaragne (France) and its tributaries were studied in relation to general geographical conditions. Bicarbonates and C formed more than 90% of the ionic content of the water. The amounts of total Fe, Ca++, HCO3-, SO4--, PO4--P, NO3-N. Mg++ and K+ decreased from the source of the river to its mouth. Concentrations of Na+, Cl- and SiO, remained constant or increased slightly down the length of the river. Conductivity changes from 114-80 micro mhos between the source and the mouth of the river. The changes in the chemical composition of the water are related to changes in the stream bottom from unstable, naked bedrock to crystalline bedrock covered with plants. Most of the chemical features showed some significant correlation with flow. The quantities of material transported down the stream during the 2 yr of the study were estimated. The river discharged into Lake Oredon a mean of 470 tons/yr of dissolved elements; 65% of this material is carried down the river when the snow melts.--Copyright 1975, Biological Abstracts, Inc.
W78-01957

RECONNAISSANCE LIMNOLOGY OF SUB-ANTARCTIC ISLANDS: II. ADDITIONAL FEATURES OF THE CHEMISTRY OF MACQUARIE ISLAND LAKES AND TARNS,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
R. T. Buckney, and P. A. Tyler.
Aust J Mar Freshwater Res. 25(1), p 89-95, 1974.

Descriptors: Calcium, Islands, Lakes, *Limnology, *Macquarie Island lakes, Magnesium, Ocean spray, *Reconnaissance, Seasonal, Spray, Subantarctic, *Tarns, *Water chemistry, *Ions.

Further analyses of waters from lakes and tarns on Macquarie Island, including some not previously sampled, confirm conclusions of an earlier survey, Oceanic spray is a principal source of ions. Geochemical influence is minimal in most lakes, but Square Lake and Waterfall Lake contain considerably more Ca than others and the cationic dominance order is changed from that of seawater. Skua Lake is similarly affectd though Ca concentrations are not so markedly increased. Mg enrichment does not occur. Though Ca and bicarbonate accrue in approximately equivalent amounts, more lakes are deflected from seawater anionic dominance order than the 3 with changed cationic orders. Despite equivalent accession of Ca and bicarbonate, Square Lake and Waterfall Lake occupy anomalous positions on a plot of Ca proportions against Oceanic Origin Factor. Seasonal variation in chemical composition is slight, but is greatest in Waterfall Lake and least in shallow Square Lake where perhaps buffering by sediments is involved. Atmospheric supply of oceanic ions is commonplace on Sub-Antarctic islands.--Copyright 1974, Biological Abstracts, Inc.
W78-02004

2L. Estuaries

OFFSHORE ISLANDS,
Harris (Frederick R.), Inc., New York.
For primary bibliographic entry see Field 8B.
W78-01704

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE,
Sylvester Underseas Inspection, Rockland, MA.
For primary bibliographic entry see Field 5C.
W78-01714

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT),
Spessard L. Holland Law Center, Gainesville, FL.
For primary bibliographic entry see Field 6E.
W78-01730

PUBLIC USE OF COASTAL BEACHES,
North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6E.
W78-01731

THE PROBLEM OF THE NUTRITION OF THE GOBY BENTHOPHILUS STELLATUS (GOBIIDAE) IN THE DNIESTER ESTUARY, (IN RUSSIAN),
Azovo-Chernomprskii Nauchno-Issledovatelskii Inst. of Morskogo Rybnogo Khozyaistva i Okeanografii, Odessa (USSR). Odessa Div.
I. F. Strautmai.
Vestn Zool 3, p 45-48, 1976.

Descriptors: Nutrients, *Fish food organisms, Seasonal, *Estuaries, *Benthophilus-stellatus, Gobiidae, Goby, *Nutrition, Ukrainian-SSR, *USSR(Dniester estuary).

Qualitative and quantitative food composition was analyzed in 215 individuals of B. stellatus (Sauvage) from the Dniester estuary (Ukrainian SSR, USSR). Changes in food spectra are determined depending on season, sex and body dimensions. Food relations of B. stellatus and other species of gobies from the Dniester estuary are traced.--Copyright 1977, biological Abstracts, Inc.
W78-01735

RESOURCE MANAGEMENT AND ESTUARINE FUNCTION WITH APPLICATION TO THE APALACHICOLA DRAINAGE SYSTEM,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 5G.
W78-01764

THE RHODE RIVER PROGRAM,
Smithsonian Institution, Edgewater, MD.
For primary bibliographic entry see Field 5G.
W78-01765

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.
W78-01766

PROBLEMS, ADVANCEMENTS, AND FACTORS CONTROLLING ESTUARINE WILDLIFE MANAGEMENT PROGRAMS,
Texas A and M Univ., Jasper.
H. D. Irby.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 43-55.

Descriptors: *Estuaries, *Wildlife management, *Ecosystems, *Baseline studies, Water pollution effects, Marshes, Resources development, Environmental effects.

Marshes and estuaries along our coastlines are among the most fertile and valuable land and water areas in North America. These areas provide habitats for some of our most valuable wildlife and fisheries resources, supplying livelihood, recreation, and aesthetic enjoyment for a multitude of people. Wildlife useage of high quality estuarine areas is extensive. Wildlife management is an attempt to rectify past habitat abuses and then, hopefully, to bring about a positive enhancement of the desired wildlife and their habitats. The wide variety of human activities which pollute estuarine wildlife resources is discussed along with recent progress in estuarine wildlife management programs. Finally, future trends and needs in estuarine wildlife management are discussed. (Sinha-OEIS)
W78-01767

IMPACT OF ESTUARINE POLLUTION ON BIRDS,
Fish and Wildlife Service, Laurel, MD.
For primary bibliographic entry see Field 5C.
W78-01768

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-01769

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5G.
W78-01770

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,
Development and Resources Corp., Sacramento, CA.
For primary bibliographic entry see Field 6G.
W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,
East Carolina Univ., Greenville, NC.
For primary bibliographic entry see Field 5G.
W78-01772

STATUS OF ESTUARINE ECOSYSTEMS IN RELATION TO SPORTFISH RESOURCES,
Conservation Foundation, Washington, DC.

For primary bibliographic entry see Field 6G.
W78-01773

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,
Living Marine Resources, Inc., San Diego, CA.
G. C. Broadhead.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 171-176, 3 fig, 20 ref.

Descriptors: *Estuaries, *Estuarine fisheries, *Environmental effects, *Commercial fishing, Shrimp, Resources development, Water pollution effects, Baseline studies, Menhaden.

The estuarine habitat of fish and shellfish is eroded by both natural and man-caused environmental changes. Shrimp and menhaden are discussed principally, noting the effects on them of salinity, temperature, and turbidity. The soft-bottomed embayments peripheral to the estuaries offer preferred living conditions. They are more productive--and more vulnerable--than the open waters of the estuaries. Recommendations are made for preserving these estuarine habitats. (Sinha-OEIS)
W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01776

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5G.
W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE,
Miami Univ., FL.
For primary bibliographic entry see Field 5G.
W78-01779

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING,
Espey, Huston and Associates, Inc., Austin, TX.
For primary bibliographic entry see Field 5G.
W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES,
American Univ., Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5G.
W78-01782

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-01783

POLLUTION PROBLEMS IN THE ESTUARIES OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 5G.
W78-01784

ENVIRONMENTAL STATUS OF HAWAIIAN ESTUARIES,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5G.
W78-01785

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W78-01786

INDUSTRIAL WASTE POLLUTION AND GULF COAST ESTUARIES,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01787

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS,
Maryland Univ., Solomons.
For primary bibliographic entry see Field 5G.
W78-01789

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS,
Ecological Analysts, Inc., Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-01790

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 5G.
W78-01791

OIL POLLUTION IN THE COASTAL ENVIRONMENT,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W78-01793

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION,
Environmental Impact Planning Corp., San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-01794

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Johns Island, SC.
Bears Bluff Field Station.
For primary bibliographic entry see Field 5G.
W78-01795

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, FL.; and Eco-Analysts, Inc., Sarasota, FL.
For primary bibliographic entry see Field 5C.
W78-01796

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-01798

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,
American Petroleum Inst., Washington, DC.
For primary bibliographic entry see Field 5B.
W78-01799

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-01800

THE CRUCIAL ROLE OF SYSTEMATICS IN ASSESSING POLLUTION EFFECTS ON THE BIOLOGICAL UTILIZATION OF ESTUARIES,
Delaware Univ., Lewes.
For primary bibliographic entry see Field 5C.
W78-01801

BACTERIA AND VIRUSES--INDICATORS OF UNNATURAL ENVIRONMENTAL CHANGE OCCURRING IN THE NATION'S ESTUARIES,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-01802

NATIONAL ESTUARINE MONITORING PROGRAM,
Environmental Protection Agency, Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-01803

A BRIEF ASSESSMENT OF ESTUARY MODELING--RECENT DEVELOPMENTS AND FUTURE TRENDS,
Corvallis Environmental Research Lab., OR.
R. J. Callaway.
In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 523-525, 5 ref.

Descriptors: *Estuarine environment, *Model studies, Baseline studies, Water pollution effects.

A brief, very informal, overview of estuarine modeling is presented; the great variety in estuarine environmental settings is exhibited with east and west coast examples. Typical problems

confronted by the environment scientist and engineer are discussed as well as some of the solution techniques employed to solve them. (Sinha-OEIS)
W78-01804

FACTORS BEARING ON POLLUTION CONTROL IN U.S. PORTS LOCATED IN ESTUARINE AREAS,
Portland Harbor Pollution Abatement Committee, ME.
For primary bibliographic entry see Field 5G.
W78-01805

FACTORS BEARING ON POLLUTION CONTROL IN WEST COAST ESTUARINE PORTS,
San Francisco Dredging Committee, CA.
For primary bibliographic entry see Field 5G.
W78-01806

SEA GRANT ESTUARINE STUDIES,
Texas A and M Univ., College Station.
L. F. Miloy.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 555-565, 4 tab, 60 ref.

Descriptors: *Estuarine environment, *Ecosystems, *Water pollution, Research priorities, Oceanography, Bibliographies, *Outer Continental Shelf.

Approximately 20% of funds dispensed under the National Sea Grant College and Program Act of 1966 (PL 89-688) has been directly related to estuarine studies. Since 1971 $13 million in federal funds, matched by $8 million in non-federal support, has been directed to this area. In the same period 533 projects in support of ecosystems research, coastal zone management, pollution studies, environmental modeling, and applied oceanography were conducted under the Sea Grant Program. Brief case histories of estuarine related studies in Narragansett Bay, Long Island Sound, the Neuse and Albermarle River Basins, Apalachicola and Escambia Bays, Barataria Bay, Matagorda Bay, and Puget Sound are presented as examples of Sea Grant work. The applied nature of Sea Grant studies is emphasized by examples of the utilization of Sea Grant estuarine-related research. Particular attention is given to how these studies have been used by local, state, and federal decisionmaking bodies. A partial bibliography citing 58 Sea Grant reports on estuarine research is presented. (Sinha-OEIS)
W78-01807

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION,
University of West Florida, Pensacola.
T. S. Hopkins.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 567-579, 2 fig, 2 illust, 59 ref.

Descriptors: *Estuarine environment, *Florida, *Water quality control, *Regional development, Ecosystems, Resources development, *Outer Continental Shelf, *Estuarine protection, Regional planning, Public interest.

Florida's gulf coastline measures over 700 statute miles, and has the most diverse estuarine flora and fauna of any state. Because of its growing population and its readily accessible coastline probably no other estuarine system has received pressures comparable to those exerted on Florida's gulf coast ecosystem from 1950 to the present. This paper revolves around the 'Florida Panhandle' in general and Pensacola in particular. Citizen involvement begins through information services provided by newspaper, radio, and TV. In Pensacola, the newspaper media had the greatest impact and long-term effect. There are a variety of vehicles and mechanisms for citizen involvement and many were sportsmen's organizations. Homeowner's associations also can be effective vehicles, but they may be self serving and are more subject to varying levels of bureaucracy. Regional planning organizations are a proper vehicle but they are even more dependent upon and subject to government bureaucracy. Governmental advisory groups can be effective if they can maintain good relations with the board that appoints them and if they can understand that governments cannot correct overnight the damages done by poor planning through decades. Regional, state, and federal hearings are an excellent outlet for citizen pressures. It is concluded that the Regional Planning Council should be the lead agency in coordinating citizen efforts in estuarine preservation. (Sinha-OEIS)
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARY PROTECTION,
Public Relations Consultant, Corpus Christi, TX.
For primary bibliographic entry see Field 5G.
W78-01809

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA,
Horan, Lloyd, Dennis, and Farr, Carmel, CA.
F. S. Farr.
Available from the National Technical Information Service, Springfield,VA 22161 (and contained in) PB-265 4 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 593-603.

Descriptors: *Estuarine environment, *Wetlands, *California, Resources development, Coasts, *Public participation, Citizens action groups.

The shocking destruction by man of California's wetland and coastal resources has occurred for more than a century, by competing uses for industrial, commercial, residential and recreational purposes. More than 80% of California's 21 million people live within one-half hour's drive of the coast. Pressures on resources in coastal areas is unbearable. This paper tells what citizen action groups have done in attempting to reverse these trends. (Sinha-OEIS)
W78-01810

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5G.
W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 5G.
W78-01812

ESTUARINE MANAGEMENT--THE INTERGOVERNMENTAL DIMENSION,
For primary bibliographic entry see Field 6E.
W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5G.
W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5G.
W78-01815

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES,
Environmental Protection Agency, Washington, DC.
D. P. Tihansky, and N. F. Meade.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 671-684, 2 tab, 59 ref.

Descriptors: *Estuarine fisheries, *Economics, *Resources development, *Estuarine environment, Baseline studies, Water quality control, Water pollution control, *Outer Continental Shelf, Commercial fisheries.

The economic importance of estuaries is assessed in their supportive role of the U.S. commercial fishing industry. Economic welfare concepts are related to major phases of the fishing industry, and empirical estimates of these values are surveyed in the literature. The exvessel price of landed species is cited to be a conservative estimate of net benefits realized by all phases. The literature survey reveals that most economic studies of fishery benefits are conducted without any apparent knowledge of valid welfare concepts. This gap between empirical and theoretical constructs must be eliminated if economic values are to be plausible and meaningful. (Sinha-OEIS)
W78-01816

ORGANIZATION ARRANGEMENTS FOR MANAGEMENT OF ATLANTIC COAST ESTUARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
M. P. Lynch.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No 440/1-77-007B, Mar 1977. Vol 2, p 687-700, 2 fig, 9 tab, 15 ref.

Descriptors: *Estuarine environment, *Management, *Legal aspects, Resources development, Coasts, U.S. East Coast, *Outer Continental Shelf, *Coastal Zone Management Act, State programs.

Since 1969, the general trend in management of Atlantic coast estuarine environments has been to strengthen state and regional capabilities principally through new federal funding programs. Interstate management entities, with limited exceptions, are not playing an extensive or significant role. Many approaches are used for estuarine management by the various states. Critical management decisions typically involve specific site-related permit decisions. In many states, these individual decisions are made within a framework

of overall state guidelines, policy, or legislative mandate. All states have adopted strict Coastal Zone Management programs. No states have separate estuarine management agencies, relying instead, on several related agencies or centralized environmental 'super agencies.' Coordination is the most necessary element of effective estuarine management. The Coastal Zone Management Act has provided states with the initiative (and funds) to effect a better coordination within their own agencies and with other states on a regional basis. Estuarine management has improved in the period 1969-1974 as a direct result of increased federal funding supported by a growing awareness of the importance of a quality environment among the general population. The principal factor in estuarine management in the next five to ten years will probably be local acceptance and support of developing Coastal Zone Management programs. (Sinha-OEIS)
W78-01817

EVALUATION OF WATER QUALITY IN ESTUARIES AND COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5G.
W78-01818

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
For primary bibliographic entry see Field 5G.
W78-01819

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
For primary bibliographic entry see Field 5C.
W78-01820

SETTLEMENT OF VENICE AND GENERAL ESTUARINE DEPOSITS,
Cape Town Univ. (South Africa).
A. D. Sparks.
9th International Conference (ICSMFE) Tokyo, July 1977. 6 p, 7 fig, 18 ref.

Descriptors: Groundwater, *Subsidence, *Estuarine sediments, Aquifers, Artesian wells, Aquitards, Soil stability, Mathematical models, Subsurface mapping, *Venice(Italy), South Africa.

Artesian conditions, such as at Venice, can exist in other offshore or estuarine deposits. The previous existence of artesian groundwater pressures increases the settlements due to pumping. Attention is drawn to the fact that soil layers located below the deepest major well can suffer delayed compression due to pumping from the wells. Mathematical computor models based on finite differences are derived for steady-state and dynamic conditions for a general aquifer-aquitard system in which the permeabilities and thicknesses of the layers vary laterally from one position to another. The future settlement at Venice is estimated. A physical model constructed at UCT is mentioned. A solution is proposed. (So African Water Info Center)
W78-01829

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,
Cape Town Univ. (South Africa).
A. Du Plessis, and M. A. Delacruz.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 285-302, May 1977. 9 fig, 18 ref.

Descriptors: *Geophysical investigations, Sediments, Sea floor, *Marine geology, Core drilling, *Boreholes, *Seismic reflection, Seismograph, Sonar, Bays, *South Africa, *Saldanha Bay.

Detailed continuous seismic reflection profiling and side-scan sonar surveys were made of the part of Saldanha Bay that lies to the landward of a line connecting Hoedjiespunt and Salamanderpunt (the 'inner' bay). Six distinctive subsurface units (Q-units) were recognized in the seismic records. They were correlated with a sequence of lithologically distinctive units encountered in boreholes drilled in the bay. At any instant in time the sea abrades the sea floor above a certain limiting depth and deposits materials below that depth. The incursion of the sea into an area therefore leads borth to the removal and deposition of materials. The borehole results and the three-dimensional distribution of the Q-units in the bay indicate that the area has been affected by three abrasional/deposition cycles during the Late Pleistocene. During the earliest transgression the sea rose to a few metres above sealevel. During the second transgression it rose to -20m. The last transgression took place when the sea rose to its present stand. While the sea stood at lowered levels, calcretes formed subaerially along 'preferred' zones in the marine deposits that were present. The main period of calcrete formation in the area was between the earliest and next transgression. (So. African Water Info Center)
W78-01834

LARVAL DEVELOPMENT, SETTLEMENT AND GROWTH OF THE BLACK MUSSEL CHLOROMYTILUS MERIDIONALIS IN THE SALDANHA BAY REGION,
Fisheries Development Corp. Ltd., Salanha (South Africa).
A. J. Du Plessis.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 303-316, May 1977. 8 fig, 19 ref.

Descriptors: *Black mussel, Marine animals, Benthic fauna, Population dynamics, Reproduction, Growth stages, Larval growth stage, Settlement, Bays, Mariculture, Shellfish, Plankton, Filter feeders, Intertidal areas, Life cycles, Water temperature, Seasonal variations, *Mussels, Chloromytilus meridionalis, *Saldanha Bay, Langebaan Lagoon, Luderitz Bay, *South Africa.

Aspects of the biology of Chromomytilus meridionalis were studied while investigating possibilities for cultivating mussels. Plankton samples were taken regularly, and growth, development and settlement behaviour of the larvae are discussed and correlated with results of a larval rearing experiment. Methods are described for the recording of settlement, and the results indicate annual, seasonal and local fluctuations in intensity of settlement at a number of sites. Reference is made to results obtained in Luderitz Bay. The growth rate of mussels suspended from rafts was determined and indicates considerable variation within the study area. This is discussed and aspects of the annual growth curves are presented. Water temperatures were obtained in Saldanha Bay during 2,75 years by means of a continuous recorder. (So. African Water Info Center)
W78-01835

DISTRIBUTION OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geology.
B. W. Flemming.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 317-340, May 1977. 21 fig, 32 ref.

Descriptors: *Sediments, *Distribution pattern, Textural analysis, Sediment analysis, Sands, Sedimentology, Bottom sediments, Marine sediments, *Sediment transport, Tidal effects, *Saldanha Bay, Langebaan Lagoon, *South Africa.

Sediment distribution in Saldanha Bay is wave controlled and can be related to the energy levels created by the refraction pattern. Four energy zones are distinguished in the inner bay: a centrally exposed zone, two marginal semi-exposed zones, a sheltered zone in the north and a bay/lagoon transitional zone in the south. Sediment is supplied on the abrasion platform of the exposed zone and along the rocky shoreline of the North Channel. These areas display the coarsest sediments. In North Bay medium sands dominate, whereas the South Channel is characterized by very fine sands. Both semi-exposed zones as well as the sheltered zone consist of very fine sand. The bay/lagoon transitional zone is constructed of a tidal delta made of fine sand. Sediment distribution seems to be in equilibrium with the prevailing hydrodynamic regime. In contrast, Langebaan Lagoon is a current controlled regime. Four physiographic units can be separated: tidal channels, subtidal flats and sandbanks, intertidal flats, and salt marshes. These units reflect the major energy levels of the tidal system. Texturally the lagoon divides into two major zones separated roughly by the central channel. East of the channel fine sands dominate whereas west of the channel medium sands are more frequent. Coarsee sediments occur as lag deposits in the northern outflow channels. In contrast to the dominating presence of very fine sand in Saldnha Bay this size fraction is surprisingly deficient in Langebaan Lagoon. There is evidence for a Holocene High stand of the sea between 6,000 and 2,000 y B.P. The modern sediment distribution is the results of the subsequent regression and stabilization of the sea-level about 1,800 y B.P. and is therefore essentially a relict feature. (So. African Water Info Center)
W78-01836

PHYTOPLANKTON PRODUCTION IN LANGEBAAN LAGOON AND SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
J. L. Henry, S. A. Mostert, and N. D. Christie.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p 383-398, May 1977. 7 fig, 5 tab, 16 ref.

Descriptors: *Phytoplankton, *Primary productivity, Seasonal variations, Turbidity, Light intensity, Surveys, Baseline studies, Chlorophyll, South Africa, Water temperature, Salinity range, Marine biology, Bays, Lagoons, *South Africa, *Langebaan Lagoon, *Saldanha Bay.

Between February 1971 and February 1972 monthly measurements of phytoplankton primary production were made at six stations in Langebaan Lagoon. The gross primary production rates obtained showed a marked seasonal variation. They increased from 261,6 mgC/3m3/day in winter to 675,4 mgC/m3/day in spring and to a maximum of 885,3 mgC/m3/day in summer. Production rates ranged from 611,0 mgC/m3/day at the entrance of the lagoon to 162,6 mgC/m3/day at the station nearest to the head of the lagoon. A correlation between total chlorophyll and gross primary production was established for the lagoon, and was used in conjunction with chlorophyll concentrations and water transparency measurements from Saldanha Bay to estimate the gross primary production of the bay. The estimates ranged from 864,9 mgC/m2/day to 3 301,2 mgC/m2/day. (So African Water Info Center)
W78-01837

SPATIAL AND TEMPORAL VARIATIONS IN INTERTIDAL ANIMAL DISTRIBUTION AT LANGEBAAN LAGOON, SOUTH AFRICA,
Cape Town Univ. (South Africa). Percy Fitzpatrick Inst. of African Ornithology.
G. M. Puttick.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p 403-440, May 1977. 11 tab, 17 fig, 35 ref.

Descriptors: *Temporal variations, *Spatial distribution, *Intertidal areas, Species distribution, Benthic fauna, Marine animals, Filter feeders, Food chains, Water birds, Biomass, Seasonal effects, Marine algae, Sediments, *Lagoons, *Langebaan Lagoon, Calidris ferruginea, Gastropoda, *South Africa.

Spatial and temporal changes in the distribution of food organisms potentially available to curlew sandpipers Calidris ferruginea at Langebaan Lagoon (33 degrees S, 18 degrees E) are described for the period February 1974 - March 1975. The inter-tidal benthic fauna at sandy sites showed spring and autumn peaks in biomass and numbers. The fauna was dominated by the gastropod Assiminea globulus, which comprised 62,5% of the total biomass. A Production: Biomass ratio of 4,96 was found for this species, and 1,36 for the amphipod Urothoe grimaldi. The fauna at sites containing macrophytes (Spartina, Zostera, Arthocnemum) showed winter peaks in biomass and numbers. Classification and ordination confirmed the discreteness of macrophyte and non-macrophyte sites each having its own characteristic benthos. There was a positive correlation between the distribution of benthos and sediment parameters at the different sites, macrophyte sites having a higher fine fraction and organic content. (So African Water Info Center)
W78-01838

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER IN SALDANHA BAY AND LANGEBAAN LAGOON,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
L. V. Shannon, and G. H. Stander.
Transactions of the Royal Society of South Africa, Vol. 42, No. 3 and 4, p 441-459, May 1977. 1 tab, 10 fig, 3 ref.

Descriptors: *Sea water analysis, Baseline studies, Thermohaline convection, Water temperature, Salinity range, *Chemical analysis, Trace elements, Heavy metals, Chlorophyll, Phosphorus, Nitrates, Nitrites, Silica, Marine pollution, Fish processing wastes, Water circulation, Tidal currents, Toxic wastes, Chemical oxygen demand, *Saldanha Bay, *Langebaan Lagoon, *South Africa.

In April 1974 the Sea Fisheries Branch commenced a detailed survey of the physical and chemical characteristics of the water in Saldanha Bay and Langebaan Lagoon to establish base-line conditions in the region prior to the development of the bay as a major port and industrial centre. The thermohaline characteristics of the water resemble those of the Benguela Current, although in summer surface heating and evaporation tend to raise the temperature and salinity somewhat. This is most marked in the Langebaan Lagoon where surface temperatures and salinities in excess of 24 degrees Centigrade and 37‰ were recorded during the latter part of summer. A variety of chemical parameters were determined. These include a number of heavy and transition elements, dissolved oxygen, nitrate/nitrite, inorganic phosphorus, total phosphorus, reactive silica, pH, chlorophylls, chemical oxygen demand and oxygen absorbed. Data for some of these parameters are tabulated, and indicate that the bay is at present relatively unpolluted. Prior to 1974 organic pollution from the fish factories in Hoedjies Bay was serious, but the situation has shown a marked improvement since the installation of the dry off-loading systems for fish. The circulation pattern in Saldanha Bay is complex. The bay and lagoon are tidal and currents in the upper 5 m are highly dependent on wind speed and direction. Surface currents in the region have a magnitude typically in the range 10-20 cm/sec. Currents in the mouth of the bay are tidal and are not appreciably influenced by wind. Tidal currents of up to 1 m/sec were recorded at the entrance of Langebaan Lagoon. The construction of the jetty and breakwater is altering the circulation pattern. The physical and chemical data indicate the existence of three systems, viz. Bay system, Lagoon System and Benguela System. The interchange between the bay and the open sea is small and on the basis of a simple model the removal time of pollutants from the bay was calculated as 20 days. The available data indicate that the discharge of noxious and toxic effluents into the bay should be discouraged. The beach near the residential area of Saldanha Bay and the Donkergat peninsula will probably be polluted on occasions once the harbour comes into operation, and it is not impossible that Langebaan Lagoon will also become polluted. (So African Water Info Center)
W78-01839

THE ALGAL FLORA OF SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
R. H. Simons.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 461-482, May 1977. 2 tab, 5 fig, 31 ref.

Descriptors: *Marine algae, Sampling stations, Baseline studies, Primary productivity, Algae distribution, Algae population, Chlorophyta, Phaeophyta, Rhodophyta, *Saldanha Bay, Ecklonia, *South Africa.

A critical review of old records of Algae of Saldanha Bay accompanies accounts of more recent surveys within this bay. The range of habitats includes rocky and sandy substrata, shores comparable with those of open coasts in terms of surf stress and those in which water movement is so reduced as to be little more than tidal ebb and flow. The conclusion is reached that the algal flora is basically of the South African west coast; modifications are imposed by protection from wave stress. (So African Water Info Center)
W78-01840

DISTRIBUTION ABUNDANCE AND ENERGY RELATIONSHIPS OF WADERS (AVES: CHARADII) AT LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Percy Fitzpatrick Inst. of African Ornithology.
R. W. Summers.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 483-494, May 1977. 5 tab, 3 fig, 22 ref.

Descriptors: Species abundance, Food chains, Biomass, Waders, *Langebaan Lagoon, *Salt marshes, Population studies, Species distribution, Marine ecosystems, Intertidal areas, Seasonal variations, Water birds, *Charadii, *Arthrocnemum, *South Africa.

The distribution and numbers of waders on the low-tide sandflats and at high-tide roosts at Langebaan Lagoon during the austral summer of 1975-76 are described. The sandflats in Rietbaai and at the lower and upper sections of the lagoon supported the highest densities of waders. Several species were restricted in their distribution. The majority of the high-tide roosts, incorporating some 30,000 waders, were situated on Arthrochemum saltmarsh, especially between Bottelray and Geelbek. Approximately 1,000 waders (3% of the lagoon's population) roosted on the beaches along the Atlantic coastline at high-tide. Many thousands roosted on the beach north of Langebaan village at night. The wader community consumed an estimating quantity of food equivalent to 20,8 kcal/sq m per year. Between 2,1 and 6,2 kcal/sq m per year are returned as faeces to the lagoon system. Feather material deposited in the lagoon was equivalent to 0,06 kcal/sq m per year. (So African Water Info Center)
W78-01841

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geochemistry.
J. P. Willis, H. H. Fortuin, and G. A. Eagle.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 497-509, May 1977. 5 tab, 6 fig, 4 ref.

Descriptors: *Geochemistry, *Sediments, Monitoring, Sampling, Chemical analysis, Trace elements, Heavy metals, Marine pollution, Baseline studies, *Sediment analysis, Sediment transport, *Pollutant identification, *Saldanha Bay, *Langebaan Lagoon, *South Africa.

Average major and trace element data are reported for recent sediments from Saldanha Bay and Langebaan Lagoon. Chemically, the sediments are composed mainly of SiO_2 and $CaCO_3$ (SiO_2 + $CaCO_3$ greater than 93%). The sediments are considered to be a three-component mix of quartz, calcite and a granitic fraction presumed to be derived from local granitic rocks. (So African Water Info Center)
W78-01842

THE ZOOPLANKTON OF LANGEBAAN LAGOON AND SALDANHA BAY,
Cape Town Univ. (South Africa). School of Environmental Studies.
J. R. Grindley.
Transactions of the Royal Society of South Africa, Vol 42, No 3 and 4, p 341-390, May 1977. 14 fig, 4 tab, 21 ref.

Descriptors: *Zooplankton, Sampling, Biomass, Salinity range, Tidal effects, Species abundance, Species diversity, Marine animals, Baseline studies, Ecology, Environment aspects, *Langebaan Lagoon, *Saldanha Bay, *South Africa.

The zooplankton of Langebaan Lagoon and Saldanha Bay are described on the basis of 127 plankton samples taken between 1946 and 1976. Hydrological conditions are described indicating a range from marine conditions in Saldanha Bay to hypersaline conditions at the head of the Langebaan Lagoon. Different zooplankton communities occur in different parts of the Saldanha-Langebaan system. In Saldanha Bay the plankton is composed predominantly of species which occur in the neritic plankton of the west coast. The plankton of Langebaan Lagoon is distinct but elements of the Saldanha Bay plankton community penetrate the lagoon to various extents. At the head of the lagoon the plankton community is estuarine in character which is remarkable as Langebaan Lagoon is not an estuary. The significance of this is discussed. Zooplankton biomass was highest in the middle reaches of Langebaan Lagoon($X = 41,80$ mg/cu m) and lowest at the head of the lagoon ($X = 16,84$ mg/cu m) where the lowest diversity index also was recorded. Studies of diurnal variations indicate that the distribution of plankton in Langebaan Lagoon is essentially dynamic resulting from a complex interaction between vertical migration and tidal transport. (So African Water Info Center)
W78-01845

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 6G.
W78-01908

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY,
Texas A and M Univ., Galveston. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5A.
W78-01911

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PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01915

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01916

BARIUM BUILD-UP IN THE TEIGN ESTUARY,
Southampton Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 5A.
W78-01933

THE EARLY SUMMER BLOOM OF DINOFLAGELLATES IN THE NORTH SEA SPECIAL REFERENCE TO 1971,
Birbeck Coll., London (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01934

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES,
New Jersey Agricultural Experiment Station, New Brunswick.
For primary bibliographic entry see Field 5B.
W78-01938

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5C.
W78-01944

STUDIES ON THE OYSTER COMMUNITY IN DELAWARE: THE EFFECTS OF THE ESTUARINE ENVIRONMENT ON THE ASSOCIATED FAUNA,
Delaware Univ., Lewes. Marine Studies Complex.
D. Maurer, and L. Watling.
Int Rev Gesamten Hydrobiol. 58(2), p 161-201, 1973.

Descriptors: Barnacles, Bivalves, Bryozoan, Crustaceans, *Delaware, Environment, *Estuarine environment, Gastropod, Hydrozoan, Malacostracan, Oligochaete, *Oysters, Polychaetes, Sand dollars, *Salinity.

The composition of the associated fauna of Delaware's oyster beds was studied. The relative position of Delaware's oyster producing tributaries lends itself to testing the classic hypothesis concerning the effect of salinity on faunal distribution. Interaction of substrate was also studied. The local oyster beds are termed the bay beds which include planted and natural populations, and the river beds. From 1967-1971, approximately 800 samples were collected. The majority of these were from the bay beds. In 1968 and 1969, 132 samples were systematically collected from the river beds and 19 from the bay beds. These were returned to the laboratory for special care in identification. Samples from fouling panels and oyster rafts provided additional species; 152 spp. were identified but only 133 spp. were statistically analyzed because they were from the systematic collections. Nonparametric statistics were used. The top 23 spp. were selected for special treatment. In order of decreasing frequency of occurrence the species were: Sabellaria vulgaris, Conopeum tenuissimum, Panopeus herbsti, Nereis succinea, Palaemonetes vulgaris, Crassostrea virginica, Nassarius obsoletus, Polydora websteri, Membranipora tenuis, Garveia fransiscana, Balanus improvisus, Diadumene leucolena, Aiptasiomorpha luciae, Melita nitida, Obelia longicyatha, Alcyonidium polyoum, Sertularia argentea, Crangon septemspinosa, Hydroides dianthus, Eurypanopeus depressus, Modiolus demissus, Parapleustes sp., and Hartlaubella gelatinosa. Species diversity decreases up the estuary with decreasing salinity. Substrate can alter this pattern in particular cases. Within a given salinity range, the presence of any firm substrate or mud influenced the nature of the community from epifaunal to infaunal. Four faunal units were recognized: the planted and natural beds, the 4 southern rivers, the Leipsic River, the Woodland Beach area. The Leipsic River area marks a critical transition zone with a rapid reduction in species. North of Woodland Beach brackish water conditions begin to prevail. The fauna was more diverse in late spring than in the fall but seasonality was not as marked as expected. The faunal composition of Delaware's oyster beds agrees with the cosmopolitan view of estuaries. The stability-time hypothesis proposed by Sanders provides a theoretical basis to explain faunal distributions in Delaware's oyster community. This oyster community may be a sensitive indicator of environmental degradation in the estuary.–Copyright 1974, Biological Abstracts, Inc.
W78-01945

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY,
Old Dominion Univ. Research Foundation, Norfolk, VA.
For primary bibliographic entry see Field 5A.
W78-01946

SOME PRELIMINARY OBSERVATIONS ON THE ENHANCEMENT OF PHYTOPLANKTON GROWTH BY LOW LEVELS OF MINERAL HYDROCARBONS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-01951

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY,
Massachusetts Univ., Boston. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01952

EDAPHIC DIATOM COMMUNITIES ASSOCIATED WITH SPARTINA ALTERNIFLORA AND S. PATENS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W78-01956

NITROGEN FIXATION BY BLUE-GREEN ALGAL COMMUNITIES IN THE INTERTIDAL ZONE OF THE LAGOON OF ALDABRA ATOLL,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01961

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS,
Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health.
For primary bibliographic entry see Field 5A.
W78-01962

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE–REPRISE,
San Diego State Univ., CA.
For primary bibliographic entry see Field 5B.
W78-01970

OCEAN WAVE STATISTICS FOR 1961 NORTH ATLANTIC STORM,
Chicago Bridge and Iron Co., Plainfield, IL. Marine Research and Development.
S. K. Chakrabarti, and R. P. Cooley.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13320, p 433-448, November 1977. 14 fig, 13 ref, 2 append.

Descriptors: *Ocean waves, *Statistics, *Storms, *Atlantic Ocean, Analytical techniques, Data processing, Waves(Water), Winds, Oceans, Equations, Mathematical models, Model studies, Statistical methods, Correlation analysis, Probability, Oceanography.
Identifiers: Wave height, Wave period, Wave spectra.

Various statistical quantities for a random wave system were derived by different proposed means and compared to each other. A series of ocean waves recorded during a severe storm in the North Atlantic in September 1961 was utilized for this purpose. The data included the growth and decay periods of the storm. Such quantities as the significant and maximum wave heights, wave periods, and spectral width parameter were obtained. The analysis was carried out both in the time and the frequency domain. The two methods were found to show reasonably good agreement in their results. The distributions of the individual wave heights and periods in a record and their joint distribution were investigated. The histograms for these parameters compared favorably with simple theoretical models for narrowband spectra. (Sims-ISWS)
W78-01976

A NOTE ON WINTER TEMPERATURE VARIATIONS IN A SHALLOW SEAGRASS FLAT,
Texas Univ. at Austin, Port Aransas. Marine Lab.
N. B. Smith.
Limnology and Oceanography, Vol. 22, No. 6, p 1079-1082, November 1977. 4 fig, 6 ref. NPS CX700050448.

Descriptors: *Water temperature, *Coastal marshes, *Variability, *Texas, *Gulf of Mexico, Sampling, Monitoring, Temperature, Measurement, Time series analysis, Diurnal, Winter, Fronts(Atmospheric), Cooling, Coasts, Tidal waters, Estuaries.
Identifiers: *Seagrass flats.

Hourly temperature readings over a 69-day period in winter 1973-1974 were used to characterize both diurnal and longer period temperature variations in a shallow seagrass flat along the Texas coast. The average diurnal temperature variation has a range of about 2.4C and includes 8 h of warming, starting at about 0800, followed by 16 h of relatively slow cooling. Longer term, quasi-periodic temperature variations occur at intervals of 11-13 days in response to frontal passages. Temperatures fall between 8 and 14C in the first 2 days following the frontal passage, before rapid warming begins. (Sims-ISWS)
W78-01981

MEASUREMENTS BY GEOMAGNETIC INDUCTION OF VOLUME TRANSPORT IN A SALT MARSH DRAINAGE CHANNEL,
Woods Hole Oceanographic Institution, MA.
T. B. Sanford.
Limnology and Oceanography, Vol. 22, No. 6, p 1082-1089, November 1977. 5 fig, 15 ref.

Descriptors: *Salt marshes, *Channel flow, *Drainage, Coasts, Marshes, Coastal marshes, Channels, Flow, Measurement, Instrumentation, Electrical equipment, Tidal marshes, Tidal waters, Wetlands, Estuaries.
Identifiers: Volume transport.

Volume transport of seawater through a salt marsh drainage channel was obtained by geomagnetic induction. The electric potential difference across the channel was interpreted in terms of water motion through the vertical component of the earth's magnetic field. A model was formulated relating volume transport to induced potential differences, and a salt bridge technique was described for measuring the weak voltages. Calibration requires independent measurements of the volume transport. Using surface flow rather than volume transport for calibration results in method errors as large as 25%. Calibration against directly measured volume transport would reduce these errors. (Sims-ISWS)
W78-01982

A VISCOUS SEA ICE LAW AS A STOCHASTIC AVERAGE OF PLASTICITY,
National Oceanic and Atmospheric Administration, Princeton, NJ. Geophysical Fluid Dynamics Lab.
For primary bibliographic entry see Field 2C.
W78-01990

HYDROLOGY OF THE WAIKOROPUPU SPRINGS: A MAJOR TIDAL KARST RESURGENCE IN NORTHWEST NELSON (NEW ZEALAND),
University of Auckland (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W78-02000

THE INFLUENCE OF CRUDE OIL AND MIXTURES OF CRUDE OIL/DISPERSANTS ON THE ONTOGENIC DEVELOPMENT OF THE BALTIC HERRING, CLUPEA HARENGUS MEMBRUS L,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
For primary bibliographic entry see Field 5C.
W78-02005

THE SEAGRASSES IN THE WADDEN SEA, (IN DUTCH),
P. J. G. Polderman, and C. Den Hartog.
Wet Meded K.N.N.V. (K Ned Natuurhist Ver). 107, p 1-32, 1975.

Descriptors: Erosion, Europe, Labyrinthula macrocystic, *Netherlands, Pollution, *Seagrasses, Temperature, *Wadden Sea, Wasting, *Zostera marina, *Zostera noltii.

Two species of seagrass occur in the Wadden Sea (Netherlands), Zostera marina L. and Z. noltii Hornem. Before 1932, Z. marina covered extensive areas in the western part of the Wadden Sea; estimates vary from 5000-15,000 ha. In 1932 the sublittoral Z. marina disappeared due to the wasting disease, which destroyed most beds of this species throughout the northern Atlantic. The causes of this disease is still uncertain. The unicellular organism Labyrinthula macrocystis Cien. has been regarded for some time as the causal agent, but recent studies have shown correlations between the outbreak of the disease and abnormally high summer temperatures. In most areas in Europe and North America, the sublittoral Zostera beds have recovered, but in the Wadden Sea there has been no recovery. This is largely due to the coincidence of the outbreak of the disease and the closure of the Zuyder Zee. The latter caused considerably hydrobiological changes, resulting in erosion of the substrates formerly occupied by seagrass. Transplant experiments in places of former luxurious growth were unsuccessful. Z. noltii and the eulittoral and brackish-water populations of Z. marina were not affected by the wasting disease. This is one of the reasons that some authors have distinguished these populations of Z. marina as separate taxa. After 1965 a marked decrease of the Zostera beds in the intertidal belt was noticed. Both species were involved. The increasing pollution of the coastal sea water is the probable cause. At present the only seagrass beds of any importance in the Wadden Sea occur on the Balgzand (mainly Z. noltii), the tidal flats south of Terschelling (mainly Z. noltii, with many Z. marina), the mud-flats south of Ameland (mainly Z. marina) and the mud-flat near Usquert (mainly Z. noltii), together covering an area of about 500 ha (in 1972).--Copyright 1975, Biological Abstracts, Inc.
W78-02045

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-02119

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W78-02121

METHOD OF MOVING A FLOATING BODY INTO A PREDETERMINED FLOAT PATH,
Atlantic Richfield Co., Los Angeles, CA. (Assignee).
For primary bibliographic entry see Field 2C.
W78-02126

APPARATUS FOR PREVENTING EROSION OF THE SEABED IN FRONT OF HYDRAULIC STRUCTURES,
For primary bibliographic entry see Field 8B.
W78-02127

AERIAL MONITORING EXPERIENCE,
Environmental Protection Agency, Edison, NJ. Region II.
For primary bibliographic entry see Field 5A.
W78-02167

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION, (VOLUME 2),
National Marine Fisheries Service, Panama City, FL. Panama City Lab.; and National Marine Fisheries Service, Panama City, FL. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-02180

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
For primary bibliographic entry see Field 5A.
W78-02192

NITROGEN FIXATION IN SALT MARSHES - A BUILT-IN PLANT FERTILIZER,
Hampshire Coll., Amherst, MA.
For primary bibliographic entry see Field 5C.
W78-02193

ALGAL RECOLONIZATION OF SOME CLEARED SUBTIDAL AREAS,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
For primary bibliographic entry see Field 5C.
W78-02196

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI. GLASS INDUSTRY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01902

3A. Saline Water Conversion

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 2K.
W78-01849

APPARATUS FOR DESALTING SALINE WATER,
Societa Italiana Resine S.p.A., Milan (Italy). (Assignee).
D. Barba, A. Germana, G. Liuzzo, and G. Tagliaferri.
U.S. Patent No. 4,030,985, 9 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1221, June 21, 1977.

Descriptors: *Patents, *Desalination, *Water treatment, *Separation techniques, Water purification, Saline water, Evaporation, Condensation.

Saline water is desalted by flowing it in two evaporation stages in series in the form of a film falling on the inside of heat-exchange tubes. The pressure and temperature in the second evaporation stage are lower than in the first stage. The steam evolved in the second stage is compressed and delivered to the first stage where it condenses on the tubes, whereas the steam evolved in the first stage is fed in the second stage where it condenses on the tubes. The condensation heat of the steam is used for vaporizing the saline water from the film. This technique allows a production of 15-50 cu m/hr of soft water, instead of a production of 15-20 cu m/hr usually obtained by conventional thermocompression techniques. (Sinha-OEIS)
W78-02128

ELECTRICALLY REGENERATED ION EXCHANGE SYSTEM,
Sybron Corp., Rochester, N.J. (Assignee).
For primary bibliographic entry see Field 5F.
W78-02138

SEMIPERMEABLE MEMBRANE,
Office of the Secretary (Interior), Washington, DC. (Assignee).
H. Yasuda.
U.S. Patent No. 4,032,440, 3 p, 2 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1705, June 28, 1977.

Descriptors: *Patents, *Desalination, *Membranes, *Semipermeable membranes, *Water quality control, Separation techniques, Membrane processes, Reverse osmosis, Polymers, Chemical reactions, Polymerization.

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Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A—Saline Water Conversion

A semipermeable composite membrane is prepared by glow discharge polymerization of a combination of an organic monomer and an inorganic monomer in the presence of a porous support, the polymerization resulting in deposition of a thin film of copolymer on the surface of the support. The organic monomers found to be most useful in the invention are unsaturatedaaliphatic or aromatic hydrocarbons, or heteroaromatic compounds, preferably containing about 1 to 10 carbon atoms. The inorganic monomers found to be most useful are carbon monoxide, water vapor and nitrogen. Although the exact mechanism of the polymerization reaction, and the specific structure of the polymer products of the invention, are not known with certainty, it is believed that the process of the invention results in incorporation of hydrophilic groups into the polymer structure, thus enhancing reverse osmosis properties. The desalination devices in which the composite membranes of the invention are typically employed are conventional. (Sinha - OEIS)
W78-02143

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS,
Universal Oil Products Co., Des Plaines, IL. (Assignee).
For primary bibliographic entry see Field 5F.
W78-02154

METHOD AND APPARATUS FOR PURIFYING A LIQUID BY PRESSURE DISTILLATION,
For primary bibliographic entry see Field 5F.
W78-02160

3B. Water Yield Improvement

THE FLORIDA AREA CUMULUS EXPERIMENT: RATIONALE, DESIGN, PROCEDURES, RESULTS, AND FUTURE COURSE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
W. L. Woodley, and R. I. Sax.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 658, Price codes: A10 in paper copy, A01 in microfiche. Technical Report ERL 354-WMPO 6, January 1976. 222 p, 82 fig, 22 tab, 75 ref, 6 append.

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Florida, Precipitation(Atmospheric), Rainfall, On-site investigations, Aircraft, Silver iodide, Projects, Cloud physics, Clouds, Storms, Meteorology.

The Florida Area Cumulus Experiment (FACE) is an outgrowth of the single cloud seeding experiments in Florida; the results of which demonstrated that 'dynamic seeding' can be effective in increasing the sizes and lifetimes of individual cumuli and the localized rainfall resulting from them. All aspects of the FACE program were treated in this report to provide a summary of current progress and problems and to serve as a basis for discussion by the scientific community. The plans for the FACE 1975 field program (which has now been completed) were detailed. The motivation, instrumentation, and procedures for each phase of the program were described. Plans beyond FACE 1975 as a function of several contingencies also were mapped. Complete tabulations of single cloud and area rainfalls were provided in the appendices for those wishing to work with FACE observations. The characteristics of the pyrotechnic flares used for dynamic seeding and the FACE cloud physics program also were discussed extensively in the appendices. Answers to questions frequently asked about FACE were provided in the final appendix. (Sims-ISWS)
W78-01975

A SIMPLE MODEL FOR ESTIMATING THE EVAPORATION FROM A SHALLOW WATER RESERVOIR,
Freie Univ. Berlin (West Germany). Inst. fuer Meteorologie.
For primary bibliographic entry see Field 2D.
W78-01998

3C. Use Of Water Of Impaired Quality

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL,
Utah Center for Water Resources Research, Logan.; and Consortium for International Development, Logan, UT.
J. I. Stewart, R. M. Hagan, R. J. Hanks, W. T. Franklin, and W. O. Pruitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 466, Price codes: A09 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan, Publication PRWG151-1, September 1977, 191 p, 71 fig, 10 tab, 21 ref, 7 append. OWRT B-121-UTAH(2) and C-5189(No. 4233)(3), 14-31-0001-5120.

Descriptors: *Optimization, *Crop production, Saline water, *Soil water, Soil analysis, *Salinity, *Irrigation, Plant growth, Moisture content, Root zone, *Soil moisture, *Water management(Applied), Model studies.
Identifiers: Yuma(Ariz), Davis(Calif), Fort Collins(Colo), Logan(Utah).

The research was carried out by four universities belonging to the Consortium for International Development (CID) in cooperation with the four Water Research Centers. Similar field experiments with corn were carried out in 1974 and 1975 at the University of Arizona (Yuma Field Station), the University of California (Davis), Colorado State University (Fort Collins), and Utah State University (Logan). The objectives were to develop production functions for estimating how crop yield is influenced by different levels of salinity and water supply at different stages of crop growth, and to formulate and test models for predicting yields as a function of water and salinity stress across a broad spectrum of climate and soil types. A unique and significant feature of the study was the establishment of a sufficient data base to test the transferability of the results, and to accomplish this feature, the research was conducted on a regional basis with data collection at the four different locations. All irrigation was applied with a line source sprinkler system, developed in Utah, which gave a continuously variable amount of irrigation water on each side of the line. The maximum evapotranspiration (ET) was estimated at all locations and measured with lysimeters at California. Evapotranspiration (ET) was calculated at all plots as the sum of precipitation, irrigation, and soil water depletion minus drainage (estimated). Yields of dry matter and grain were measured at the end of each growing season. This study has provided an extensive data base on how corn yields respond to moisture deficiency and salinity stress under different soil and climatic conditions.
W78-02018

3D. Conservation In Domestic and Municipal Use

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-01865

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01873

3E. Conservation In Industry

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT).
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01722

GEOTHERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT,
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 6E.
W78-01724

WATER FOR FOOD AND FIBER PRODUCTION.
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-01727

THE SOLAR ENERGY SCENE IN SOUTH AFRICA,
National Building Research Inst., Pretoria (South Africa).
J. F. Van Straaten.
Construction in Southern Africa, Vol 21, No. 5, p 79-95, 1976. 7 fig.

Descriptors: *Solar energy, Economics, Equipment description, Research and development, Domestic water, *Energy conservation, *South Africa.

Solar energy is becoming an increasingly attractive proposition as conventional forms of energy escalate in cost. The United States is spending large sums of money on research and development in this field and it is estimated that by the year 2020 solar energy could account for 25 per cent of United States energy requirements. In South Africa - as this article makes clear - solar energy is already extensively used for water heating while space heating and cooling applications could become common within a few years. (So African Water Info Center)
W78-01830

PRELIMINARY DESIGN AND ANALYSIS OF A PROCESS FOR THE EXTRACTION OF LITHIUM FROM SEAWATER,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 2K.
W78-01849

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-01865

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAAL SUMMARY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.

W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II. INDUSTRY PRIORITY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III. IRON AND STEEL INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV. PETROLEUM REFINING INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V. PULP AND PAPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI. OLEFINS INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII. AMMONIA INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII. ALUMINA/ALUMINUM INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01901

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII. PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01905

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX),
Kappalaverket, Lidingo (Sweden).
For primary bibliographic entry see Field 5E.
W78-02025

SOME ION EXCHANGE APPLICATIONS TO RECOVER AND REUSE VALUABLE MATERIALS FROM POLLUTANTS,
For primary bibliographic entry see Field 5D.
W78-02039

RE-USE OF WASTE WATERS,
For primary bibliographic entry see Field 5D.
W78-02041

ARTICHOKE INDUSTRIES--CUTTING BOD BY 95%.
For primary bibliographic entry see Field 5D.
W78-02048

SX'S KEY ROLE: TREATING METAL WASTES.
For primary bibliographic entry see Field 5D.
W78-02053

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED,
For primary bibliographic entry see Field 5D.
W78-02058

SPENT SULPHURIC ACID WASTES CONVERTED TO USEFUL GYPSUM.
For primary bibliographic entry see Field 5D.
W78-02064

TURNING WASTE WATER AROUND.
For primary bibliographic entry see Field 5D.
W78-02065

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.
Reading, PA. USAC Project.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-236 976, Price codes: A07 in paper copy, A01 in microfiche. HUD Special Technical Report No USAC-RPA2-3241, June 11, 1974. 60 p, 14 fig, 5 append. H-1212.

Descriptors: *Sewerage, *Water supply, *Data processing, *Information exchange, Sewers, Urban drainage, Cities, Computer programs, Water rates, Pennsylvania, Systems analysis, Data transmission, Data storage and retrieval.
Identifiers: *Reading(PA), USAC, IMIS, Billing, Meter reading.

Reading, Pennsylvania, an industrial city with a metropolitan area of about 300,000, was one of five cities chosen by the Urban Information Systems Inter-Agency Committee (USAC) to develop integrated municipal information systems (IMIS). Reading was assigned the Physical and Economic Development subsystem (PED), divided into 15 modules. This report describes the Sewer and Water Accounts Processing module (SWAP), which includes gathering and updating customer information, determining customer usage, billing, and recording and maintaining sewer and water accounts. Emphasis has been on computerized data processing and transfer and on integration of data supplied and utilized by various city activities. The total PED structure is designed to become a regional system. The SWAP module uses disc-oriented computer files combined with manual files and operating procedures. Operations performed are: (1) water service application processing; (2) meter reading and calculation of water consumption; (3) billing; (4) cash receipts posting; (5) maintaining customer accounts; and (6) producing periodic reports. The system includes Bureaus of Water (with an Administrative Office, Meter Reading Office, and storeyard), Treasury, Law, Revenue Control, and Management Services (data processing). A detailed description is given of organizational structure, computer programs, and operational requirements. (Lynch-Wisconsin)
W78-02181

3F. Conservation In Agriculture

STRUCTURAL INDICES OF IRRIGATED CALCAREOUS CHERNOZEM, (IN RUSSIAN),
Kishinev Agricultural Inst. (USSR).
For primary bibliographic entry see Field 2G.
W78-01705

SOME ASPECTS OF MOISTENING SURFACE FORMATION DURING SPRINKLING (SIMULATED TESTS), (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-01706

PRINCIPLES, METHODS AND RESULTS OF DEFINING WATER-PHYSICAL PROPERTIES OF IRRIGATED SOIL IN ROMANIA, (IN RUSSIAN),
Institutul de Cercetari pentru Pedologie si Agrochimie, Bucharest (Rumania).
For primary bibliographic entry see Field 2G.
W78-01711

SETTING UP CROP ROTATION ON HYDROMORPHIC SOILS IN A MOIST CLIMATE, (IN GERMAN),
Zagreb Univ. (Yugoslavia). Zavod Opcu Proizvode Bilja.
V. Mihalic, M. Gikic, J. Gotlin, J. Cizek, and A. Pucaric.
Poljopr Znan Smotra 36(46), p 169-176, 1976.

Descriptors: *Rotation, Grasses, *Climates, Corn(Field), *Crop production, Crop response,

Clover, Gley, *Hydromorphic soils, Soybeans, Wheat, *Yugoslavia.

Agricultural experiments were carried out for 4 yr on gley soil in the upper Sava Valley (Yugoslavia) in a moist climate, comparing several systems of field production, to determine which system would best correspond to existing environmental conditions and the requirements of large-scale agricultural production. The 2-field crop rotation, corn (maize)-wheat made the best showing, compared to corn monoculture, 6-field crop rotation with grass-clover mixture and 3-field crop rotation with soybeans. On amphigley soils, crop rotation should make available the free summer period for planting in heavy soil, with the emphasis of fall plowing, as well as timely summer and winter seeding. This objective is achieved by planting early crops within the system of agricultural plant production or by crop rotation.--Copyright 1977, Biological Abstracts, Inc.
W78-01712

UNDERGROUND PART OF THE GRASS MIXTURE IN IRRIGATED PASTURES OF THE HILLY RELIEF IN THE LITHUANIAN SSR, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
N. A. Lapinskene, and L. V. Gutauskas.
Liet Tsr Mokslu Adad Darb Ser C Biol Mokslai 2, 3-14, 1976.

Descriptors: *Grasses, *Soil moisture, Irrigated lands, *Crops, Alfalfa, Cereal, Clover, Humus, *Lithuanian-SSR, Pastures, USSR.

In June of 1972 and 1973 mixed grass-legume crops (cereal grasses and alfalfa cereals with white and red clovers, cereals) in a hilly area were investigated in Lithuania, USSR. The bulk of the underground part of the plants (58-89% in watered areas and 51-81% in unwatered) accumulated in the soil layer at a depth of 0-5 cm. Decrease of root mass (8 down to 0.6%) was observed at a depth of 25-35 cm. Total underground mass was low due to the lower amount of moisture and humus in the upper slope parts than in the lower.--Copyright 1977, Biological Abstracts, Inc.
W78-01713

COMPARATIVE STUDIES ON THE INTERVARIETAL HYBRIDIZATION OF WINTER SOFT WHEAT UNDER IRRIGATION AND DRY FARMING, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Genetics and Selection of Plants.
B. Bochev, and D. Ivanka.
Genet Sel 9(3): 179-193. 1976. (In Bulg. with Russ. and Engl. summ.).

Descriptors: Belostaya, Cultivars, *Dry farming, Elia, Grain, Heterosis, *Hybridization, *Irrigation, Jubileina, Plant, *Winter wheat.

The influence of irrigation on the inheritance and character of hybrid variability in basic quantity fretures was studied with hybrids of reciprocal 'Bezostaya' X'Elia' and 'Bezostaya 1' X'Jubileina II' crosses in relation to their cropping capacity. Grain weight per ear, 1000-grain weight number of productive tillers and stem height showed highest heterotic effect in the 'Bezostaya 1' and 'Elia' hybrids. In most cases irrigated hybrids had a most strongly expressed heterosis effect. The individual features in F2 hybrid populations of the different crosses displayed an unequal diversity when grown both under irrigation and dry farming conditions. A higher degree of variability in the features was observed in hybrids grown without irrigation. A greater possibility of select and more positive transgressions were found under irrigation in hybrids of 'Bezostaya 1' and 'Elia'. The relative share of the genetic control in the total phenotypic variance, expressed by the coefficient of inheritance, was unequal for the separate features in the different crosses and treatments of growing. Plant height, ear length and 1000-grain weight were distinguished by highest coefficients of inheritance and greatest possibilities of selection, while grain number per ear and number of productive tillers were characterized by lowest coefficients of inheritance, being greatly influenced by environmental conditions. Irrigated hybrids had higher coefficients of inheritance enabling their earlier stabilization, had highest and stable yields in later generations of the crosses. Lines of the 'Elia' X 'Bezostaya 1' cross proved most promising in this respect. Progenies produced and grown under irrigation up to F3 and unirrigated in the following generations behaved differently depending on the meteorological conditions, amount and distribution of precipitation during the growing season, and their genetic origin.--Copyright 1977, Biological Abstracts, Inc.
W78-01715

WATER FOR FOOD AND FIBER PRODUCTION.
Texas A and M Univ., College Station. Water Resources Inst.
Proceedings of the Texas A and M University Centennial Year Water for Texas Conference, March 25-26, 1976, College Station, Texas, Texas Water Resources Institute, 138 p, 13 fig, 13 tab.

Descriptors: *Texas, *Foods, *Fiber crops, *Agriculture, Conferences, Competing uses, Local governments, Oil industry, Publications, Agricultural engineering, Fibers(Plants), Irrigation, Irrigation practices, Moisture availability, Economics, Elasticity of supply, Water allocation(Policy), Water sources, Irrigated land, Irrigation water.

One of the major uses of water in Texas is for the production of food and fiber. The 8.3 million acres of irrigated land in Texas not only places it third in total agricultural cash receipts nationally but also spawns agribusiness industries such as fertilizer, seeds and farm machinery. Papers presented at the Water for Texas Conference focused upon the technological aspects of food and fiber production as well as the U.S. supply situation for those products. Climate cycles and the impact of energy costs on food and fiber production were also of concern. The impact of bays and estuaries of food demand in the state and nation was discussed. The effect of state and federal environmental constraints placed on irrigation agriculture was the topic of one paper. A final segment of the conference explored competing water used from the oil, gas and power industries as well as the various municipalities. (Moorhouse-Florida)
W78-01727

AGRICULTURAL APPLICATIONS OF SOLAR ENERGY,
National Building Research Inst., Pretoria (South Africa).
W. N. Cawood.
Agricultural Engineering in South Africa, Vol 10, No 1, p 13-20, 1976. 9 fig, 1 tab, 11 ref.

Descriptors: *Solar energy, *Agriculture, Solar heating, Solar stills, Crop drying, Power generation, Equipment description, *South Africa.

Until the advent of nuclear power all man's energy requirements were provided by solar energy, either directly or indirectly in the form of fossil fuels. Unfortunately man is consuming the remaining fossil fuel reserves at a far greater rate than they are being formed. Accordingly it is essential that alternative energy resources be developed, and that we learn how to exploit the direct applications of solar energy. A high percentage of our energy requirements is at temperatures below 100C, and it is to this aspect that the author considers most solar energy effort should be directed. Solar water heaters are discussed in some detail, as this is the only area where indepth research has already been conducted, and considerable commercial exploitation has already proceeded. Other areas such as crop drying, space heating, solar distillation and power generation are also discussed briefly. (So African Water Info Center)
W78-01844

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-01865

INVESTIGATIONS OF THE METEOROLOGICAL INFLUENCES ON THE DRY MATTER INCREASE OF SPRING BARLEY AND WINTER WHEAT IN THE PANNONIAN CLIMATE AREA: II. RESULTS OF INVESTIGATIONS IN THE YEARS 1971 AND 1972, (IN GERMAN),
Hochschule fuer Bodenkultur, Vienna (Austria). Inst. fuer Pflanzenbau und Pflanzenzuechtung.
P. Ruckenbauer, and W. Mueller.
Arch Meteorol Geophys Bioklimatol Ser B Klimatol Unweltmeteorol Strahlungsforsch. 22(4), p 375-392, 1974.

Descriptors: *Austria, *Barley, Climates, *Dry matter, Growth rates, Hordeum-vulgare, *Meteorology, Pannonian, Radiation, Rainfall, Soils, Spring, Temperature, Triticum-aestivum, *Wheat(Winter), *Plant growth.

The sum of total radiation, the actual soil temperature in 5 cm depth above the 5C level and the energy demand for the evaporation of free water surfaces offered the highest correlation with the growing performance parameters of barley (Hordeum vulgare) and wheat (Triticum aestivum). The influence of other factors and also of rainfall quantity was of lower importance. These correlations are only valid, if sufficient soil water is available, a situation which was given the the cereal growing area in both years. The influence of interception to radiation and rainfall was studied. This value was correlated with the density of the rainfall, and also with the plant height. (See also W74-12729) --Copyright 1975, Biological Abstracts, Inc.
W78-01968

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: II. ASSESSMENT OF THE MAIN COMPONENTS OF THE WATER BUDGET,
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal.
Samaru Res Bull. 149, p 41-52, 1972.

Descriptors: Agriculture, Hydrology, *Nigeria, Runoff, Samaru, Seepage, *Watersheds(Basins), *Water budget, *Small watersheds, Crops, Evaluation, *Rainfall.

What happens to rainfall in an agriculturally important part of the Northern Guinea Savanna zone in northern Nigeria is discussed. The results based on the study of a small catchment basin indicate that during an exceptionally wet year (54.4 in. of rainfall), run-off and seepage accounted for 33.3% of the received rainfall. In a moderately dry year (39.0 in. of rainfall), a high proportion of rainfall (16.0-27.2%) was still lost in run-off and seepage. The amount of rainfall that can be accepted by soils of the lower and middle slopes of the catchment basin under conditions of normal rainfall distribution and local pattern of agriculture is estimated to be about 44 in. Rainfall in excess of 44 in. must be lost in surface run-off or interflow since the storage capacity of the soil is limited by the depth of the dry-season water-table which, over most parts of the catchment basin, is fairly shallow. The amount of water temporarily accepted by the soil, but then lost by seepage

because of the rise in the water-table was 14.5% of rainfall during an exceptionally wet year and between 10.3-15.3% in a moderately dry year. The maximum rainfall that can be stored and used for dry land farming under the rainfall distribution, topography and cropping pattern as they exist at Samaru is about 36 in. This value can serve as a reference point in classifying seasons as adequate or inadequate in water supply. The mean rate of evapo-transpiration during the main growing period when water was not limited was between 0.159 and 0.176 in./day. (See also W76-01230 and W75-03765)--Copyright 1974, Biological Abstracts, Inc.
W78-01971

MOSS ASSOCIATIONS ON ICELANDIC PEAT SOILS AND THEIR DEPENDENCY ON WATER AND FOODSTUFF BALANCE (IN GERMAN),
Freiburg Univ. (West Germany). Inst. fuer Biologische Holzforschung.
For primary bibliographic entry see Field 2I.
W78-02013

OPTIMIZING CROP PRODUCTION THROUGH CONTROL OF WATER AND SALINITY LEVELS IN THE SOIL,
Utah Center for Water Resources Research, Logan.; and Consortium for International Development, Logan, UT.
For primary bibliographic entry see Field 3C.
W78-02018

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS IN FERTILIZER INDUSTRY,
Fertilizer Corp. of India, Trombay.
For primary bibliographic entry see Field 5D.
W78-02040

IRRIGATION SYSTEM FLUSHING VALVE,
Hawaiian Sugar Planters' Association Experiment Station, Honolulu. (Assignee).
B. A. McElhoe, and J. G. Tabrah.
U.S. Patent No. 4,031,915, 8 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1534, June 28, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Drip irrigation.

A soil irrigating system includes drip tubes connected with a supply of pressurized water to dispense a substantially continuous flow of water to the soil. Flushing valves are connected to remote ends of the drip tubes to periodically flush the tubes clean. Each flushing valve comprises an inlet, an outlet, a pilot opening arranged to introduce pressurized pilot water to the valve, and a valve of resiliently deformable material. The valve has a recessed configuration to extend into a sealing posture in response to urgings of pressurized pilot water at the pilot opening to prevent discharge of water from the remote end of the associated drip tube. When water pressure at the pilot opening is relieved, water pressure from the drip tube shifts the valve to an open position to enable water to be flushed from the drip tubes. A valved manifold is provided to conduct pressurized liquid to the pilot openings to simultaneously shift the valve elements to their closed positions to prevent flushing of the drip tubes. The valve manifold is also able to relieve liquid pressure at the pilot openings so that the valve elements are simultaneously shifted to their open position by water pressure from the drip tubes, to permit flushing of the drip tubes. (Sinha-OEIS)
W78-02133

SOIL IRRIGATION METHODS AND APPARATUS,
Hawaiian Sugar Planters' Association, Honolulu. (Assignee).
B. A. McElhoe, and J. G. Tabrah.
U.S. Patent No. 4,032,072, 8 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1588, June 28, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Flow control, Application equipment, Remote control, Drip irrigation.

An irrigation technique called 'drip' or 'trickle' method which greatly relieves root stress is carried out by a network of conduits placed adjacently to plant rows. The conduits, which can be laid above or below ground are provided with tiny openings. Water is continuously supplied to the conduits to effect a continuous drip or trickle of water through the openings. Water thus distributed to the soil in a continuous fashion eliminates periods where the soil is overly dry. However among the problems characteristics of drip irrigation techniques is a tendency for the drip openings to become clogged. The object of this invention is to provide methods and apparatus by which both drip irrigation and drip-tube flushing can be performed under high water pressure conditions and the network of drip tubes are flushed simultaneously by remote control. The apparatus relies solely upon irrigation liquid as a source of actuating power. A pressure-responsive sealing valve assembly achieves these objects. (Sinha-OEIS)
W78-02134

AUTOMATED IRRIGATION SYSTEM,
E. F. Jacobi, and M. R. Madden.
U.S. Patent No. 4,033,508, 9 p, 12 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 186, July 5, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Water distribution, Automation, Application equipment.

An automated control system for cyclically extending the length of the pivoted irrigation pipe to allow irrigation of the corners is provided. Pivotally articulated pipe is conformed to telescopically receive in the free end a deployable extension. This deployable extension is supported by an articulated undercarriage which, by way of a stepping switch, can be controlled to assume various alignments away from tangent, and thus controls the deployment. Accordingly, concurrent with the pivotal motion of the irrigation pipe, command inputs are applied to this second traveler which by its alignment will then deploy the telescoping extension to reach into the corners. (Sinha - OEIS)
W78-02144

LAWN SPRINKLER AND FERTILIZER DISPENSER,
K. T. Sheets.
U.S. Patent No. 4,033,509, 9 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 186-187, July 5, 1977.

Descriptors: *Patents, *Irrigation, Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Fertilization, Flow control.

An apparatus for incorporating fluid solutions, suspensions, or mixtures of chemicals such as fertilizer, insecticide or weed killer in the fluid spray of the sprinkler is described. The lawn sprinker contains means for spraying fluid solutions, through the nozzle of the sprinkler. The nozzle is connected to a reservoir chamber by a channel. Liquid is conveyed from the chamber to the nozzle under pressure. A manifold is connected to the reservoir with a flow regulator to regulate the rate of flow of fluids from the reservoir. The reservoir chamber also has an aspirator. (Sinha - OEIS)
W78-02145

ARC-TRAVERSING WATER SPRINKLER,
Thompson Mfg. Co., Los Angeles, CA. (Assignee).
J. M. Jennison, and H. T. Williams.
U.S. Patent No. 4,033,510, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 187, July 5, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment.

An oscillating sprinkler is provided that is easily adapted to different water-line pressures and is relatively immune to foreign particles clogging the operation of the oscillating mechanism. The body structure of the sprinkler which moves through a predetermined arc carries a pin which has its extending end formed to provide a pivot surface. The oscillating mechanism has a bearing aperture slightly larger in diameter than the diameter of the body structure pin. One opening of the bearing aperture receives a pin that is inserted into it. The end of this oscillating mechanism pin in the bearing aperture acts as the bearing surface for the body structure pin pivot surface. A support plate carried by the body structure has a bearing aperture to receive the oscillating mechanism pin. This support plate carries a spring mechanism which is attached to the end of the oscillating mechanism pin protruding beyond the support plate, in addition to the support plate. The attachment of the spring mechanism to the support plate is adjustable in a manner that provides a variable rotational force on the oscillating mechanism pin. The spring mechanism is shielded from the elements by a protective housing. (Sinha - OEIS)
W78-02146

ALIGNMENT CONTROL SYSTEM PARTICULARLY SUITED TO CONTROL TRAVELING IRRIGATION SYSTEMS,
D. E. Sage, and G. E. Sage.
U.S. Patent No. 4,034,778, 15 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 616, July 12, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Control systems, Conveyance structures, Strain gages, Strain measurement.

This invention involves the control of an irrigation system for large fields of the type that consists of a series of articulating sections which are independently driven. The control system for such irrigation devices typically operate so that the device pivots around one end of the chain of sections which are kept in substantially linear alignment to permit coverage of a large circular area. the irrigation apparatus may also be operated to travel uniformly across the field. The components of this system are a deflecting member, a strain gauge attached to the deflecting member, a sensor for monitoring the variations detected by the strain gauge and controlling the drive, a sensor for determining the direction of the travel and to modify the signals to the driven control accordingly, and an overtravel sensor to stop the system should the misalignment become excessive. (Sinha-OEIS)
W78-02157

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
G. B. Hergert, and J. Gall.
Can J Soil Sci. 53(4), p 483-484, 1973.

Descriptors: *Agricultural runoff, *Instrumentation, *Sampling, Pollutant identification, Agriculture, *Automatic sampling, Runoff.

A modification of a Mark IV 24 Bottle Sampler is described which takes samples sequentially at equal time intervals. The instrument may be used

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in the study of runoff quality from agricultural land.-eCopyright 1974, Biological Abstracts, Inc.
W78-02185

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A RECALL FOR GREENWAYS,
For primary bibliographic entry see Field 6E.
W78-01732

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE, (MEETING 75-4, 1975).
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E.
W78-01738

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT),
Systems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W78-01739

PLUMBING AND DRAINAGE IN TALL BUILDINGS,
National Building Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 8B.
W78-01846

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO--FISCAL YEAR 1977,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-01858

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
L. R. Peterson, and G. Meyer.
Open-file report 77-596, May 1977. 30 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Water resources development, *Available water, *Investigations, *Planning, *Foreign countries, Surface waters, Rivers, Groundwater, Water supply, Network design, Evaluation, *Nigeria.

Initial moderate water requirements of the new Federal Capital Territory in Central Nigeria are available from the two large rivers, the Niger and Benue, from the smaller Gurara River, and possibly from several smaller streams. Ground water in the southwestern part of the Territory and in adjacent areas along the Niger River is also a potential source. The Niger and Benue Rivers are obvious sources of major supply for eventual large demands, and the Gurara River and sedimentary aquifers also may have that potential. Available data are sparse and highly inadequate for satisfactory design of assessment, development, and management plans for the Territory. Initiation of systematic investigation and collection of data at an early date is recommended. (Woodard-USGS)
W78-01859

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E.
W78-01866

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
J. C. Stephens.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 56, 1977. 37 p, 3 fig, 9 tab, 39 ref.

Descriptors: *Hydrologic data, *Hydrologic cycle, *Hydrologic budget, *Arid lands, *Utah, Surface-groundwater relationships, Evapotranspiration, Phreatophytes, Precipitation(Atmospheric), Runoff, Ephemeral streams, Groundwater resources, Water quality, Water utilization, Livestock, Water storage, Methodology, Water table, Drawdown, *Tule Valley drainage basin(Utah), *Juab County, Millard County.

The Tule Valley drainage basin is an area of about 940 square miles in Juab and Millard Counties in west-central Utah. Precipitation in the basin averages about 8 inches annually. There is no surface outflow and all streams are ephemeral. Annual runoff averages about 0.09 inch. Because there is no sustained runoff, and flow is local and infrequent, reservoirs do not provide dependable water supplies. Groundwater recharge from precipitation in the basin is estimated to average 7,600 acre-feet annually. Discharge, principally by evapotranspiration, averages about 40,000 acre-feet annually. Subsurface inflow from adjacent areas is estimated to average about 32,000 acre-feet annually. Nearly all discharge from the groundwater system is evaporated directly from the water table or transpired by phreatophytes in the 68,000 acres that constitute a natural discharge area on the northern valley floor. Dissolved-solids concentrations in the water range from 516 to 1,580 milligrams per liter. Water from all sources sampled apparently is of satisfactory chemical quality for livestock use. The temperature of water discharged by spring ranges from 12.5 to 28.0 degrees Celsius. More than 700,000 acre-feet of water might be obtained from storage and by capture of water now being consumed by evapotranspiration if wells in the principal area of natural discharge were pumped to lower the water table 100 feet. Supplies for livestock could be obtained from wells at many locations on the alluvial fans and nearly anywhere on the valley floor. (Woodard-USGS)
W78-01872

MAGNITUDE AND FREQUENCY OF FLOODS IN CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-01874

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-01875

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01882

AQUATIC WEED PROBLEMS IN PUERTO RICO,
Office of the Chief of Engineers (Army), Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01921

WATER HYACINTH CONTROL ON THE LOWER FITZROY RIVER,
Queensland Dept. of Primary Industries, Rockhampton (Australia).
For primary bibliographic entry see Field 5G.
W78-01922

WATER HYACINTH CONTROL PLAIN FOR THE ST. JOHNS RIVER,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
For primary bibliographic entry see Field 5G.
W78-01923

SELECTED LIFE CYCLE FEATURES OF FANWORT,
Florida Dept. of Natural Resources, Tallahassee.
D. P. Tarver, and D. R. Sanders, Sr.
Journal of Aquatic Plant Management, Vol. 15, p 18-22, June, 1977. 1 fig, 5 tab, 9 ref.

Descriptors: *Growth stages, *Life cycles, *Life history studies, Aquatic plants, Germination, Pollen, Flowering, Louisiana, Aquatic weed control.
Identifiers: *Fanwork, *Cabomba caroliniana, Nymphaeaceae, Bees, Apis mellifera, Pollination, Joyner's Pond(LA), Iatt Lake(LA).

A study of fanwort (Cabomba caroliniana), a major pest plant throughout the Gulf Coast and especially in Louisiana, deals with seed germination and maturation, flowering, and pollination. Seeds collected in Joyner's Pond (Saline, LA) and Iatt Lake (Grant Parish, LA), were subjected to varying red light, temperature, carbon dioxide, and oxygen conditions. Stem sections containing inflorescences and six leaf pairs, but no roots, were collected in Joyner's Pond and used in laboratory pollination and flowering tests, and field observations were made. While the major growth of fanwort is due to vegetative production, seed germination contributes to its reproductive potential. Germination was achieved by 20% of seeds kept in greenhouse conditions, but no seeds kept in darkness germinated. No significant effects of temperature (10-45 C), red light, oxygen, or carbon dioxide were found in seed germination experiments. Tests and observations indicated that: (1) the pollination mechanism for fanwort is natural cross-pollination by insects and (2) seed development on detached inflorescences can occur, indicating that roots are not essential for successful seed production. The most common pollinator was the introduced honey bee (Apis mellifera); others were the dragon fly, damselfly, and sweat bee. No flowers isolated from insects, even those cross-pollinated by hand, developed seeds. Seed-development occurred within 28-31 days of anthesis on successfully pollinated flowers. (Lynch-Wisconsin)
W78-01924

EFFECTS OF CONSECUTIVE WATER FLUCTUATIONS ON SUBMERSED VEGETATION OF BLACK LAKE, LOUISIANA,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 5G.
W78-01925

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-01928

MANAGEMENT OF AQUATIC PLANTS WITH ACROLEIN,
Water Resources Commission, Griffith (Australia).
For primary bibliographic entry see Field 5G.
W78-01929

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO EGGS, ALEVINS, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES,
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01932

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8B.
W78-01973

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I., FLORA AND CHEMISTRY,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W78-02007

JOINT USE OF INTERNATIONAL WATER RESOURCES,
Mahart, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W78-02010

THE LAKE CHELAN CASE--ANOTHER VIEW,
Washington State Bar Association, Seattle.
For primary bibliographic entry see Field 6E.
W78-02098

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING,
For primary bibliographic entry see Field 6E.
W78-02100

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED,
Washington Univ., Seattle. Dept. of Geography.
M. McCrea.
Coastal Zone Management Journal, Vol. 3, No. 1, p. 83-89, 1976.

Descriptors: *Washington, *Shores, *Land management, *Land development, *Governmental interrelations, Urbanization, Local governments, Human population, Economics, Spatial distribution, Industries, Permits, Economic impact, Land use, Shore protection, Pacific Northwest U. S., Water law, *Washington State Shoreline Management Act, *Puget Sound(Wash), Shoreline management, Coastal zone management, Property interests.

Under the Washington State Shoreline Management Act both urban and rural interests have an opportunity to express themselves. The author of this article challenges an article by Peter Harrison on the spatial aspects of the pressure for shoreline development using Puget Sound as an example. In reconsidering Harrison's findings, the author insists that since the Act generally covers only two hundred feet inland from the high tide line, and each local government develops its own management program, it is extremely doubtful that nodal or spread development on a regional level in Puget Sound can be meaningfully addressed under the Act's provisions. As a result of the Act, local governments have wide latitude in determining the spatial patterns which they deem desirable. The state, however, does provide general guidelines to insure that the policy of the Act is followed. The state also retains the right to protect state interests on shores of state-wide significance. Because each local government now has a greater capability to regulate its shore due to the establishment of a planning department in each county, the author concludes that there may be evidence of nucleation or spread patterns at the local level. (See also W74-05872) (Quarles-Florida)
W78-02119

COMBINED LEACHING AND SUMP CATCHBASIN,
For primary bibliographic entry see Field 5G.
W78-02131

WATER RESOURCES OF AUSTRALIAN DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 4B.
W78-02163

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY,
W. C. Nelson, and R. J. Ehni.
Farm Research, Vol 34, No 2, p 25-26, November-December 1976. 1 fig, 1 tab, 2 ref.

Descriptors: *Agricultural runoff, *North Dakota, *Land use, Federal Water Pollution Control Act, Simulation analysis, Computer models, Model studies, *Sheyenne River Valley(ND), *Nonpoint pollution, *Cropping patterns, Soil loss.

Interfaces between land use and water quality in the lower Sheyenne River Valley (ND), which is about 90 percent agricultural, were studied with a computerized model that simulates relationships among crop agriculture, the regional economy, and river sediment. Preliminary results indicate soil loss can be reduced and Sheyenne River water quality improved substantially by eliminating summer fallow, limiting row crops and emphasizing production of high value small grains. The eliminations, limitations and crop switches would not only improve water quality but increase per acre profits and regional gross receipts. While results are preliminary, they suggest controlling nonpoint pollution from cropland can be achieved without economic losses for farmers and may, in fact, improve their economic situation. (Coyle-Wisconsin)
W78-02190

BENEFITS OF FLOODWATER MANAGEMENT IN THE CLOSED DEVILS LAKE BASIN,
D. F. Scott, and J. A. Leitch.
Farm Research, Vol 34, No 2, p 27-28, November-December 1976. 1 fig.

Descriptors: *Flood control, *North Dakota, *Wetlands, Flood damage, Regional economics, Cost-benefit ratio, Economic impact, Water management(Applied), *Devils Lake Basin(ND), *Wildlife production, Economic structure.

The North Dakota legislature in 1975 created a committee to develop and recommend a comprehensive land and water management plan for the Devils Lake Basin. Periodic flooding in the Basin region has seriously damaged agricultural production and depressed economic growth in the region. Attempts to develop flood damage reduction plans for many of the subwatershed areas in the basin have been unsuccessful. The basin is one of the nation's prime waterfowl production areas and there has been opposition to plans that would be detrimental to that production. While work continues on refinement of estimates of benefits and

costs associated with reducing flood damage, three alternative plans have been analyzed using benefit-cost analysis. In each instance the benefit-cost ratio is greater than 1.0 for both structural measures and land treatment measures, but less than 1.0 for wetlands restoration. But with adequate compensation to landowners, some wetlands restoration could be justified. (Coyle-Wisconsin)
W78-02191

4B. Groundwater Management

GEOTHERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT,
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 6E.
W78-01724

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA,
Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center.
For primary bibliographic entry see Field 5B.
W78-01848

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5B.
W78-01851

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO--FISCAL YEAR 1977,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-01858

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01859

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
K. S. Muir, and D. A. Webster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 503, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-22, July 1977. 40 p, 8 fig, 6 tab, 27 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Indian reservations, *California, Groundwater availability, Groundwater movement, Water yield, Groundwater recharge, Water levels, Water quality, Surface waters, *Round Valley Indian Reservation(Calif), Mendocino County(Calif).

The Round Valley Indian Reservation in northern California obtains most of its water from the ground-water reservoir. The ground-water reservoir is made up of continental deposits, alluvium, and stream-channel deposits ranging in age from Pliocene to Holocene. Most of the water is pumped from the alluvium. Most ground water (about 20,000 acre-feet or 25 cubic hectometers per year) is derived from stream seepage. Natural discharge (discharge to streams, evapotranspiration, and underflow) has averaged about 21,000 acre-feet per year. Pumping and flow from artesian wells has averaged about 2,750 acre-feet per year. Ground water occurs in both confined and unconfined aquifers. The ground-water reservoir is full, and about 230,000 acre-feet of water is stored in the depth interval 10-200 feet. The water is chemically and biologically suitable for domestic or irrigation use, although hardness is high for domestic use and, locally, dissolved iron is a problem. There is potential for developing additional ground-water supplies. (Woodard-USGS)
W78-01863

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
R. P. Fogelman, and G. L. Rockwell.
Open-file report 77-486, October 1977. 82 p, 3 fig, 36 maps, 4 tab.

Descriptors: *Groundwater resources, *Baseline studies, *Well data, *Water quality, *California, Water wells, Water yield, Water levels, Water utilization, Drawdown, Chemical analysis, Data collections, Sites, Maps, *Eastern Sacramento Valley(Calif).

The Sacramento Valley occupies the northern one-third of the Great Central Valley of California. The study area of this report includes about 1,300 square miles in the eastern part of the Sacramento Valley, extending from the latitude of Roseville on the south to the latitude of Chico on the north and bounded on the east by the foothills of the Sierra Nevada and on the west by the Sacramento River, in Yolo, Yuba, Placer, Sutter, and Butte Counties. Between February and July 1976, 809 wells were canvassed, and during August and September 1976, water samples were collected for chemical analysis from 222 of the wells. Field determinations of alkalinity, conductance, pH, and temperature were made on the site at the time of sampling. The samples were then field prepared for shipment and analysis for selected constituents and properties at the Geological Survey Central Laboratory, Arvada, Colo. Descriptive data for water wells, chemical data, and the location of wells are presented. This is the third in a series of data reports showing baseline well data and water-quality data in the Sacramento Valley and is in cooperation with the California Department of Water Resources. (Woodard-USGS)
W78-01864

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER,' JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01868

GROUND-WATER HYDROLOGY AND SUBSURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-01869

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01872

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01882

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER,
Southwest Texas State Univ., San Marcos. Aquatic Station.
For primary bibliographic entry see Field 5C.
W78-01920

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, MI. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W78-01949

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
For primary bibliographic entry see Field 5B.
W78-01993

GEOELECTRIC SOUNDING FOR ESTIMATING AQUIFER HYDRAULIC CONDUCTIVITY,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W78-01994

CLEAT ORIENTATION AND AREAL HYDRAULIC ANISOTROPY OF A WYOMING COAL AQUIFER,
California Univ., Livermore. Lawrence Livermore Lab.
R. Stone, and D. F. Snoeberger.
Ground Water, Vol. 15, No. 6, p 434-438, November-December 1977. 7 fig, 10 ref. ERDA W-7405-Eng-48.

Descriptors: *Hydraulic conductivity, *Anisotropy, *Coal, *Wyoming, Fractures(Geologic), Groundwater, Aquifers, Stratigraphy, Geology, Sandstones, Wells, Water wells, Test wells, Groundwater movement, Hydrology.
Identifiers: *Powder River Basin(Wyo).

The anisotropic, areal hydraulic conductivity of the Felix No. 2 coal (Eocene, Wasatch Formation) was defined in a four-well pump test at a site in the Powder River Basin of northeastern Wyoming. The direction of maximum hydraulic conductivity of the subbituminous coal bed bears N59 deg E and is associated with a horizontal hydraulic conductivity of 0.27 m/day. The direction of minimum hydraulic conductivity bears N31 deg W and is associated with a horizontal hydraulic conductivity of 0.15 m/day. The direction of maximum hydraulic conductivity approximately corresponds to the trend of the prominent face cleat in the coal, while the direction of minimum hydraulic conductivity corresponds to the trend of the butt cleat. The cleat orientation appears related to the alignment of major structural features of the region. Prediction of the direction of both maximum and minimum horizontal hydraulic conductivity in near-horizontal coal beds appears possible. However, either the cleat orientation of the bed or the alignment of the controlling fold structure must be known or obtainable. (Sims-ISWS)
W78-01995

THE SIGNIFICANCE AND PREDICTION OF OBSERVATION WELL RESPONSE DELAY IN SEMICONFINED AQUIFER-TEST ANALYSIS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 2F.
W78-01996

MEETING THE GROUNDWATER CONTAMINATION PROBLEM,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-02031

INDUSTRIAL DUMPS THREATEN GROUNDWATER.
For primary bibliographic entry see Field 5B.
W78-02043

WATER RESOURCES OF AUSTRALIAN DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
L. A. Dorokhov.
Probl Osvoeniya Pustyn. 1, p 23-33, 1973.

Descriptors: *Australia, *Deserts, *USSR(Central Asia), Water resources, Water supply, *Groundwater.

In Australian deserts runoff is ephemeral and has a wide range of discharge. Underground water is the principal source of the desert water supply. The main hydrologic features of Australian deserts and those of Central Asia (USSR) are compared. Water resource supplementation in Australian deserts is lower than in Central Asia.--Copyright 1976, Biological Abstracts, Inc.
W78-02163

4C. Effects On Water Of Man's Non-Water Activities

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W78-01823

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01873

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
For primary bibliographic entry see Field 5B.
W78-01993

4D. Watershed Protection

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).
For primary bibliographic entry see Field 6E.
W78-01748

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.
D. T. Kao, B. J. Barfield, and A. E. Lyons.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 219, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 107, October 1977. 108 p, 15 fig, 4 tab, 18 ref. OWRT A-049-KY(2), 14-31-0001-4017, 14-31-0001-5017.

Descriptors: *Drag, *Flow resistance, *Grassed waterways, Turbulent flow, *Overland flow, Vegetation, Simulation analysis, Flow rates.
Identifiers: *Hydraulic resistance.

Simulated dense vegetation with random blade arrangements and different blade flexibilities were used to determine the hydraulic properties of flow of small, non-submerging depths. With the water flowing among the randomly patterned vegetation blades, drag resistance becomes the dominant force that retards the flow. The equation of flow was established based on the momentum balance in the system. Experimental results were used to determine the coefficient of blade resistance, and plotted in terms of blade width and flow depth Reynolds number respectively. (Huffsey-Kentucky)
W78-01823

VEGETATION PATTERNS ON A SOUTHERN APPALACHIAN WATERSHED,
Old Dominion Univ., Norfolk, VA. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01943

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN,
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-02017

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY,
For primary bibliographic entry see Field 4A.
W78-02190

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

NATIONAL ESTUARINE MONITORING PROGRAM,
Environmental Protection Agency, Gulf Breeze, FL.
P. A. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 519-521, 2 ref.

Descriptors: *Estuarine environment, *Monitoring, *Pesticides, *Water pollution effects, Estuarine fisheries.

About 8,000 samples of estuarine molluscs were monitored for pesticide residues in the period 1965-1972. Residue trends and typical pollution situations are briefly described. Beginning in 1972, fish were substituted for molluscs. The basic needs for a continuing monitoring program are described. (Sinha-OEIS)
W78-01803

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
A. C. Miller, L. A. Krumholz, S. E. Neff, D. E. Jennings, and P. B. Olmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 221, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 106, October 1977. 135 p, 25 fig, 27 tab, 136 ref. OWRT B-035-KY(1), 14-31-0001-4087.

Descriptors: *Water quality, *Water chemistry, Sediments, Environmental effects, Limnology, Rainfall, Runoff, *Pre-impoundment, Evaluation, Kentucky, Monitoring, *Salt River(Kent).

Monthly water samples were taken and analyzed to determine the water quality of the Salt River in Anderson and Spencer counties in Kentucky prior to the river's impoundment. Sediments from the

area watershed were analyzed by total acid digestion, barium chloride extraction, and aqueous extraction methods. Rainwater and runoff water were collected and analyzed for major cations and anions from two sites in the watershed. Calcium and bicarbonate in the Salt River originate from weathering of calcite, although mole ratios of these two ions suggest that weathering of magnesium carbonates also contributes bicarbonate to the water. High levels of sulfate in rainwater indicate some of this anion may be introduced into the area watershed by atmospheric precipitation. (Huffsey-Kentucky)
W78-01822

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER IN SALDANHA BAY AND LANGEBAAN LAGOON,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
For primary bibliographic entry see Field 2L.
W78-01839

A PRELIMINARY REPORT ON THE GEOCHEMISTRY OF RECENT SEDIMENTS IN SALDANHA BAY AND LANGEBAAN LAGOON,
Cape Town Univ. (South Africa). Dept. of Geochemistry.
For primary bibliographic entry see Field 2L.
W78-01842

POLLUTION ESTIMATION FACTORS,
Construction Engineering Research Lab. (Army), Champaign, IL.
G. W. Schanche, J. R. Cannon, L. R. Greep, and B. A. Donahue.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 753, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No N-12, November 1976. 26 p, 29 tab, 4 ref. 4A162121A896.

Descriptors: *Pollutant identification, *Waste identification, *Waste disposal, *Waste water(Pollution), Water pollution sources, *Air pollution, Estimating, *Emission factors.

Utilizing an extension of EPA's emission factor approach, estimation is made of the types and amounts of solid waste and wastewater discharged from certain activities common to U.S. Army Training and Doctrine Command (TRADOC) and Forces Command (FORSCOM) military facility and vehicle operation. Army-relevant sections of EPA's 'Compilation of Air Pollutant Emission Factors' (AP-42) are listed. Although the factors are useful for providing preliminary estimates of air emissions from a group of activities without conducting field investigations, they are not precise indicators of air emissions from a specific source; examples for point, line, and area sources are provided for illustrative purposes. Literature-based factors for estimating the quantity and composition of solid waste and wastewater materials are presented. The factors are grouped by facility type with both average and 95 per cent confidence interval values reported for each factor. Examples of these factors, which are to be used purely for general guidance in assessing the environmental consequences of proposed actions and in approximating the magnitude of problems for preliminary planning, are given. (Dorfman-IPA)
W78-01850

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA.
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 10C.
W78-01852

A SOLID SUBSTRATE IMMUNOLOGICAL ASSAY FOR MONITORING ORGANIC ENVIRONMENTAL CONTAMINANTS,
IRT Corp., San Diego, CA.
H. R. Lukens, and C. B. Williams.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-266 357, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA/600/1-77-018, March 1977. 40 p, 4 fig, 8 tab, 5 ref, 2 append. 68-02-2202.

Descriptors: *Chemical analysis, Chemicals, Assaying, *Analytical techniques, *Pollutant identification, Monitoring, Environment, *Organic wastes, Chemical wastes, 2-aminobenzimidazole, 2-ABZI.

A solid substrate 'film-badge' type monitor, capable of detecting 2-aminobenzimidazole (2-ABZI) at less than one part per million in water in less than 10 minutes, has been developed. The monitor utilizes both the reaction which takes place between 2-ABZI in the sample and a monolayer of its antibody that has been deposited on a thin film of indium on a glass substrate. A second approach has been demonstrated in principle; the antibody is mounted on polystyrene and reaction of its antigen-binding sites with a fluorescein-labeled antigen are subject to competition with nonlabeled antigen in the sample. Improvements to this alternate approach are proposed. The major disadvantage (correctable, however) is the high level of background fluorescence from the polystyrene, which limits its sensitivity. The potential advantage is quantitative measurement. (Dorfman-IPA)
W78-01853

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 973, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA/625-6-76/003, July 1976, Second edition, 298 p, 7 tab, 28 fig, 107 ref, append.

Descriptors: *Pollutant identification, Methodology, Analysis, *Analytical techniques, *Chemical analysis, *Water pollution, *Waste water(Pollution), Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Boron, Chlorides, Organic compounds, Inorganic compounds, Monitoring, Flourides, Metals, Trace elements, Nitrogen, Phosphorus, Oil, Arsenic, Iodides.

Chemical analytical procedures used in EPA laboratories for the examination of ground and surface waters, domestic and industrial waste effluents, and treatment of process samples are presented. The manual is to be utilized as a basic reference for monitoring water and wastes in compliance with the requirements of the Federal Water Pollution Control Act Amendments of 1972. Test procedures for the measurement of physical, inorganic and selected organic constituents and parameters are included. (Dorfman-IPA)
W78-01854

MODEL STATE WATER MONITORING PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 596, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-440/9-74-002, June 1975, 61 p, 10 tab, 2 fig, 47 ref.

Descriptors: *Pollutant identification, *Monitoring, *Control systems, *Data collections, *Operations, *Regulation, Environment, Biology, *Management, Water management(Applied), *Operation and maintenance.

A model state water monitoring program, developed by a panel of Federal and State professionals actively engaged in managing and operating such programs, is presented. The objectives were to: (1) provide some basis to the states for building and operating programs; (2) illustrate the various types of monitoring activities, their costs and their uses, and (3) suggest to EPA Regions and States how monitoring resources can be utilized in pollution control and abatement. Areas discussed include planning and management, ambient water quality monitoring, biological monitoring, compliance monitoring, and quality assurance. (Dorfman-IPA)
W78-01855

DEVELOPMENT OF HATREMS DATA BASE AND EMISSION INVENTORY EVALUATION,
Midwest Research Inst. Kansas City, MO.
C. M. Maxwell, R. Bohn, R. Caiazza, and C. Cowherd, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 634, Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-450/3-77-011, April 1977. 215 p, 7 fig, 20 tab, 16 ref, 5 append. 68-02-2390.

Descriptors: *Pollutant identification, *Fluorides, *Air pollution, *Chlorides, Environment, Chlorine, Data collections, *Emission factors, *Trace pollutants, *Lead, *Emission inventory, Area sources(Pollution).

An extensive data collection and analysis program was conducted to (1) develop an emission factor data base for HATREMS; (2) prepare these data loading into HATREMS; and (3) evaluate emission inventory information from HATREMS. HATREMS (Hazardous and Trace Emission System) is a computerized subsystem of EPA's AEROS (Aerometric and Emission Reporting System), which stores and reports source and emission data for noncriteria pollutants in a manner parallel to NEDS (National Emissions Data System) which stores and reports data for the five criteria pollutants. Three hazardous pollutants (lead, fluorides, and HCl/chlorine) were selected from a list of nine pollutants for incorporation as separate chapters into 'Emission Factors for Trace Substances' (EPA-450/2-73-001); these special report chapters appear as appendies. Point source data were developed/coded for 26 pollutants; area source data for 22 pollutants; and 'free' (non-NEDS) area source data for four pollutants. Methodology was developed for evaluation of the emission inventory information to be generated from HATREMS, even though the HATREMS data base was not processed through the computer system as part of the study. Lead was evaluated for use in the EHIS, another subsystem of NEDS. (Dorfman-IPA)
W78-01856

TECHNICAL MANUAL FOR PROCESS SAMPLING STRATEGIES FOR ORGANIC MATERIALS,
Monsanto Research Corp., Dayton, OH.
W. Feairheller, P. J. Marn, D. H. Harris, and D. L. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 696, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-122, April 1976, 162 p, 20 fig, 9 tab, 46 ref, 2 append. 68-02-1411 Task 11.

Descriptors: *Pollutant identification, Analytical techniques, *Air pollution, *Sampling, Analysis, *Chemical analysis, *Water analysis, *Industrial wastes, *Organic compounds, Industrial processes, *Waste streams, *Environmental assessment, *Fugitive emissions, *Stationary sources(Pollution).

Sampling approaches for conducting Level I, II and III environmental source assessment surveys of the feed, product and waste streams associated

with the production of organic materials are examined. Level I presents large quantities of sample in a short time period for both analysis of the chemical classes of compounds present and biological testing programs. Level II presents a more detailed qualitative and quantitative chemical analysis of the organic compounds. Level III is a quantitative study of process variables on the emission rates of specific organic materials. The manual is geared for those basically experienced in sampling techniques and is intended for use in source assessment programs. Specific methods of obtaining samples from stationary sources, fugitive emission sources, and process and waste streams (including gas, liquid and solid phases) are outlined in Level I; state-of-the-art description and an extension of state-of-the-art sampling methods available for application are provided in Levels II and III. Sample survey data sheets are shown, and a fugitive source diffusion model is given. (Dorfman-IPA)
W78-01857

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR GALLIANO, LOUISIANA (LAROSE TO GOLDEN MEADOW, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, LA. Water Resources Div.
H. L. Leone, Jr.
Open-file report 77-576, July 1977. 12 p, 1 fig, 1 plate, 5 tab, 9 ref.

Descriptors: *Environmental effects, *Water quality, *Levees, *Construction, *Louisiana, Flood protection, Hurricanes, Baseline studies, Water analysis, Dredging, Cores, Sampling, Chemical analysis, Heavy metals, Pesticides, *Galliano area(La), Pre-construction data.

Seven core-material-sampling sites were chosen by the U.S. Army Corps of Engineers as possible borrow areas for fill material to be used in levee construction near Galliano La. Four receiving-water sites also were selected to represent the water that will contact the proposed levees. Analyses of selected nutrients, metals, pesticides, and other organic constituents were performed upon these bed-material and native-water samples as well as upon elutriate samples of specific core material-receiving water systems. The results of these analyses are presented without interpretation. (Woodard-USGS)
W78-01861

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01864

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01880

VOLTAMMETRIC DETERMINATION OF ACROLEIN,
Tennessee Valley Authority, Chattanooga, Div. of Environmental Planning.
L. H. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 376, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-005 and TVA report No. E-LB-76-1, July 1976. 42 p, 8 fig, 3 tab, 36 ref, 1 append. E-AP 78BDH, EHE 625C, D6-E721.

Descriptors: *Pollutant identification, *Polarographic analysis, Water pollution, Water sampling, Analytical techniques, Propenal, Molluscicides, Clams, Heat exchangers, Thermal powerplants, *Acrolein.

A differential pulse polarographic method, based on electrochemical reduction of acrolein at the dropping mercury electrode, was developed for determining concentrations of acrolein in natural waters and in condenser cooling water. With this method, acrolein can be quantitated at concentrations of 0.05 to 0.5 mg/l. The sample for acrolein analysis is buffered at pH 7.2 with 0.09 mile per liter phosphate to resist changes in pH, and ethylenediaminetetraacetic acid is added in a concentration of 0.09% to prevent interference from zinc. The recovery of acrolein by this method was unaffected by pH in the 6.8-7.6 range and by zinc at 2.0 mg/l. Replicate analyses at concentrations of 0.1 and 0.3 mg/l acrolein in reagent water gave respective standard deviations of 7.2 and 4.1% and relative errors of 2.8 and 3.3%. Acrolein concentrations can also be determined by differential voltammetry at the glassy carbon electrode. Acrolein is measured indirectly by forming the acrolein-sulfite complex; unreacted sulfite is determined by measuring the oxidizing current at positive potentials in a buffer solution. This procedure's poor sensitivity makes it less attractive than the polarographic method. The effectiveness of sulfite in preserving acrolein could not be evaluated as attempts failed in quantitatively recovering acrolein at 0.5 mg/l in the presence of excess sulfite. The recommended differential pulse polarographic method is presented. (Wares-IPA)
W78-01883

BIOLOGICAL ELECTRODES SPECIFIC FOR PHOSPHATE AND NITRITE IONS,
New Orleans Univ., LA.
G. G. Guilbault.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 233, Price codes: A02 in paper copy, A01 in microfiche. Report no. EPA-600/4-76-034, October 1976. 7 p, 11 ref. 1BA027, R800359.

Descriptors: *Assays, Pollutant identification, *Electrodes, Enzymes, Ion exchange, Microenvironment, Biology, *Phosphates, Nitrates, *Chemical analysis, *Nitrites, Ions, *Biological electrodes, Alkaline phosphatase, Glucose oxidase.

Biological electrodes were developed for the selective analysis of phosphate and nitrite ions at microlevels. A phosphate electrode was constructed by using two enzymes, alkaline phosphatase and glucose oxidase, which were immobilized and mounted on the surface of the platinum electrode. The competitive inhibition of phosphate ion on alkaline phosphatase slows down the hydrolysis of glucose-6-phosphate to glucose, which is subsequently used by glucose oxidase as a substrate in the presence of molecular oxygen. The phosphate ion concentration in the reaction mixture was proportional to the oxygen consumption. The assay of nitrite in the range 10-4M-10-2M was accomplished with the use of nitrite reductase which catalyzes the reduction of nitrite into ammonia. Nitrite could be accurately determined with either soluble or immobilized enzyme using an air gap electrode as sensor. Preparations of benzidine phosphate and hexammino cobalt nitrate in silicone rubber for liquid ion exchange and triphenyltin electrode have been attempted, and results obtained were unsatisfactory due to their poor selectivity. (Wares-IPA)
W78-01885

NITRATE INTERFERENCE IN TOTAL KJELDAHL NITROGEN DETERMINATIONS AND ITS REMOVAL BY ANION EXCHANGE RESINS,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
A. Schlueter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 285, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-017, February 1977. 16 p, 6 tab, 11 ref. EHE625, R-802755-02.

Descriptors: *Chemical analysis, *Spectroscopy, *Sampling, *Nitrogen compounds, *Nitrogen, *Nitrates, Ammonia, *Anion exchange, Pollutant identification, *Kjeldahl nitrogen, Interference.

The interference of nitrate with the determination of total Kjeldahl nitrogen (TKN) was investigated to: (1) confirm the interference of nitrate in the Kjeldehl nitrogen determination; (2) understand the mechanism of the loss of nitrogen; and (3) find a simple, yet effective way to prevent the nitrate interference and enable accurate TKN determination of any sample. TKN losses of greater than 90% were observed in solutions containing a nitrate-nitrogen concentration 10 times greater than the TKN level. The loss was found by infrared spectroscopy to be occurring due to nitrate and ammonia decomposition to nitrous oxide at the elevated TKN digestion temperatures. Prevention of the nitrate interference in TKN analyses was possible only by removal of the nitrate prior to TKN analysis. Several anion exchange resins in the chloride form were effective in this removal. Samples containing known TKN levels and high nitrate concentration when treated by these resins prior to TKN analysis gave nearly 100% TKN recovery on TKN analysis. (Wares-IPA)
W78-01886

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Arthur D. Little, Inc., Cambridge, MA.
D. S. Allan, and G. H. Harris.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 655, Price codes: A10 in paper copy, A01 in microfiche. Final Report No. ADL-CG-D-117-76, October 1976. 208 p, 16 fig, 6 tab, 18 ref, 4 append. 4430, DOT-CG-24, 655-A.

Descriptors: Bodies of water, *Water pollution, *Hazards, *Information retrieval, *On-site investigations, *Accidents, Boats, Chemical analysis, Publications, Transportation, Basic data collections, On-site data collections, Coasts, Computer programs, *Hazard assessment, *Hazard response, Discharge(Chemical), Contingency planning.

Studies related to the major components of CHRIS, for use in U.S. Coast Guard control of transport of hazardous chemicals and response to accidents involving their discharge, are presented. CHRIS was designed to meet field analysis emergencies, by providing information on 400 hazardous chemicals, methods of predicting hazards resulting from their accidental discharge, and procedures for selecting and implementing appropriate responses to discharges. CHRIS is composed of four manuals (a condensed guide to hazardous chemicals, a hazardous chemical data manual, a hazard assessment handbook, and a response methods handbook), a regional contingency plan data base, and a hazard assessment computer system. Additional related work projects have included development of training courses for CHRIS users, a lecture set for describing CHRIS to nonusers, development of a CHRIS-like system applicable to chemical discharges from other transportation modes, identification and assessment of factors influencing method development to ameliorate hazardous effects of chemical discharges into water-bodies, and an inventory of equipment and agents currently available to the U.S. Coast Guard for responding to marine transportation fires. Additional chemical data sheets and hazard assessment models will be added to CHRIS during implementation and test phases. (Wares-IPA)
W78-01887

APPLIED POLAROGRAPHY FOR ANALYSIS OF ORDNANCE MATERIALS. PART 1. DETERMINATION AND MONITORING OF 1,2-PROPYLENEGLYCOLDINITRATE IN EFFLUENT WATER BY SINGLE-SWEEP POLAROGRAPHY,
Naval Weapons Center, China Lake, CA.
G. C. Whitnack, and W. J. Becktel.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 468, Price codes: A02 in paper copy, A01 in microfiche. Final Report No. NWC TP 5860, Part 1, June 1976. 20 p, 5 fig, 2 tab, 9 ref. Task Area SF57572301.

Descriptors: *Analysis, *Polarographic analysis, *Water pollution, *Water sampling, *Effluents, *Electrochemistry, *Water purification, Chromatography, *1 2-Propyleneglycoldinitrate, Ordnance material.

A rapid, specific, and unique polarographic method of analysis for 1,2-propyleneglycoldinitrate (PGDN) in effluent water is described. A 2-ml or larger aliquot water sample is placed in a quartz cell with mercury anode. The cathode is immersed in the sample in the cell, which is placed in the constant temperature device and brought to constant temperature. The cell solution is flushed with oxygen-free nitrogen, and the start potential of the single-sweep polarograph is set. After several sweeps, a polarogram is recorded with the X-Y recorder. The standard addition technique and recalculation or a previously calculated standard curve of waveheight vs PGDN concentration can be used to obtain a ratio of two recorded polarogram waveheights. A portable and inexpensive digital polarograph and monitoring system are described for field analysis of PGDN. The portable system was demonstrated by analysis of an effluent water sample obtained from a Navy carbon column cleanup process to remove the explosive from Otto Fuel wastewater. Data obtained by the polarographic method of analysis and field equipment developed for its application compared favorably with data obtained by a vapor-phase chromatographic method on the same samples of effluent water. The method is also recommended for analysis of other organic and inorganic pollutants in natural and effluent water. (Wares-IPA)
W78-01888

EFFECTS AND PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ.-Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5C.
W78-01906

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY,
Texas A and M Univ., Galveston. Dept. of Marine Sciences.
R. J. Scrudato, B. F. Henningsen, and E. L. Estes.
The Texas Journal of Science, Vol. 27, No. 4, p. 419-426, December, 1976. 2 fig, 5 tab, 5 ref. NOAA R/E-7.

Descriptors: *Trace elements, *Metals, Aquatic animals, Estuaries, Rivers, Texas, Lead, Copper, Chromium, Zinc, Cadmium, Oysters, Crabs, Shrimp, *Sabine Lake(TX), Sabine River(TX), Neches River(TX), Crassostrea virginica, Callinectes sapidus, Peneus setiferus.

A study of trace metal concentratins (cadmium, chromium, copper, lead, and zinc) in selected macrofauna in Sabine Lake, Texas, was conducted from 1971 to 1973. The trace metals are known to be discharged into the Sabine and Neches rivers, which drain into Sabine Lake. River waters are used for processing and cooling by upstream petrochemical industries, and sewage is also discharged into the rivers. Sabine Lake is a shallow (2 m average depth) estuary along the Texas-Louisiana border which is connected to the Gulf of Mexico by a narrow tidal inlet. The Lake is 24 km long by 10 km wide. Trace metal concentrations were studied in oysters (Crassostrea virginica), blue crabs (Callinectes sapidus), and shrimp (Peneus setiferus). Results of the study show that lake macrofauna are accumulating trace metals above concentration levels found in associated waters. Trace metal concentrations found do not appear to greatly exceed the limits set by the Texas Water Quality Board. Zinc concentrations range from 21.7 ppm to 1367.9 ppm, copper from 0.1 to 157.6 ppm, cadmium from 0.4 to 4.0 ppm, chromium from 0.1 to 3.7 ppm, and lead from <0.1 to 22.0. A significant difference in metal concentrations was found between 1971-72 and 1973, in particular for lead in Callinectes sapidus (1.2-22 ppm vs <0.1 ppm). 1973 was unusually rainy (198 cm) and this 50% increase in rainfall may have diluted the lake waters and caused the decreased lead concentrations. (Lynch-Wisconsin)
W78-01911

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-01915

BARIUM BUILD-UP IN THE TEIGN ESTUARY,
Southampton Univ. (England). Dept. of Geology.
J. R. Merefield.
Marine Pollution Bulletin, Vol. 7, No. 11, p. 214-216, November, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Barium, *Estuaries, Sediments, Rivers, Mine wastes, Heavy metals, Mining, Saline water-freshwater interfaces, Mixing, Water pollution sources.
Identifiers: *Teign Estuary(England), Teign River(England), Barytes.

Analysis of sediments in the River Teign of southwest England showed two abnormally rich areas of barium concentration. The first, in the freshwater Middle Teign River adjacent to streams traversing a former mining area, registered a peak value of 34,052 ppm. The second is located in the freshwater saltwater mixing zone of the Teign Estuary, to the seaward side of the normal tidal limit; the high concentration was 6,919 ppm. Most barium in Teign sediments was present as barytes (BASO4) derived from the orefield of the Middle Teign Valley, an area of mineralization scattered with mine dumps. The highest percentage-frequency of barytes relative to total heavy minerals was 41% for the river, and 25% for the estuary. Barium build-up in the upper Teign Estuary seems to be caused by (1) the mineralization-mine dump area 12.8 km from the estuary; (2) mechanical abrasion during transportation; (3) the tidal salt-barrier at the head of the estuary; (4) heavy mineral selection during sediment sorting; and (5) barium transportation in ionic solution and co-precipitation. Estuarine values decreasing toward the mouth suggest that build-up of deposits away from the upper estuary is unlikely. Tidal scour carrying barytes seaward plus the net influx of landward-drifting sediments tends to dilute any potential contribution from barium concentrations at the salt/freshwater interface. It seems likely that barium enrichment in the upper estuary will continue. (Lynch-Wisconsin)
W78-01933

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, MA.
T. J. Lawson, and G. D. Grice.
Bulletin of Marine Science, Vol 27, No 1, p 80-84, 1977. 2 fig, 2 tab, 9 ref. NSF GX-42580.

Descriptors: *Zooplankton, *Sampling, Research equipment, Methodology, Canada, Testing procedures.
Identifiers: *Controlled Experimental Ecosystem, CEPEX program, Saanich Inlet(British Columbia).

In CEPEX program water pollution experiments water columns were entrapped in large plastic bags (controlled experimental ecosystem enclosures or CEEs. Because it was possible to count an entire population from a CEE once an experiment was completed, these enclosures offered a unique opportunity for examining/sampling accuracy under conditions approximating those in the field. Zooplankton sampling techniques were evaluated for sampling variance in a CEE, sample densities vs. those in the CEEs, and the comparability of sampling estimates from different CEEs. A 0.25-scale CEE in Saanich Inlet, B.C., Canada was sampled in two experiments in May-June 1974. A modified Bongo net (202-micron aperture) without closing mechanism was used for collecting samples vertically integrated from 14 m to the surface. A schindler trap was also used, with 202-micron netting, for collecting discrete samples from just below the surface, from 7 m, and from 14 m. Each net filtered about 0.7% of the volume of the CEE. Replication consisted of four vertical net hauls and four trap collections from each of the three discrete sampling depths. Of the four types of samples collected, Bongo hauls and, to a lesser extent, 7-m trap collections were the most precise and accurate. A two- to three-fold change in population estimates would be sufficient to detect pollution effects on density in the CEEs, and population changes in several CEEs are comparable using vertically integrated Bongo hauls. (Lynch-Wisconsin)
W78-01941

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY,
Old Dominion Univ. Research Foundation, Norfolk, VA.
P. Fleischer, T. A. Gosink, W. J. Hanna, J. C. Ludwick, and D. E. Bowker.

Report to NASA Langley Research Center, August 1976. 125 p, 19 fig, 8 tab, 8 ref, 8 append. CR-148803, NAS5h21816.

Descriptors: *Estuaries, *Chesapeake Bay, *Remote sensing, *Satellites(Artificial), Synoptic analysis, Maps, Mapping, Chlorophyll, Attenuation, Suspended solids, Sediments, Tides, Tidal effects, Bays.
Identifiers: *LANDSAT-1, Multispectral scanning(MSS).

Synoptic monitoring of large estuaries is useful for determining circulation patterns, sedimentation, and spatial-temporal productivity. As monitoring of large estuaries is difficult to accomplish by conventional methods, this study was designed to determine which water parameters could be correlated to images produced by the LANDSAT-1 satellite and to test the feasibility of constructing synoptic water-parameter maps from the images. LANDSAT-1 has a 4-band multispectral scanner (MSS); its cycle is short enough (18 days) to monitor seasonal or shorter variations, and its 185 x 185 km image area is sufficiently large to encompass even large estuaries in a single image. The lower Chesapeake Bay-James River system was chosen as the study area. Two principal water characteristics, productivity and suspended material, were selected for correlation with the LANDSAT-1 images. Chlorophyll, particulate counts, attenuation coefficients, and suspended matter were measured over one year using helicopters and baseline transects obtained by surface vessel. Bands 5 and 6 of the multispecrral scanner were found to be useful for monitoring total particles, although daily calibration was required. Band 5 had a high correlation with sediment. Attenuation coefficient monitored continuously by ship along three baselines were cross-correlated with radiance values. Evidence for tidal effects was obtained by improved correlations when the ship data was adjusted to 'tidal time'. A contouring program was developed to display a synoptic map of suspended sediment concentration for one overpass. (Lynch-Wisconsin)
W78-01946

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
K. W. Thornton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 819, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-7, December 1976, 73 p, 5 fig, 5 tab, 44 ref, 1 append.

Descriptors: *Dissolved oxygen, *Artificial lakes, Dams, Maine, Lakes, Forecasting, Reservoirs, New England, Flood control, Recreation.
Identifiers: *Dickey Lake(ME), Saint Joan River(ME).

Dickey Lake, a projected impoundment on the Saint John River in northern Maine has been proposed by the U.S. Army Engineer Division, New England. For the purposes of providing peaking power generation (including pumpback operation), flood control, and recreation. The lake would extend 75 km upstream behind a 102.1-m-high dam. If constructed, the lake would be second only to Lake Champlain as the largest and deepest lake in New England. This report is a preliminary evaluation of the dissolved oxygen (DO) regime that might be expected in the proposed lake. Based on a comparison of DO profiles in 25 lakes located in Maine, Vermont, New York, and Quebec, Canada, Dickey Lake is presented to be a dimictic, holomictic lake that will freeze over in winter. During the filling period the reservoir may become meromictic, but is expected to be holomictic after pumpback operations begin. By the second year after complete filling, the lake should have 5 mg/l of DO in the hypolimnion. The DO after stabilization of the lake (6-9 years) is expected to be near saturation in the epilimnion, and at or above 6 mg/l in the hypolimnion at the end of the summer stratification period. The DO may be lower in the coves and embayments, depending on mesoclimatological events. DO contents approaching 2 mg/l may be expected at isolated times in the hypolimnion of the shallower coves. (Lynch-Wisconsin)
W78-01947

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01954

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS,
Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health.
C. Faget, N. M. Trieff, and G. J. Songer.
The Texas Journal of Science, Vol 27, No 4, p 465-475, December, 1976. 1 fig, 10 tab, 6 ref.

Descriptors: *Water quality, *Baseline studies, Texas, Water temperature, Runoff, Coliforms, Nutrients, Sewage, Industrial wastes, Recreation, Bayous, Algae, Dissolved oxygen.
Identifiers: *Dickinson Bayou(TX).

Water quality baseline data for Dickinson Bayou, Texas were gathered at three sampling sites during the summer of 1972. This slow-moving bayou flows 20-25 mi from its source north of Alvin to Dickinson Bay. It is 8-10 feet deep in Dickinson, and ranges from 25-60 yards in width. Agricultural runoff, and discharge from 60 septic tanks, five sewage treatment plants and one industry contaminate the bayou. Indicators studied were nitrite, nitrate, orthophosphate, pH, temperature, chemical oxygen demand (COD), biochemical oxygen demand (BOD), dissolved oxygen (DO), coliform MPN, fecal coliform MPN, and presence of Salmonella or Shigella. Water temperature in the summer averages 28C. Results show that pollution exists to a certain extent at all sampling sites. Domestic sewage and land runoff account for high nutrient concentrations and sewage-associated bacteria. Coliform MPN averages 3480-7110/100 ml and indicates pollution from untreated sewage. Fecal coliform MPN averages 1190-2380/100 ml. Elevated COD (average of 102.2-230.3 mg/l) points to the presence of nonbiodegradable wastes, perhaps industrial, and there is potential for eutrophication. The pH is well within normal limits. DO readings vary greatly from day to day and by site; a fish kill of shiners on 31 July at Site 2 is attributed to a low DO level of 0.5 mg/l. Occasionally algal growth will supersaturate the water with DO. (Lynch-Wisconsin)
W78-01962

CHEMICAL-PHYSICAL AND BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THE CUYAHOGA RIVER (1973-1974),
Akron Univ., OH. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-01964

DETERMINATION OF SAMPLING STRATEGY FOR BENTHIC MACROPHYTES IN POLLUTED AND UNPOLLUTED COASTAL AREAS,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston, R. S. Lloyd, and M. S. Zimmerman.
Bulletin of Marine Science, Vol. 26, No. 4, p 569-575, 1976. 2 fig, 2 tab, 9 ref. EPA R-803339.

Descriptors: *Sampling, *Benthic flora, Water pollution, Bays, Gulf of Mexico, Data collections, Biomass, Aquatic plants, Algae, On-site data collections, Bottom sampling.
Identifiers: Apalachee Bay(Fla), Macrophytes, Seagrass.

A series of repetitive samples of benthic macrophytes was used to determine the adequacy of various sampling strategies. Plants were collected at 14 stations in Apalachee Bay (Fla.) on the Gulf of Mexico. Two study areas were involved, one at the mouth of the unpolluted Econfina River, and one at the mouth of the adjacent Fenholloway River, contaminated by kraft mill effluents. Each station was located so as to represent a broad system, such as a grass bed or mud flat. Samples were taken between February 1974 and June 1975 by means of aluminum hoops 0.25 x 0.25 m dropped randomly into 10 x 15 m areas. Seagrasses and algae within each hoop were gathered by divers. A sample was composed of a series of 16 subsamples (0.25 sq m) taken at each station; at one station 40 subsamples (0.25 sq m) were taken. Total dry weight of the whole plant for each species was determined and recorded by station; relative dominance was computed for each station based on previous data. Using confidence limits, the number of subsamples needed to attain a given percentage of the true mean of biomass of each species was determined. A computer program was developed to determine the number of subsamples needed to achieve various levels of species accumulation. It was found that only a few subsamples were needed to determine the biomass of dominant species, while less common species required more sampling. For species determination, stations with low species diversity and reduced biomass required more samples. (Lynch-Wisconsin)
W78-01967

LAKE TAHOE GEOCHEMICAL STUDY. 1. LAKE CHEMISTRY AND TRITIUM MIXING STUDY,
Scripps Institution of Oceanography, La Jolla, CA.
D. M. Imboden, R. F. Weiss, H. Craig, R. L. Michel, and C. R. Goldman.
Limnology and Oceanography, Vol. 22, No. 6, p 1039-1051, November 1977. 4 fig, 4 tab, 38 ref. NSF 29952.

Descriptors: *Geochemistry, *Lakes, *Water chemistry, *Tritium, *Chemical properties, Limnology, Stratification, Chemical analysis, Analytical techniques, Radioactivity, Temperature, Dissolved oxygen, Nitrates, Water quality, Nutrients, Mixing, Hydrogen ion concentration.
Identifiers: *Lake Tahoe, *Tritium mixing study, *Lake chemistry, Reversing thermometers.

The study of vertical mixing in Lake Tahoe by temperature and oxygen measurements was limited to the top layer of the lake, since vertical gradients are extremely small at greater depth. Below 200 m, the temperature gradient is about -0.00016 C/m, with little or no seasonal variation. A tritium profile was taken at a midlake station in 1973 together with samples for measurements on lake chemistry. Oxygen, nitrate, total inorganic carbon, and pH showed the effects of Photosynthetic activity to a depth of about 80 m, well below the thermocline; average planktonic composition was calculated from the data. Silicate and carbonate alkalinity profiles were essentially uniform, showing that biological removal is negligible in comparison to the rate of vertical mixing. Essentially no variation in tritium concentration with depth was observed. Tritium measurements and input estimates in Crater Lake were used to calculate tritium concentration in Lake Tahoe between 1954 and 1973 and to estimate a ratio in tritium input of 32% precipitation to 68% vapor exchange. The tritium profile gives strong evidence for at least occasional complete mixing of Lake Tahoe. The last complete mixing may have occurred in March 1973, and at least one other such event took place between 1964 and 1968. (Henley-ISWS)
W78-01978

THE TREATMENT AND ANALYSIS OF CYANIDE WASTEWATER,
Thiokol Corp., Brigham City, UT. Wasatch Div.
For primary bibliographic entry see Field 5D.
W78-02021

THE APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO WASTE WATER ANALYSES USING THE DETERMINATION OF LOW VOLATILITY PETROLEUM-HYDROCARBON COMPOUNDS AS AN EXAMPLE (DIE ANWENDUNG DER DUENNSCHICHT-CHROMATOGRAPHIE IN DER ABWASSERANALYTIK AM BEISPEIL DER BESTIMMUNG SCHWERFLUECHTIGER MINERALOEL-KOHLENWASSERSTOFFE),
Stadt Cologne (West Germany). Abwasserlaboratorium.
H. G. Goebgen, and J. Brockmann.
Vom Wasser, Vol. 48, p 167-178, 1977. 3 fig, 14 ref.

Descriptors: *Water analysis, *Chromatography, *Laboratory tests, *Oil wastes, *Organic compounds, Industrial wastes, Chemical analysis, Analytical techniques, Waste water treatment, *Pollutant identification, Thin-layer chromatography.

A thin-layer chromatographic method has been developed for the determination of higher boiling-point petroleum components, such as paraffins and napthenes, which have been extracted from sewage and industrial effluents with carbon tetrachloride. Details of the method and its limitations are presented. The presence of other extractable components such as vegetable oils and fats, additives, surfactants, aromatics, and sulfides should not interfere with determinations. The method should provide a rapid, simple, inexpensive means of identifying fuel oil, light lubricating oil, and other heavier oils in waste water. (Schulz-FIRL)
W78-02030

TREATING THE WATER FOR WATNEY'S.
Water and Waste Treatment, Vol 20, No 9, p 48, September, 1977.

Descriptors: Equipment, *Monitoring, Water analysis, *Industrial water, Food processing industry, Hydrogen ion concentration, Analytical techniques, Pollutant identification.

The quantity and quality of water used in the brewing processes as Watney Brewery in Mortlake, England, are being monitored with analytical equipment supplied by Electronic Instruments Ltd., a member of the George Kent Group. The 40,000 gal/hr of raw water used at the Watney Brewery is analyzed with 98 instruments to measure and control the pH at a level of 6.0-6.5. Boiler make-up water used for power generation is mixed with the returning condensate, requiring readjustment of the pH to 9.5-10.0. Temperatures in the five fermenters are measured and controlled with Clearspan P130L instruments which are provided by Foster Cambridge Ltd. The heat exchanger outlet is controlled with three Clearway instruments, and flow measuring devices were provided by Kent Instruments Ltd. (Schulz-FIRL)
W78-02046

MONITORING PLANT EFFLUENT WITH OPEN-CHANNEL FLOW METER,
Vulcan Mold and Iron Co., Trenton, MI.
L. Laux, and M. Neff.
Instruments and Control Systems, Vol. 50, No. 11, p 82, 84, November, 1977. 4 fig.

Descriptors: *Flow measurement, *Flowmeters, *Gaging stations, *Flow rates, Equipment, Industrial wastes, Flow characteristics, Waste water treatment.

Flow measurement was instituted at the Vulcan Mold and Iron Company in Trenton, Michigan, to comply with regulations imposed by the State of Michigan Department of Natural Resources. A mechanical recording American Meter open channel flowmeter system was installed at an 18 inch concentrate pipe which leads to the company's holding pond. A fiberglass Parshall flume restricts the flow in the pipe so that fluid level is a measure of flow rate. A bubbler system, which operates with nitrogen gas, and a circular chart instrument are used to record the liquid level. The American Meter System is used to record flow from the holding pond for a 24-hr period each week. Average flow rates which have been observed with the metering system have been in the range of 50 gpm, while the system is effective over the 0-200 gpm range. (Schulz-FIRL)
W78-02054

AN EXAMPLE FROM THE WESER: CHANGES IN THE BLOOD COUNT OF FISH EXPOSED TO HIGHER CONCENTRATIONS OF POTASSIUM (AM BEISPIEL DER WESER: VERAENDERUNGEN IM BLUTBILD DER FISCHE BEI HOEHEREN KALIUMKONZENTRATIONEN),
E. Halsband.
Wasser, Luft und Betrieb, Vol. 21, No. 10, p 548-551, 1977. 7 fig, 1 tab, 14 ref.

Descriptors: Environmental effects, *Potassium, *Bioassay, *Absorption, *Pollutant identification, Toxicity, Fish physiology, Freshwater fish, Water pollution sources, Rivers, Foreign countries, Path of pollutants, Industrial wastes, Waste water disposal, *Weser River(West Germany).

A massive fishkill in West Germany in August 1976 prefaced this investigation into the effects of high potassium concentrations on the blood count of fish collected downstream from a nuclear power plant. Three species of fish, including breams, chubs, and roaches, were collected at seven stations along the Weser River. Parameters measured included hematocrit, erythrocyte count, mean corpuscular volume, hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and the potassium content. The survey indicated that the major source of spent caustic potash in the Weser River was the Werra, a Tributary to the Weser. Analyses revealed that potassium levels in chubs were as much as 540% higher than normal. Current appeals are being directed to East German officials to provide more control over the amount of spent caustic potash discharged to the Werra and Weser Rivers. (Schulz-FIRL)
W78-02063

DAMAGING ACTION OF WATER POLLUTANTS TO DAPHNIA MAGNA (BEFUNDE DER SCHADWIRKUNG WASSERGEFAEHRDENDER STOFFE GEGEN DAPHNIA MAGNA),
Vienna Univ. (Austria), Inst. fuer Analytisches Chemie.
For primary bibliographic entry see Field 5C.
W78-02067

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

A WASTEWATER TREATMENT STUDY FOR SKOKOMISH SALMON PROCESSING PLANT,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
For primary bibliographic entry see Field 5D.
W78-02071

WASTE TREATMENT FOR SMALL MEAT AND POULTRY PLANTS,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Food and Wood Products Branch.
For primary bibliographic entry see Field 5D.
W78-02087

EVALUATING AND TREATING POULTRY PROCESSING WASTEWATER,
Richard B. Russell Agricultural Research Center, Athens, GA.
For primary bibliographic entry see Field 5D.
W78-02088

ANALYTICAL VARIABILITY OF FIVE WASTEWATER PARAMETERS - PETROLEUM REFINING INDUSTRY,
Robert S. Kerr Environmental Research Lab., Ada, OK.
L. H. Myers, T. E. Short, Jr, B. L. DePrater, and F. M. Pfeffer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 652, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-234, September 1976. 67 p, 11 fig, 15 tab, 3 ref, 2 append.

Descriptors: *Analytical techniques, *Chemical analysis, *Oil wastes, *Statistical methods, *Water analysis, Chemical oxygen demand, Suspended solids, Phenols, Oily water, Industrial wastes, Waste water treatment, Analytical error.

A laboratory analysis exercise was conducted by Environmental Protection Agency, industrial, and state agency laboratories to evaluate the repeatability (intralaboratory deviation) and the reproducibility (interlaboratory deviation) in the analysis of waste water obtained from the petroleum refining industry. Samples obtained from the final clarifier effluent at a petroleum refinery activated sludge plant and from the discharge of an American Petroleum Institute separator were sent to 12 laboratories to be analyzed for chemical oxygen demand, suspended solids, ammonia nitrogen, phenolics, and oil and grease. The interlaboratory standard deviations for COD, suspended solids, ammonia, phenolics, and oil and grease were 15.0, 5.2, 0.9, 0.8, and 2.9 mg/liter, respectively. The intralaboratory deviations were 9.5, 1.8, 0.1, 0.2, and 2.3 mg/liter, respectively. Mean values were 134 mg/liter for COD, 19.1 for suspended solids, 8.5 for ammonia, 5.5 for phenolics, and 11 for oil and grease. A summary of a seminar designed to eliminate sources of error and to review analytical procedures in a stepwise manner is presented. (Schulz-FIRL)
W78-02092

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT).
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-02106

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, AND MANGANESE CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA, (IN JAPANESE),
Okayama Univ. (Japan). Inst. of Agricultural and Biological Science.
For primary bibliographic entry see Field 5B.
W78-02151

CLEANING SYSTEM FOR A CONTINUOUS SENSING OIL-IN-WATER MONITOR,
Dresser Industries, Inc., Dallas, TX. (Assignee).
L. R. Louden, C. A. Blessington, and J. L. Beatty.

U.S. Patent No. 4,034,219, 8 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 403, July 5, 1977.

Descriptors: *Patents, *Water pollution control, *Monitoring, Measurement, Cleaning, *Oil pollution, *Pollutant identification, Oil-in-water monitoring systems.

An oil-in-water monitoring system uses an energy source such as ultra-violet light directed into a sample cell or tube to detect the presence of oil and/or other fluorescing products in the water being monitored. This invention provides a system for keeping the sample cell clean. Sample cells of oil-in-water monitoring equipment have a tencency to become coated and cause inaccurate readings. A source of cleaning solution is provided and means are provided for transmitting the cleaning solution to the sample cell in place of the sample fluid for selected periods at selected intervals. The valve means which channels the cleaning solution may be operated manually or by a programmable device. (Sinha-OEIS)
W78-02155

AERIAL MONITORING EXPERIENCE,
Environmental Protection Agency, Edison, NJ. Region II.
P. F. Nixon.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 6-9.

Descriptors: *Remote sensing, *Aerial photography, Aircraft, Monitoring, New Jersey, Virgin Islands, Water quality, Legal aspects, Regulation, Water quality control, Land use, Water pollution control, Infrared radiation, Helicopters, Enforcement.

Aerial monitoring, which combines sampling and remote sensing, is only in the formation state in EPA's Region II. Two missions have been flown to date; preliminary data indicate that IR imagery is adequate for measuring surface temperature and the size of thermal plumes. Photographs from both high- and low-altitude missions were found in NASA-Houston archives, but extreme difficulty was encountered in procuring copies. The photographs showed that even high-altitude missions were valuable for land use documentation and detection of current patterns in tidal waters, and that normal or infrared-sensitive color photography should be used in addition to thermal infrared imagery. A multispectral approach is preferable to any single technique. Use of a helicopter in a 1971 legal action against New Jersey coastal municipalities reduced survey costs by half and the number of samples required by a third. Collection-to-report turnaround was also reduced by half, and sampling manpower was reduced from eight to two. Aerial photographs were admitted as evidence. (Lynch-Wisconsin)
W78-02167

CONTINUOUS MONITORING BB ION SELECTIVE ELECTRODES,
Pittsburg Univ., PA. Graduate School of Public Health.
J. B. Andelman.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973. Section IV, p 27-37. 1 fig, 4 tab, 5 ref.

Descriptors: *Monitoring, *Water quality, Pollutants, Water pollution, Instrumentation, On-site data collections, *Pollutant identification, *Sensors, *Electrochemical sensors, *Ion-selective electrodes, Potentiometric sensors, Continuous monitoring.

Ion-selective electrodes, used increasingly for analyzing water and waste water samples, can determine fluoride, chloride, sodium, ammonia, nitrate, calcium, total hardness, sulfide, and cyanide and other parameters. Although used mostly for single samples, ion-selective electrodes can also monitor continuously. Certain limitations must be considered, however, including interferences, the need for pH adjustment, and reference electrode instability. To improve measurement capabilities, additions have been made of pH buffers, salt solutions to control ionic strength, chelators to negate the effects of interfering metals, and ion indicators. Orion Research, Inc. has made several ion-selective electrode monitoring systems available in their 1000 series. A table lists these systems and their characteristics. They use reagent addition techniques to reduce electrode and method interference and control ionic strength, and incorporate ion-selective electrodes such as sodium as reference electrodes to reduce potential drift. They also provide filtration of the sample stream to remove suspended solids, and have temperature control and automatic periodic standardization. (Lynch-Wisconsin)
W78-02168

LIDAR FOR REMOTE MONITORING,
National Environmental Research Center, Las Vegas, NV.
S. R. Melfi.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Sect. I, p 39-43, 3 fig.

Descriptors: *Remote sensing, *Air pollution, *Aerosols, Monitoring, Electromagnetic waves, Pollutants, Path of pollutants, Instrumentation, Data collections, *Pollutant identification, *LIDAR, Lasers.

LIDAR, an acronym for Light Detection and Ranging, provides range-resolved measurement of scattered electromagnetic radiation utilizing a pulsed laser as the source of an optical telescope as the receiver. A system is being developed by the National Environmental Research Center in Las Vegas (NERC-Las Vegas) to use LIDAR to assess meterological and topographical effects on dispersion of pollutants. The LIDAR system is mounted in an aircraft, and the pulse of laser energy interacts with molecules and aerosols as it propagates down from the aircraft. Some of the energy is scatteredd back toward the telescope. Analyzing the signal as a function of time provides a range-resolved indication of aerosol or particulate concentration; the data is presented to a TV monitor resulting in a display of the aerosol mixing. Analog data are also digitized by the ADC and stored on magnetic tape. (Lynch-Wisconsin)
W78-02169

ENVIRONMENTAL KEYS FOR OIL AND HAZARDOUS MATERIALS,
McDonnell Aircraft Co., St. Louis, MO.
C. L. Rudder, and C. J. Reinheimer.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section VI, p 34-46. 12 fig. EPA 68-10-0140 and 68-01-0178.

Descriptors: *Remote sensing, *Oil spills, *Aerial photography, Methodology, Oil pollution, Oil industry, Water pollution, *Pollutant identification, Imagery keys, Imagery.

The design of imagery interpretation keys and their usefulness in extracting information from airborne remote sensor systems is described in a paper that details the application of such a key to oil spill detection. An imagery interpretation key for an aerial photograph of a titanium plant could, for example, take the form of photographic views of each type of facility involved and a chemical flowchart of the operation giving origins and destinations of products and wastes. The interpreter then employs 'deductive analysis' to trace outfall content back to its source. In the absence of such a key, only 'direct analysis' is possible, in which simple geometries and contrasts are evaluated to arrive at conclusions. Thermal imagery from infrared radiation provides additional remote sensing information. A properly constructed key allows combination of photographic and thermal imagery for identification of heat-emitting materials. Multispectral scanner imagery similarly requires knowledge of spectral signatures for interpretation. For development of the McDonnell Aerial Spill Detection Key for Petroleum Refineries, a cartographic camera, multi-band camera array, and low-performance commercial aircraft were used to collect data. Diagrams and photographs are presented to illustrate this key, and a description of its use is given. (Lynch-Wisconsin)
W78-02170

DETECTION OF DISSOLVED OXYGEN IN WATER THROUGH REMOTE SENSING TECHNIQUES,
Environmental Protection Agency, Denver, CO.
A. W. Dybdahl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price code s: A99 in paper copy, A01 in microfiche. In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section VIII, p 48-66. 5 fig, 3 ref.

Descriptors: *Dissolved oxygen, *Remote sensing, *Aerial photography, Water quality, Films, Filters, Cameras, Monitoring, Eutrophication, Trophic level, *Pollutant identification, Densitometers.

A KS-87B aerial framing camera with Kodak 2443 false color infrared film and a Wratten 16 orange gelatin filter were used to develop a photographic technique for measuring dissolved oxygen (DO) content of bodies of water. Aerial color photographs of water. Aerial color photographs of water saturated with DO taken from an aircraft at 1/4 to 1/3 f-stop below normal exposure showed as a bright blue, while septic waters (those having near-zero DO) appeared virtually black. Graduations of blue/black were found for intermediate waters. The usual EA-5 chemicals and procedures were used in film development. Ground-truth data confirmed the aerial observations. A Macbeth TD-203AM Transmission Densitometer was used to measure the exposed film, and a curve was generated relating degree of DO concentration to the blue-black/black-black linear progression. This DO remote sensing technique has an accuracy of plus or minus 1 ppm. Interferences which must be considered include under- or over-exposure of the film, lens fall-off, and water discoloration due to turbidity, suspended solids, or industrial wastes. (Lynch-Wisconsin)
W78-02171

SCOPE OF RESEARCH NEEDS,
Environmental Protection Agency, Denver, CO.

LIBRARY OF THE MARINE BIOLOGICAL LABORATORY

For primary bibliographic entry see Field 5G.
W78-02172

SINGLE WAVELENGTH FLUORESCENCE EXCITATION FOR ON-SITE OIL SPILL IDENTIFICATION,
J. R. Jadamec.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section VI, p 1-20, 10 fig, 1 tab, 7 ref.

Descriptors: *Oil, *Oil spills, *Fluorescence, *On-site investigations, Spectroscopy, Spectrophotometry, Pollutants, Water pollution, Instrumentation, *Pollutant identification.

Identification and 'fingerprinting' (analysis of the main characteristic of an oil without deffraction) of oils by fluorescent techniques directly in the field at the site of a spill appears feasible according to a study in which a single fixed excitation wavelength (254 nm) was used to generate characteristic fluorescence spectra. Spectra were obtained with a Perkin-Elmer MPF-3 Fluorescence Spectrophotometer, equipped with a 150-w xenon lamp, and model QPD-33 recorder. All spectra were recorded at fixed excitation and emission spectral band widths of 34 and 1.5 nm, respectively. Sixteen crude and refined petroleum oils were tested. A table lists the major and minor fluorescent responses for each oil; this data can be used to index oils as a function of fluorescence peak responses when a constant excitation energy is used. In cases where oils have similar peak responses, the use of peak ratios may be of value. Sample preparation and short-term weathering of oils do not significantly affect the fluorescence fingerprint of an oil. (Lynch-Wisconsin)
W78-02173

REMOTE MONITORING IN REGION VI,
Environmental Protection Agency, Dallas, TX. Region VI.
R. Lozano.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 21-22.

Descriptors: *Remote sensing, *Monitoring, *Oil spills, *Aerial photography, Thermal pollution, Louisiana, Texas, Gulf coastal plain, *Pollutant identification.

In EPA's Region VI remote monitoring has been used primarily for surveillance and analysis, and hazardous materials control; geographically it has been limited to coastal zones, off-shore waters, and rivers. No comprehensive monitoring measurement systems have been developed. Remote sensing was used in the fall of 1970 to monitor thermal discharge from a power plant on Trinity Bay (TX). In 1970-71 an oil-drilling platform off the Louisiana coast burned and spilled oil; thermal infrared aerial photographs were taken of the spill. In the fall of 1972, 624,000 gallons of diesel oil were spilled from a San Antonio (TX) power plant, and seeped through the subsurface into the San Antonio River. Although invisible to the unaided eye, the oil was successfully photographed using a 35 mm camera equipped with a Wratten 39 UV filter and fake infrared film. Color aerial photography was used for an oil spill in the Atchafalaya River Basin (LA) in July 1973, in an area accessible only by air. Following a flood stage of the Mississippi River, 104 leaks and discharges from waste treatment pits were located and described by means of color and black-and-white aerial photography. Remote monitoring is planned for about 12 of an expected 70 major oil spills in 1974. Remote thermal mapping and multispectral scanner use are projected. (Lynch-Wisconsin)
W78-02174

REGION III'S REPRESENTATIVE REPORT,
Environmental Protection Agency, Philadelphia, PA. Region III.
E. H. Cohen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 10-14.

Descriptors: *Remote sensing, *Pollution abatement, Monitoring, Air pollution, Water pollution control, Water quality control, *Pollutant identification.

Because of regional limitations, federal assistance is needed for such costly programs as aerial surveillance and photo-interpretation. Use of portable remote sensing instruments would help eliminate the wasted time, expense, hostility, and anxieties which result from court orders for on-site investigations of suspected polluters. Region III suffers from a wide variety of environmental problems including acid mine drainage, oil spills, ocean dumping, municipal and industrial sludge disposal, farm runoff, oil refining, power plants, heavy industry pollution, automotive emissions, and urban solid waste disposal. Internally Region III has encouraged further development of advanced sensors to meet needs for remote air and water pollution monitoring. Currently, low-light image intensifiers are used for visual measurements of air pollution. The needs of various programs are listed. (Lynch-Wisconsin)
W78-02175

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5G.
W78-02176

REGION IV ENVIRONMENTAL MONITORING EQUIPMENT,
Environmental Protection Agency, Atlanta, GA. Region IV.
E. P. Lomasney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 15-17.

Descriptors: *Southeast U.S., *Monitoring, *Pollution abatement, Water quality control, Water pollution control, Remote sensing, *Pollutant identification, Earth Resources Technology Satellite(ERTS).

In the eight states of the Southeast Region (EPA's Region IV) the diversity of land usage, abundance of dammed freshwater lakes, and the proximity of the Gulf of Mexico and Atlantic Ocean have created conditions which can be adequately monitored only through remote sensing. Areas of most pressing concerning are pesticide control, agricultural runoff, thermal pollution, eutrophication, disinfection, and nutrients. Perhaps the most serious problem is contamination and destruction of estuaries through industrial expansion and dredging for landfill. Aerial photography, utilizing the visual, infrared, and ultraviolet spectra, has primising applications to these problems. Data from the Earth Resources Observation Systems and Earth Resources Technology Satellite (ERTS) programs should be employed. Although some ERTS photographs of the region have been received, there is a lack of information on monitoring activities being conducted in the region. (Lynch-Wisconsin).
W78-02177

REMARKS, REGION IX,
Environmental Protection Agency, San Francisco, CA. Region IX.
D. Longwell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 29-31.

Descriptors: *Southwest U.S., *Remote sensing, Aerial photography, Sediments, California, Water pollution control, Nevada, Thermal pollution, *Pollutant identification, Plumes.

The Pacific Southwest Region (IX) of EPA includes Arizona, California, Hawaii, Nevada, American Samoa, Guam, and the Pacific Islands Trust Territory. Due to the complex topography and associated environmental problems, remote sensing techniques have great application in the region. An ongoing study of Lake Tahoe is using remote sensing to detect algal growth and sediment plumes. Photographic and thermal infrared imagery were used for an extensive aerial survey of the San Francisco Bay area to identify outfalls. Aerial photographs taken at Moss Landing (CA) and in the Los Angeles area documented sediment plumes for enforcement purposes. Current aerial photography missions include a survey of oil fields in the Bakersfield (CA) area, and a survey of the Las Vegas-Lake Mead vicinity to aid in siting sampling stations. (Lynch-Wisconsin).
W78-02178

REMARKS, REGION VIII,
Environmental Protection Agency, Denver, CO. Region VIII.
R. W. Fitch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 26-28.

Descriptors: *Rocky Mountain region, *Seepage, Brines, Water quality, Water pollution, Salinity, Remote sensing, *Pollutant identification, Non-point pollution, Saline seepage.

Region VIII (EPA), which includes Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, three specific areas which need more attention in terms of remote monitoring are saline seeps, nonpoint pollution, and recycled water. Saline seeps, which destroy more land than coal strip mining, have a white crusty appearance when they appear on the ground surface. They tend to be circular and occupy about 1/2 acre. Plant growth in and around them is affected. Region VIII is heavily irrigated, and agricultural chemicals are widely used. Nonpoint pollution problems, including salinity increases in streams and utlimately in the Colorado River, might possibly be monitored by remote sensing techniques. Remote monitoring could also be used for feedlot censuses, assessing the extent of irrigated land and the area and configuration of irrigation canals and ditches, and measuring land slope and soil composition in rela-

tion to pesticides and herbicides. Water scarcity will increasingly dictate urban water recycling, and remote sensing could aid in measuring the quantity and location of water resources. (Lynch-Wisconsin)
W78-02179

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 3F.
W78-02185

COLLABORATIVE TESTS OF WATER ANALYSIS (THE CHEMAQUA PROGRAMME),
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
C. D. Stevenson, M. Lingsford, and W. H. L. Edgerley.
New Zealand Journal of Science, Vol 19, No 4, December 1976. p. 353-357. 1 fig, 3 tab, 10 ref.

Descriptors: *Water analysis, *Laboratory tests, *Sampling, Water quality, Water quality control, Nitrates, Nitrogen, Phosphorus, *Chemaqua Paogramme(New Zealand), Sodium arsenate, Mercuric chloride, Reactive dissolved phosphorus, Total dissolved phosphorus.

Twenty-three New Zealand laboratories participating in a collaborating international data exchange program (Chemaqua) analysed two synthetic water samples for nitrate, nitrogen, reactive dissolved phosphorous and total dissolved phosphorous. The water for sample preparation was re-distilled from alkaline permanganate solutions to keep low levels of nitrate and phosphorous species. Weighed amounts of dried analytical reagent grade cytidine-5-monophosphate, potassium nitrate, and potassium dihydrogen orthophosphate were dissolved in a large volume of redistilled water. Analar sodium arsenate was added to one solution. Analar mercuric chloride (60 g/cu m) was used as a preservative. Participants could use their current methods and/or recommended methods, but were to explain how their current methods differed from the recommended methods. About 45% of the results for reactive dissolved phosphorus, and 17% of the results for total dissolved phosphorus were subject to interference by arsenate and/or mercuric chloride. If these were not considered, rejection rates for the remainder were 35%, 6%, 31%, and 25%. Coefficients of variation ranged from 3.7-23.6%. (Spaeth-Wisconsin)
W78-02188

WATER QUALITY OF IMPOUNDMENTS ON SURFACE-MINED SITES,
J. E. Gailley, G. W. Gee, and A. Bauer.
Farm Research, Vol 34, No 2, p 37-39, November-December 1976. 4 tab, 2 ref. Old West Regional Commission 10470016.

Descriptors: *Strip mines, *Impoundments, *Runoff, *Land use, *North Dakota, *Missouri River, Hardness(Water), Calcium, Chlorides, Potassium, Sodium, Dissolved solids, Sulfates, *Water soluble constituents, *North American Coal Corp Indian Head Mine, *Sodium adsorption ratio.

Water samples were collected from impoundments on a North Dakota strip mine area and evaluated for livestock and irrigation use. Also analyzed were water samples taken from surface water sites outside the mine complex. The impoundments were at the North American Coal Corporation Indian Head Mine near Zap, ND. Samples were also taken from two stock ponds in the Zap vicinity, from the Spring Creek near Zap and from the Missouri River near Washburn. Samples were taken in November 1975, when conditions were at near minimum pond elevation, and in May 1976, representing conditions following snowmelt. Evaluation showed variations in concentrations of water soluble constituents between sampling locations. Significant variations in water quality were evident between the November and May samplings. Factors of potential concern included sodium adsorption ratio, total dissolved solids and sulfate. The study notes that complete evaluation would require collection of samples over several years from numerous locations of varying depths. The results are considered tentative and should be reevaluated as more water quality information becomes available. (Coyle-Wisconsin)
W78-02189

TRACE METAL CONCENTRATIONS IN SEDIMENTS FROM LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
R. A. Greig, R. N. Reid, and D. R. Wenzloff.
Marine Pollution Bulletin, Vol 8, No 8, p 183-188, August 1977. 1 fig, 2 tab, 10 ref.

Descriptors: *Trace elements, *Chemical analysis, *Neutron activation analysis, Copper, *New York, Chromium, Nickel, Lead, Zinc, Cadmium, Mercury, Cobalt, *Long Island Sound, *Trace metal concentrations, Marine sediments, Silver, Antimony, Selenium, Scandium, Manganese.

Trace metal concentrations in marine sediments from Long Island Sound were measured by comparison with sediments from seven other areas in the U.S. and the United Kingdom. Although baseline data was obtained on the occurrence and distribution of benthic organisms, pathogenic and pollution indicator microorganisms, nutrient levels in water, and trace metal concentrations in sediments, the report discusses only data on trace metals in the sound sediments. Two chemical analysis procedures were used. One procedure was used for neutron activation analysis. Great variation in metal concentrations were found for various Sound locations. Fairly similar distribution patterns were found for copper, chromium, nickel, lead and zinc. For silver, cadmium and mercury, the highest concentrations were in the far western Sound. For the rest of the Sound, no distribution pattern for these three metals could be found. Cobalt, antimony, selenium and scandium were faily uniformly distributed; distribution of manganese was different from that of all other metals discussed. The comparison with other locations measured only chromium, copper, nickel, lead and zinc. (Coyle-Wisconsin)
W78-02192

5B. Sources Of Pollution

THE HYDROCARBON BURDEN IN THE MARINE ENVIRONMENT SURROUNDING A REFINERY TANKER JETTY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
B. H. Gump, H. S. Hertz, W. E. May, and S. N. Chesler.
Journal of Environmental Science Health, Vol A12, No 3, p 105-113, 1977. 2 fig, 1 tab, 7 ref.

Descriptors: *Water pollution sources, *Environmental effects, *Sediments, Resources development, Jetties, Bottom sediments, *Oil spills, *Outer Continental Shelf, Refineries, Docking facilities, Transshipment.

In an investigation of petroleum hydrocarbons in the vicinity of a refinery docking facility in a 'clean' environment, water samples taken from the surface and at a 10-m depth and sediment samples taken from a nearby beach were found to have essentially no contamination, while bottom sediment had a low level hydrocarbon contamination. Of particular interest was the relative abundance of benzo(a)pyrene in the bottom sediment. (Sinha-OEIS)
W78-01707

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION,
Environmental Impact Planning Corp., San Francisco, CA.
H. A. Feibusch.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 409-414, 1 tab, 8 ref.

Descriptors: *Estuaries, *Water pollution sources, *Solid wastes, *Waste disposal, Pollution abatement, Federal government, *Outer Continental Shelf, Government policy.

The general relationship of solid waste to estuarine pollution is described. Current major impact of solid waste on estuarine pollution comes from fills, legal and illegal, where leachates contain pollutants including pesticides, heavy metals, and oxygen-demanding materials. Most coastal states have regulated against further use of estuarine areas for the disposal of solid wastes. It is recommended that the Federal government establish a data bank to determine where the various kinds of waste materials originate and where they are disposed. Long-range solutions to the danger of estuarine pollution by solid waste materials lie in reduction of the quantity of solid wasts generated and in large-scale recycling efforts. (Sinha-OEIS)
W78-01794

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
E. W. Davey, and D. K. Phelps.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 445-449, 1 fig, 3 tab, 7 ref.

Descriptors: *Estuaries, *Mercury, *Food chains, *Water pollution effects, Toxicity, *Metals, Ecosystems, *Outer Continental Shelf, *Trace metals, Biological effects.

Increased input of mercury to the estuarine environment resulted in bioaccumulation in marine food chains that affected man. Toxic effects of other metals on marine animals has been demonstrated under laboratory conditions. However, cause and effect between elevated environmental metals levels and toxicity to marine animals has yet to be conclusively demonstrated under field conditions. Municipal waste water treatment plants, dredging and spoiling activities, and the dumping of sewage sludge and industrial wastes are the major sources of metals to the marine environment. These sources are likely to increase in the future unless the Federal Water Pollution Control Act Amendments of 1972 (PL-92-500) are carefully enforced. (Sinha-OEIS)
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.
M-Y. Li.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 451-466, 1 fig, 6 tab, 65 ref.

UNIVERSITY OF MARYLAND - CHESAPEAKE

Descriptors: *Estuaries, *Water pollution sources, *Agriculture, *Pesticides, Ecosystems, Aquatic life.

Agricultural pesticides enter the estuarine environment by several means: direct application to water; runoff from treated lands; industrial discharges; domestic sewage; atmospheric drift; and accidental spills. A recent national survey on organochlorine residues in estuarine mollusks reveals that 'at no time were residues observed of such a magnitude as to imply damage to mollusks.' However, residues were large enough to pose a threat to other elements of the biota through recycling and magnification. The maximum pesticide residues can be correlated with proximity of monitoring stations to agricultural runoff. Long-term, sublethal effects of pesticides in estuaries are difficult to assess at present, as most data on pesticide effects are limited to a few species and concentration that is lethal in short-term tests under laboratory conditions. Pesticide pollution in the estuarine environment can be minimized through the use of alternative pesticides, more effective use of pesticides, removal of pesticides from water, improvement of farm management practices, regulatory control of pesticide use, and a better understanding of the pesticide behavior in the estuarine ecosystem. (Sinha-OEIS)
W78-01798

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,
American Petroleum Inst., Washington, DC.
K. G. Hay.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 467-474.

Descriptors: *Estuaries, *Environmental effects, *Resources development, *Water pollution, Offshore platforms, Monitoring, Oil pollution, *Outer Continental Shelf, Petroleum operations, Marine environment.

America is facing a serious energy crisis, as domestic petroleum supplies are consumed at a greater rate than new reserves can be located and placed in production. It is necessary to the nation's economic and political security to expand the search for crude oil and natural gas into the frontier areas of our Outer Continental Shelf. Expertise gained through more than two decades of exploration for and production of crude oil and natural gas in the Gulf of Mexico, and the advances in exploration, drilling and production technology and equipment, minimize the danger of environmental damage from offshore petroleum operations. Studies of the impact of oil on the marine and estuarine areas are continuing, and the results so far indicate that petroleum operations can be and are being conducted in an environmentally acceptable manner. (Sinha-OEIS)
W78-01799

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,
California Univ., Berkeley.
H. B. Fischer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 477-485, 10 fig, 10 ref.

Descriptors: *Estuarine environment, *Circulation, *Water pollution, *Water quality, Dispersion, Pollutants, Flushing rate.

One important feature of estuaries is their ability to assimilate wastes and transport them to the ocean. This paper discusses how flushing rates can be quantified, predicted, and used as part of the process of specifying allowable waste loadings. The various mechanisms which, in concert, drive the circulation of the ocean water is discussed. A practical analysis for computing flushing rates are described as well as procedures that can be used in a more predictive way, but are still in a state of research and development. Finally both practical needs relevant to current legislation and longer-term research needs are discussed. (Sinha-OEIS)
W78-01800

A BRIEF ASSESSMENT OF ESTUARY MODELING--RECENT DEVELOPMENTS AND FUTURE TRENDS,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 2L.
W78-01804

HYDROGEOLOGIC ASSESSMENT OF AN UNDERGROUND COAL GASIFICATION PROJECT SITE, GRANT DISTRICT, WETZEL CO., WEST VIRGINIA,
Energy Research and Development Administration, Morgantown, WV. Morgantown Energy Research Center.
T. L. Sole, C. W. Byrer, H. W. Rauch, and W. K. Overbey, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as MERC/TPR-76/5, Price codes: A04 in paper copy, A01 in microfiche. Report MERC/TPR-76/5, July 1976. 50 p, 14 fig, 5 tab, 21 ref.

Descriptors: *Baseline studies, *Water pollution sources, Control, Water quality standards, Aquifers, Testing, Coals, Manganese, Lead, Iron, West Virginia, *Underground coal gasification, Arsenic, Coal gasification.

Baseline data on water quality and aquifer properties for the area surrounding the Underground Gasification of Coal (UGC) Project, near Pricetown, West Virginia, are presented. Stratigraphic and domestic water well studies indicate that most wells are in shale aquifers of the Middle Dunkard Group; these wells yield about 1 to 8 gallons per minute of relatively good-quality water, except for excessive dissolved iron, manganese, arsenic, and lead in some. Moderate to low permeabilities of 0.032 to 0.18 millidarcies and transmissivities of 268 to 1,003 gallons per day per foot were measured for shallow aquifers. Aquifer permeability and well productivity are significantly higher for wells within 35 feet of mapped fracture traces. Geologic information was derived from fieldwork, well logs, and previous investigations. Most wells were less than 100 feet in depth, top shale aquifers, and exhibited good water quality. Results of the hydrologic assessment indicate that fracture zones are the primary avenues for migration water pollutants. Domestic wells within one mile of the underground coal gasification site should be periodically monitored (at least twice a year) for water quality after coal burning begins, and nearby surface sources of ground water contamination not related to the UGC project should be carefully checked out. (Wares-IPA)
W78-01848

POLLUTION ESTIMATION FACTORS,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 5A.
W78-01850

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING,
Battelle Columbus Labs., OH.
A. K. Reed, H. C. Meeks, S. E. Pomeroy, and V. Q. Hale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 413, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-76-036, December 1976. 50 p, 6 fig, 10 tab, 19 ref. 68-02-1323.

Descriptors: *Mining, *Mills, *Mine acids, *Mine drainage, Environment, *Environmental effects, *Underground mining, *Waste treatment, *Waste disposal, Mine water, Acid mine water, Research and development, Deep wells, Reclamation, Water reuse, *Uranium, Tailings ponds.

The characteristics and locations of domestic uranium ore reserves, and conventional methods for mining and milling of these ores are reviewed. Potential environmental impacts associated with the entire cycle from exploration and mining to recovery and production of yellowcake are identified and discussed as are land reclamation aspects. Mining methods: (1) open pit--acid leach process, (2) underground--acid leach process, (3) underground--alkaline leach, and (4) in-situ mining are discussed from the standpoint of typical active mills, which were visited during the program. Flowsheets indicate specific environmental aspects. The use of tailings ponds and deep well injection to dispose of the more toxic chemical wastes represent the major focus to be considered in future environmental studies. With regard to reclamation, additional research is needed in the development of plant species that are adaptable to reclamation needs and in the development of alternative uses of disturbed lands which cannot be restored to their premine condition. (Dorfman-IPA)
W78-01851

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO--FISCAL YEAR 1977,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 9D.
W78-01858

GROUND-WATER HYDROLOGY AND SUBSURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
D. E. Prudic, and A. D. Randall.
Open-file report 77-566, July 1977. 28 p, 14 fig, 2 tab, 10 ref.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Landfills, *Path of pollutants, *New York, Groundwater movement, Aquitards, Radioactive well logging, Hydrogeology, Till, Radioisotopes, Water level fluctuations, Evaluation, *West Valley(NY).

Burial trenches for disposal of solid radioactive waste at West Valley, N.Y., are excavated in till that has very low hydraulic conductivity (about 5 x 10 to the minus 8th power centimeters per second). Fractures and root tubes with chemically oxidized and (or) reduced soil in their walls extend to 3 to 4.5 meters below natural land surface. Preliminary simulations of pressure heads with a digital model suggest that hydraulic conductivity is an order of magnitude greater in the fractured till near land surface than at greater depth. Hydraulic gradients are predominantly downward, even beneath small valleys. The upper part of a body of underlying lacustrine silt is unsaturated; in the lower, saturated part, slow lateral flow may occur. In the older trenches, water began to build up in 1971, overflowed briefly in 1975, and was pumped out in 1975-76. Water levels rose abruptly during major rainstorms in mid-1975, indicating rapid infiltration through cracks in the cover material. The new trenches have maintained low, stable water levels, perhaps because of thicker, more compact cover

and less waste settlement; pressure heads near these trenches are low, locally approaching zero, perhaps because of slight infiltration and limited near-surface storage. Peak tritium concentrations in test-hole cores (generally 0.00001 to 0.001 microcuries per milliliter) were found within 3 meters of land surface and are attributed to surface contamination. Concentrations declined rapidly with depth within the fractured till; secondary peaks found at about 9 meters in three holes are attributed to lateral migration from trenches. Other radioisotopes were detected only near land surface. Samples from the walls of shallow fractures revealed no accumulation of radioisotopes. (Woodard-USGS)
W78-01869

VOLTAMMETRIC DETERMINATION OF ACROLEIN,
Tennessee Valley Authority, Chattanooga, Div. of Environmental Planning.
For primary bibliographic entry see Field 5A.
W78-01883

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS,
Bureau of Mines, Spokane, WA Spokane Mining Research Center.
R. R. Backer, R. A. Busch, and L. A. Atkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 724, Price codes: A03 in paper copy, A01 in microfiche. Bureau of Mines Report of Investigations No. Bu-Mines RI 8216, 1977. 29 p, 17 fig, 9 tab, 12 ref.

Descriptors: *Coals, *Waste dumps, *Physical properties *Chemical properties, Geographical regions, Mining, Soil mechanics, *Coal mine wastes, Waste dumps, Liquefaction.

The typical physical and chemical properties of coal waste material from the western part of the United States are reported and compared where possible with the properties of waste materials from eastern coal operations. A disparity exists among mines and preparation plants in the western U.S. coal operations; dissimilarities are also evident in comparison with typical operations in the East. The relatively cleaner product from the predominance of surface mining and occurrence of thicker seams in the West reduces the amount of coal preparation required and the size of the waste piles. Many of the waste piles are low and extended over large areas, since an abundance of land has been available for waste disposal. New concepts relating statistical shear strength data to liquefaction potential are presented; the limited data available show the western coal sludge to be coarser, with higher permeabilities and shear strengths, than the eastern coal. Results are recommended for use in planning and evaluating coal waste pile construction. (Wares-IPA)
W78-01884

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
C. P. Hwang, T. H. Lackie, and P. M. Huang.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2754-2760. December 1976. 3 fig, 3 tab, 6 ref. National Research Council of Canada A3248.

Descriptors: *Phosphorus, *Adsorption, *Sediments, Lakes, Reservoirs, *Canada, Particle size, Nutrients, Laboratory tests, *Blackstrap Lake(Canada).

Sediment samples collected from six locations in Blackstrap Lake, Saskatchewan, Canada, were tested for inorganic phosphorus adsorption related to sediment particle size. Blackstrap Lake, a large reservoir created in 1967 on the South Saskatchewan River, is 14 km wide and averages 5.2 m depth. Samples were collected from places generally less than 2.54 cm in depth. The sediment was mixed thoroughly to make a composite which was then dispersed in distilled water; the sediment was subsequently separated into <0.2, 0.2-2, 2-5, 5-20, 20-50, and >50 micrometer fractions. Inorganic phosphorus solution prepared from anhydrous potassium dihydrogen phosphate was selected as adsorbate. Results indicated that the adsorption characteristics of various-sized fractions of lake sediments are significant for both colloidal fractions and noncolloidal fractions. The best adsorption efficiency was observed at 2-5 micrometers. Other conclusions were: (1) composite sediment adsorption of inorganic phosphorus was directly proportionate to the initial phosphorus solute concentration; (2) greater gyration of the shaker resulted in somewhat higher adsorption; (3) finer particles had a higher adsorption potential than coarser ones; (4) the sum of the adsorption capacity of different sediment fractions was 81% that of the composite sediments; and (5) the adsorption rate of the composite calculated from the fractions was 67% of that in the actual test of the composite sediment. (Lynch-Wisconsin)
W78-01907

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W78-01916

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W78-01935

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES,
New Jersey Agricultural Experiment Station, New Brunswick.
J. K. Shisler, and D. M. Jobbins.
Marine Biology, Vol 40, No 2, p 127-134, 1977. 3 fig, 6 tab, 21 ref.

Descriptors: *Carbon, *Organic matter, *Tidal effects, *Salt marshes, Detritus, *New Jersey, Estuaries, Marshes, Streams, Tidal streams.
Identifiers: *Organic carbon.

This study compares the movement of organic carbon in several small tidal creeks in a half-managed and half-natural marsh at Tuckerton, N.J., over several tidal cycles using a simulation program. Three natural tidal creeks in the natural marsh were chosen to correspond in size to three constructed ditches in the managed marsh. Dissolved organic carbon (DOC) and particulate organic carbon (POC) were monitored. The study concludes that individual marshes, creeks, and tidal cycles cannot be used to determine actual movement of organic components. In addition, one organic component cannot be used to characterize the net movement of other organic components in the estuarine system. The overall means of all samples within a creek for a single date or series of dates do not accurately estimate the creek's organic carbon movement, as organic carbon concentrations may persist for short periods of time in small volumes of water in the tidal cycle. The spring tide showed significantly higher organic carbon concentrations in the latter segments of the tidal cycle than the other two tidal cycles; precipitation seems to have been the only reason for the difference. Organic carbon components showed lower concentrations at flood slack than at ebb slack. Mid-ebb concentrations were significantly higher than mid-flood concentrations for TOC and POC. (Lynch-Wisconsin)
W78-01938

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Scura, and G. H. Theilacker.
Marine Biology, Vol 40, No 4, p 317-325, 1977. 2 fig, 4 tab, 35 ref. NSF-IDOE GX-32977.

Descriptors: *Food chains, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Trophic levels, Algae, Rotifers, Aroclors, Industrial wastes, Water pollution, Pollutants, Marine microorganisms, Laboratory tests.
Identifiers: Bioamplification, Dunaliella, Brachionus plicatilis, Anchovies, Engraulis mordax.

The concentration of PCB in each trophic level of a three-step marine food chain (algae, rotifer and anchovy larvae) was monitored for 45 days. Transfer of chlorinated hydrocarbons (CHCs) in such chains was simulated in the laboratory using the algal flagellate Dunaliella sp., the rotifer Brachionus plicatilis, and northern anchovy larvae Engraulis mordax. Most investigators agree that aquatic organisms accumulate CHCs either by eating contaminated food or by a partitioning of the compounds directly from the water into the lipid until an equilibrium is established. Since partitioning occurs between polar and nonpolar phases, the seawater used in the tests were kept free of even trace amounts of organic solvents which could affect the partitioning. In addition, CHC levels in the test seawater were representative of seawater off southern California. The data indicate that CHC accumulation is the result of direct partitioning of the compounds between the seawater and the test organisms, and not a food-chain phenomenon. Unfed anchovy larvae accumulated the same amount of CHC as fed larvae, and the final concentration appeared dependent of the CHC concentration in the seawater. When the PCB concentration was calculated on a lipid basis, algae and rotifers contained essentially the same levels, and what had appeared to be a food-chain accumulation was really a reflection of the greater amount of lipid in the rotifers. However, PCB residues in fish larvae lipid were ten times greater than in the invertebrates, apparently contradictory evidence supporting bioamplification. (Lynch-Wisconsin)
W78-01939

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5C.
W78-01944

PREDICTIVE ANALYSIS OF DISSOLVED OXYGEN IN DICKEY LAKE, MAINE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-01947

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, MI. Hiawatha National Forest.
N. Johnson, and D. H. Urie.
Ground Water, Vol 14, No 6, p 403-410, November-December, 1976. 5 fig, 4 tab, 3 ref.

Descriptors: *Recreation wastes, *Sewage disposal, *Waste disposal, Wastes, Sewage, Organic wastes, Water quality control, Nutrients, Coliforms, Biodegradation, Groundwater, Water table, Michigan, Water pollution sources.
Identifiers: *Soil incorporation, *Land disposal.

LIBRARY OF THE HARVARD FOREST

Sealed concrete vault toilets were installed in campgrounds in northern Michigan's Hawatha National Forest because the extremely sandy soils with high percolation rates and little capacity to renovate waste. Three available methods for disposal of the waste pumped from the vaults were rejected: spreading on the ground for biodegradation, transfer to municipal waste treatment plants, and a new treatment facility on the grounds. A soil incorporation method proved to be reliable and economical ($2,000/yr to dispose of 57,000 l of wastes). According to this method sewage is injected into furros 0.69 m apart and 10-20 cm deep by a tank trailer which opens the furrows, injects the sewage, and closes the furrows in one operation. Bacterial, nutrient, or viral contamination of the ground water is unlikely if the site (1) has a ground water level at least 3 m below ground level, (2) has good soil development, and (3) operates under normal precipitation conditions. The system depends on filtration by the soil above the ground water table and nutrients being used by vegetation. Preferred soil textures in decreasing order (all well-drained) are: sandy loams, fine sandy loams, loamy sands, sands, and loams. The site must be at least 180 m from the nearest residence or travel lane, preferably one-half mile. Application rate must not exceed 6.2 liters of waste per m of furrow, and the slope should not exceed 5%. Reapplication is possible after three years. (Lynch-Wisconsin)
W78-01949

WEST VIRGINIA ACID MINE DRAINAGE STUDY IN NORTH POTOMAC RIVER BAIN.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
July, 1974. 77 p, 23 fig, 2 tab, 1 append.

Descriptors: *Acid mine water, *Mine drainage, *Potomac River, *West Virginia, Effluents, Watersheds(Basins), Water pollution, Water quality, Tributaries, Rivers, Streams.
Identifiers: *North Branch Potomac River Basin(WV and MD).

Earlier studies of the North Branch of the Potomac River indicated that mine drainage emanating from West Virginia and Maryland was responsible for acid pollution of the North Branch. This study was undertaken to locate and map all acid mine drainage sources in West Virginia, measure stream flow, analyze water samples, and research historical and geological information. Using results of a federal water pollution control study made in 1968-69, trends in the acidity of streams from 1968 to 1973 were established. It was concluded that current coal mining, rather than old abandoned mines, was responsible for the generation of acid in the West Virginia streams of the North Branch Potomac Basin. From 1968-72 probably over half of the acid in the North Branch Potomac at the Barnum monitoring station came from Island Creek Coal Company's Alpine and North Branch mines. Acid discharge from the Alpine Mine was reduced substantially over the period, but discharge from the North Branch Mine increased enormously, contributing 38% of the acid art Barnum. Acid discharge from Abrams Creek more than doubled between 1968-69 and 1973 as a result of surface mining. In 1973 average daily acid load in lbs/day was 72,000 from the North Branch at Barnum, 22,900 for Buffalo Creek, 15,000 for Abrams Creek, 10,500 for Stony River, and 8,000 for Piney Swamp Run. (Lynch-Wisconsin)
W78-01959

A PRELIMINARY SURVEY ON THE WATER QUALITY OF DICKINSON BAYOU, TEXAS,
Texas Univ. Medical Branch at Galveston. Dept. of Preventive Medicine and Community Health.
For primary bibliographic entry see Field 5A.
W78-01962

CHEMICAL-PHYSICAL AND BIOLOGICAL ASSESSMENT OF WATER QUALITY IN THE CUYAHOGA RIVER (1973-1974),
Akron Univ., OH. Dept. of Biology.
J. H. Olive.
The Ohio Journal of Science, Vol. 76, No. 1, p 5-15, January 1976. 5 fig, 2 tab, 20 ref.

Descriptors: *Water quality, *Water pollution, Rivers, Tributaries, Pollutants, Ohio, Watersheds(Basins), Dissolved oxygen, Coliforms, Heavy metals, Nitrogen compounds, Water temperature, Water chemistry.
Identifiers: *Cuyahoga River(OH).

Water quality of the Cuyanoga River in heavily populated and industrialized northeastern Ohio was monitored at seven sampling stations from October 1973 to September 1974, for dissolved oxygen, hydrogen ions (pH), ammonia-nitrogen, nitrate-nitrogen, total inorganic phosphate, filtrable residue, heavy metals, and water temperature. Biological measurements included fecal coliform bacteria density, and taxa and abundance of benthic macroinvertebrates. During this survey dissolved oxygen concentrations in all areas consistently exceeded 6 mg/l, well above minimum Ohio water quality standards. However, automatic DO monitors of the U.S. Geological Survey showed that during the summer of 1974 downstream of Akron DO often fell below 4 mg/l, and dropped as low as 2 mg/l. Such low concentrations even for short periods are undoubtedly harmful to aquatic life. Ammonia-nitrogen concentrations ranged from 0.1 mg/l upstream to 7.1 mg/l between Akron and Brecksville. Lead levels at Brecksville (0.1 mg/l) were unacceptably high. Fecal coliform bacteria density ranged from 130/100 ml at Hiram Rapids to over 10,000/100 ml below Akron. Whereas at Hiram Rapids 60% of benthic invertebrates were pollution-sensitive, between Akron and Independence over 90% were pollution-tolerant. Species diversity declined drastically from a high of 106 taxa at Hiram Rapids to 30 at Independence, with a low of 25 at Boston Mills. Most other indicators were generally at acceptable levels. (Lynch-Wisconsin)
W78-01964

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE--REPRISE,
San Diego State Univ., CA.
K. K. Bertine, and E. D. Goldberg.
Environmental Science and Technology, Vol. 11, No. 3, p. 297-299, March 1977. 1 fig, 2 tab, 5 ref.

Descriptors: *Heavy metals, *Water pollution sources, *California, Banks, Metals, Cobalt, Cadmium, Lead, Chromium, Copper, Manganese, Nickel, Zinc, Iron, Aluminum, Pacific Ocean, Coasts, Littoral, *Sediments.
Identifiers: *Anthropogenic input, *San Clemente Basin(Pacific Ocean), *Santa Catalina Basin(Pacific Ocean), Silver, Vanadium, Plutonium 23a, Plutonium 240, Lead 210.

Amounts and possible sources of heavy metal pollution in an outer basin 100 km off the southern California coast are determined and compared with those previously studied 30 km off the coast. Sediments currently studied were taken from a bank slope between the San Clemente and Santa Catalina basins along the nearshore. Lead, zinc, and vanadium are significantly enriched relative to aluminum in the uppermost 2 cm. Cadmium, manganese, and colbalt are higher in the first two levels, 0-0.5 and/or 0.5-1.0 cm, than at greater depths. Bioturbation may account for the Pu 239 and 240, and Pb 210 distributions. Pu 239 and 240 is found to a depth of about 10 cm, but with a sedimentation rate of 5 cm/1000 years, it should be found within the top 0.2 cm, representing the past 40 years. This 0.2 level indicates a time of about 1949, when anthropogenic input first became obvious in the inner basin sediments. Anthropogenic fluxes of zinc, vanadium, and lead from the coast to the ocean, roughly fall off as a square of the distance from shore. Fluxes to the outer basin relative to the inner basin are less by a factor of about ten. This indicates that transport of these three metals may be mainly atmospheric. (Spaeth-Wisconsin)
W78-01970

LAKE TAHOE GEOCHEMICAL STUDY. 1. LAKE CHEMISTRY AND TRITIUM MIXING STUDY,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-01978

BUOYANT RECTANGULAR SURFACE THERMAL PLUMES,
Old Dominion Univ., Norfolk, VA School of Engineering.
J. M. Kuhlman, and J. M. Prahl.
Journal of Great Lakes Research, Vol. 2, No. 2, p 340-356, December 1976. 12 fig, 2 tab, 15 ref.

Descriptors: *Thermal pollution, *Powerplants, *Model studies, Thermal powerplants, Nuclear powerplants, Electric powerplants, Heat flow, Heat transfer, Circulation, Water circulation, Flow, Temperature, Water temperature, Water pollution.
Identifiers: *Thermal plumes.

A near-field integral model of a buoyant surface thermal plume entering a crossflow was developed which includes the effects of buoyancy through the empirical assumption that the slope of the plume thermocline is proportional to the local plume depth times the local plume excess temperature and inversely proportional to the initial plume internal Froude number. The model was compared with the laboratory data and field data. Data generally agreed well with the model using single values of the empirical constants in the theory, varying only the initial internal Froude number and the crossflow-to-initial-plume-velocity ratio, to match the data values. Matching was achieved for distances along the plume center line of approximately 20 initial plume widths for the laboratory data and 50 widths for the field data. (Sims-ISWS)
W78-01986

CURRENTS AND CONTAMINANT DISPERSION IN THE NEARSHORE REGION AND MODIFICATION BY A JETPORT,
Case Western Reserve Univ., Cleveland, OH Dept. of Earth Sciences.
Y. P. Sheng, and W. J. Lick.
Journal of Great Lake Research, Vol. 2, No. 2, p 402-414, December 1976. 12 fig, 7 ref.

Descriptors: *Dispersion, *Lake Erie, *Diffusion, *Wastes, Currents(Water), Islands, Shores, Water quality, Lakes, Winds.
Identifiers: *Jetports, Wind-driven currents.

The steady-state and the time-dependent, constant density, wind-driven currents in the nearshore Cleveland area of Lake Erie, under present conditions and as modified by the proposed Lake Erie International Jetport, were calculated numerically. Two specific jetport configurations were studied in detail: (1) an island, and (2) an island with causeway to shore. Coupling procedures between the fine nearshore numerical grid and the coarse overall-lake grid were studied in detail and were presented in this paper. For the above jetport configuration, several computations illustrating the dispersion of a contaminant from a point source (the Cuyahoga River) into Lake Erie were made. For the particular cases studied, it was shown that the island does not significantly modify the currents or contaminant dispersion while the island with a causeway to shore does. The nearshore numerical models presented here can be modified

easily to study the nearshore dispersion in other large lakes. (Lee-ISWS)
W78-01989

A HAZARD OF SUBDIVIDING FARMLAND,
Harford County Health Dept., BelAir, MD.
W. W. Whitlock, Jr.
Ground Water, Vol 15, No 6, p 416-419, November-December 1977. 2 fig, 4 ref.

Descriptors: *Groundwater, *Water quality, *Nitrates, *Maryland, Wells, Water wells, Farms, Farm wastes, Land use, Urbanization, Suburban areas, Nitrogen, Sampling, On-site data collections, Water chemistry, Hazards, Public health, Pollutants, Water pollution.
Identifiers: Farmland subdividing.

Changing land-use patterns are occurring in all areas of the United States, especially those surrounding urban centers. Previously farmed land is being converted to residential subdivisions of 1/4 to 1/2 acre lots with on-site water supply and sewage disposal systems (well and septic). This in itself can also hazards resulting from the original uses of the land that have not been anticipated. This paper was concerned with the high nitrate nitrogen levels in groundwater resulting from long-term farming. Natural chemicals and biological activity will break down manure to persistent nitrate that is then leached into the water table. Subsequent subdivision of the land, well installation, and consumption of the contaminated groundwater constitute a problem that has been recognized medically since 1945, but not by the drilling industry or environmental health personnel. Regulations of the Maryland State Department of Health and Mental Hygiene provide for a required series of bacteriological and chemical samples prior to the water supply being put into service. To date, the tests usually are conducted after occupancy, if at all. In Harford County, Maryland, at least 4 subdivisions have been shown to have areas of excessive nitrate nitrogen (up to 60 ppm) showing the need for stringent enforcement of existing regulations. (Sims-ISWS)
W78-01993

PLUTONIUM AND AMERICIUM: UPTAKE FROM CONTAMINATED SEDIMENTS BY THE POLYCHAETE NEREIS DIVERSICOLOR,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W78-02003

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, CLAIRTON WORKS, PITTSBURGH, PENNSYLVANIA, JANUARY 28-31, 1976.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 586, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-330/2-76/025, May 1976. 138 p, 4 fig, 11 tab, 5 ref, 4 append.

Descriptors: *Monitoring, *Sampling, *Water analyses, *Water pollution sources, *Outlets, Water quality, Path of pollutants, Water sampling, On-site data collections, Reliability, Industrial wastes, *Waste water disposal, Clairton(PA), Steel mills.

The Clairton, Pennsylvania, works of the United States Steel Corporation include a coke plant, chemical plant, and steel plant. Since the facility is on the Monongahela River approximately 18 miles above the confluence of the Ohio, Monongahela, and Allegheny Rivers, a waste water monitoring survey was conducted for waste water discharged daily through 10 outfalls into the Monongahela River and for nine outfalls which discharge into Peters Creek, a tributary of the Monongahela. The National Enforcement Investigations Center also conducted a dye study at four of the outfalls on December 15-18, 1975, to assess whether the United States Steel Corporation sampling locations were representative of the total waste water flow discharged from the Clairton works. Results of an in-plant monitoring survey conducted on January 28-31, 1976, are presented. (Schulz-FIRL)
W78-02020

MEETING THE GROUNDWATER CONTAMINATION PROBLEM,
Robert S. Kerr Environmental Research Lab., Ada, OK.
J. W. Keeley.
Water and Sewage Works, Vol. 124, No. 11, p 88-90, November, 1977. 1 fig, 2 tab, 12 ref.

Descriptors: *Water pollution control, *Groundwater, *Subsurface waters, Industrial wastes, Municipal wastes, Leachates, Brines, Nitrates, Chlorides, Waste water disposal.

Five geographical areas in the United States were covered in studies conducted by the EPA to establish priorities in potential groundwater contamination sources. Areas examined were the northwest, southwest, south central, southeast, and northeast sections of the country. Sources of groundwater pollution are listed according to severity for all five regions. Chloride, nitrates, heavy metals, and hydrocarbons were the four most common pollutants encountered in the study. Individual sewage disposal systems which can contribute nitrates, chlorides and coliform are reported as adding approximately 3.5 billion gal of waste to the subsurface environment daily. Groundwater pollution from the petroleum industry results from brines recovered with crude oil, which are reinjected for disposal or for repressurization of an oil horizon for secondary recovery projects. Leachates from landfills and surface waste impoundments are cited as additional groundwater pollution sources which have not yet been fully defined. Salts, fertilizers, pesticides from agricultural sources, and highway deicing salts are discussed as potential groundwater pollutants. Faulty water well construction also contributes to groundwater pollution. The economic consequences of groundwater pollution are discussed. (Schulz-FIRL)
W78-02031

STREAM ASSIMILATION CAPACITY: A FACTOR IN TRACE ORGANIC WASTEWATER TREATMENT POLICY,
Alabama Univ., University.
G. C. April, and S. Ng.
AIChE Symposium Series, Vol. 73, No. 166, p 364-379, 1977. 9 fig, 3 tab, 15 ref.

Descriptors: *Phenols, *Water quality, *Waste assimilative capacity, *Self-purification, Surface waters, Mathematical models, Chemical wastes, Aromatic compounds, Odor, Taste, Hydrologic data, Industrial wastes, Waste water treatment.

Since decisions in trace organic waste water treatment policy often ignore the self-purification properties of receiving streams, the stream assimilation capacity of receiving waters for phenolic chemicals is discussed. Various elements which may influence an assessment of the stream impact of treated waste discharge are discussed, including a knowledge of the technical, political, and historical details of the system; identification of the users, locations, quantity, and characteristics of each discharge along a water course; hydrographic and hydrologic data; and water quality data. Specific aspects of phenolic chemicals are discussed, including taste and odor objections, toxicity to aquatic species, BOD, and COD. Various mechanisms and reactions in the transport and fate of phenol in a stream are examined with respect to the nature of self-purification. A basic material balance equation for phenolic chemicals in a fresh water stream is presented. Previous data on stream quality were used to determine the rate constant for phenol depletion. Methods used to calibrate and verify the material balance equations for phenolic chemicals within the creek included an estimation of phenolic chemical depletion coefficients; the comparison of trends indicated by the coefficients with hydrologic and biologic activity noted in the surveys; and the direct comparison of the model and survey phenolic chemical profiles in the creek. The application of the model equations to assess the effects of plant loads and low flow is discussed with respect to creek quality. (Schulz-FIRL)
W78-02035

INDUSTRIAL DUMPS THREATEN GROUNDWATER.
Engineering News-Record, Vol. 199, No. 4, p 69, October, 1977.

Descriptors: *Water pollution sources, *Groundwater, *Leaching, *Path of pollutants, *Landfills, Metals, Hydrogeology, *Waste disposal, Industrial wastes.

A seven-month study conducted by Garaghty and Miller, Inc., of Port Washington, New York, for the EPA has revealed that land disposal sites which receive a large proportion of industrial wastes may present a source of groundwater pollution. Migration of hazardous substances into subsurface water supplies was observed at 43 of the 50 disposal sites in the survey. Selenium, barium, cyanide, copper, and nickel were identified as the most frequently observed inorganic contaminants while PCB's organic solvents, and benzene and its derivatives were designated as the most common organic pollutants. Levels in drinking water obtained near 26 of the disposal sites were higher than federal regulations allow for selenium, arsenic, chromium, and lead. The 50 sites, which are located in 11 states east of the Mississippi River, were chosen from 122 disposal sites visited by Garaghty and Miller. Although approximately 50% of the selected sites already used monitoring wells and 9% of the sites were equipped with groundwater protection systems, none of the facilities monitored with the path of organic chemicals. (Schulz-FIRL)
W78-02043

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIPARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA),
A. Horvath.
Gepgyartastechnologia, Vol. 17, No. 4, p 150-154, April, 1977. 9 tab.

Descriptors: *Sludge disposal, *Soil-water-plant relationships, *Leaching, *Path of pollutants, Heavy metals, Waste water disposal, Landfills, Industrial wastes.

Recommendations on the basis of laboratory leaching tests with sand are given for the disposal in temporary landfills of sludges generated by electroplating shops. The experiments investigated the leaching of toxic components, especially cyanides, cadmium, and nickel. The findings indicate that such sludges can be disposed of on soil surfaces only on an interim basis, after laboratory leaching tests. There must be a ground layer with a minimal thickness above the highest groundwater level. Disposal sites larger than 20 sq m should be sealed if the thickness of the sludge layer to de deposited is to exceed 50 cm. The groundwater quality should be monitored at various distances from the disposal site. Sludge mixed with concrete in concrete blocks was found to present practically no groundwater contamination hazard. (Takacs-FIRL)
W78-02056

PHOTODECOMPOSITION OF ODOROUS CHLOROPHENOLS IN WATER,
National Inst. for Environmental Studies, Tsukuba (Japan). Dept. of Chemistry and Physics.
For primary bibliographic entry see Field 5D.
W78-02068

THE DRIFT OF ORGANISMS IN FLOWING WATER, (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Dept. de Biologie Animaux et Zoologie.
M. Bournaud, and M. Thibault.
Ann Hydrobiol. 4(1), p 11-49, 1973.

Descriptors: *Drifting(Aquatic), Aquatic insects, Diatoms, *Diptera, *Ephemeroptera, Gammarid, Hydracarina, Invertebrates, Limnephilidae, *Plecoptera, Microorganisms.

Information obtained from about 10 yr work on drift (the aggregate of organisms and debris carried downstream by the current) is summarized. Samples were taken either with a net placed at a fixed point in the stream (net mouth 300-I800 cm2, length 0.75-2.50 m, mesh width 0.1-1 mm) to catch all the drift, or by means of a sieve or net placed in a waterfall and sometimes provided with a recording apparatus which turns on a 24 h cycle. The unit of measure, which is most convenient and most suitable for comparisons between stations, is the number of individuals drifting through a section of 1 m2 during 1 h, or what is called the intensity of drift. The weight or volume of organisms is also utilized. In addition to mineral and organic particles (plant debris dead bodies and exuviae of animals) carried along by the current, the drift is composed of living organisms, either of terrestrial origin (exogenous) or of aquatic origin (emerging imagines of insects and all benthic invertebrates). All the aquatic groups are involved, but the most abundant are usually gammarids and larvae of Ephemeroptera, Plecoptera and Diptera. Most of the animal groups involved in the drift have a nocturnal maximum, either at the beginning of the night (bigeminus type) or at the end of the night (alternans type). On the other hand, several groups (Diatoms, Hydracarina, some Limnephilidae) are diurnal. It was shown experimentally that there is a parallel rhythm of locomotory activity in the case of larvae of Ephemeroptera and Trichoptera, and the maximum activity is also noctural, corresponding to the period of feeding. The standardization of techniques and experimentation would make it possible to determine the mechanisms of drift.--Copyright 1975, Biological Abstracts, Inc.
W78-02103

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, AND MANGANESE CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA, (IN JAPANESE),
Okayama Univ. (Japan). Inst. of Agricultural and Biological Science.
J. Kobayashi, J. Morii, S. Muramoto, S. Nakashima, and H. Teraoka.
Jpn J Limnol 36(1), p 6-15, 1975.

Descriptors: Trace elements, Arsenic, Biwa, Cadmium, Copper, *Distribution, *Japan(Lake Biwa), Lead, Manganese, Sediments, Spectrophotometry, Zinc, *Metals, Lake sediments.

To investigate the vertical and horizontal distribution of trace metals in the sediment of Lake Biwa (Japan), 51 samples were collected and analyzed for As, Cd, Pb, Zn, Cu and Mn by atomic absorption spectrophotometry. Of these samples, 14 were taken from various points on the surface of the bottom sediment and 37 were taken at intervals of about every 5 m from a vertical core to a depth of 200 m below the lake bottom. The vertical distribution of the metals in the core was, on a dry matter basis, as follows; As 9-58 ppm (average 24 ppm), Cd 0.24-1.36 ppm (0.44 ppm), Pb 18-34 ppm (27 ppm), Zn 98-160 ppm (133 ppm), Cu 34-66 ppm (52 ppm), and Mn 620-5300 ppm (1800 ppm). The highest values of both Mn and Cd were found in the same sample from 130 m, and some significant environmental changes took place during the period in which it was deposited, roughly 300,000 yr ago. For other samples the content of trace metals did not differ much with depth although the materials from the core were probably deposited during the past several hundred thousand years. A remarkable accumulation of As (126-450 ppm) and Mn (8300-17,300 ppm) was observed at several points near the center of the northern part of the main lake basin, where pollution was not expected. In the southern part of the lake, the surface sediment near the Seta River which flows out of the lake was polluted by Cd and other metals (Cd 26 ppm, Pb 259 ppm, Zn 736 ppm). At other points the content of trace metals in the surface sediment was similar to that of the verticle core samples from below the level polluted by man. The high concentration of trace metals detected in the surface sediment at some points indicated that he natural process of accumulation of trace metals throughout the past several hundred thousand years have been broken by recent human activity. --Copyright 1975, Biological Abstracts, Inc.
W78-02151

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER,
Waterloopkundig Lab., Delft (Netherlands).
For primary bibliographic entry see Field 5C.
W78-02183

WATER QUALITY OF IMPOUNDMENTS ON SURFACE-MINED SITES,
For primary bibliographic entry see Field 5A.
W78-02189

LAND USE AND NONPOINT POLLUTION IN THE SHEYENNE VALLEY,
For primary bibliographic entry see Field 4A.
W78-02190

OXYGEN UTILIZATION IN SOILS FLOODED WITH SEWAGE WATER,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
J. C. Lance, F. D. Whisler, and H. Bouwer.
J Environ Qual. 2(3), p 345-350, 1973.

Descriptors: *Denitrification, *Diffusion, *Flooded soils, Flow, Mass flow, *Nitrification, Oxygen transport, Sewage effluents, Soils, Water pollution, *Path of pollutants.

Diffusion and mass flow were important mechanisms of O2 transport in soil columns intermittently flooded with sewage water. The amount of O2 entering the soil by mass flow during drainage was 30-40% of the total amount entering the soil. Most of the estimated available O2 was used in the oxidation of NH4+ to NO3. Enough O2 entered the soil during a 5-day dry period to oxidize all of the N applied when the soil was flooded for 6 days with secondary sewage effluent containing 20 mg/l of NH4-N at an infiltration rate of 50 cm/day. Application of NH4+ in excess of that which could be oxidized during the dry period resulted in a gradual increase in the NH4+ concentration of the reclaimed water. An increase in NH4+ concentration can be prevented by balancing the NH4-N applied against the O2 entered during the dry period. Most of the O2 entered the columns during the 1st 3-4 days of the dry period. Thus the amount of O2 entering the soil can be increased more effectively by increasing the frequency rather than the length of the dry periods. The soil profile remained in a reduced state below the 140-cm depth during a 10-day dry period. This showed that NH4+ stored below this depth would not be nitrified and that an environment favorable for denitrification was maintained in part of the profile at all times. Anaerobic reactions were as effective as aerobic reactions in reducing the chemical oxygen demand (COD) of sewage water from 50 to 18 mg/l.--Copyright 1974, Biological Abstracts, Inc.
W78-02194

EFFECT OF SUSPENDED PARTICLES AND THEIR SIZES ON NITRICATION IN SURFACE WATER,
Pahlavi Univ., Shiraz (Iran).
B. Kholdebarin, and J. J. Oertli.
Journal Water Pollution Control Federation, Vol. 49, No. 7, p. 1693-1697, July 1977. 2 fig, 2 tab, 19 ref.

Descriptors: *Nitrification, *California, *Oxidation, *Surface waters, *Particle size, Ammonium compounds, *Suspended particles, *Whitewater River(CA).

Results of studies with water samples from the Whitewater River in Southern California clearly indicate the importance of the presence of suspended particulates and of particle size in nitrifying bacteria in surface water. While organisms can function well in media lacking measurable suspended solid materials, their activities will be enhanced as the amount of particulates increases in the solutions; the stimulating effect of particles is largely caused by their acting as a physical support for the prliferation of the nitrifying bacteria, rather than as base exchange sites for the substrates used in nitrification processes. Also, it appears particles as large or larger than the organism are most efficient in stimulating the nitrification process, contradicting findings of earlier studies which concludes that particles with diameters in excess of 0.7 microns are not essential for rapid biological nitrification in aquatic systems. (Coyle-Wisconsin)
W78-02200

5C. Effects Of Pollution

ON THE BIOLOGY OF THE CLADOCERAN HOLOPEDIUM GIBBERUM ZADDACH IN WINDGFAELLWEIHER (BLACK FOREST) (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
For primary bibliographic entry see Field 2H.
W78-01703

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE,
Sylvester Underseas Inspection, Rockland, MA.
J. D. Eger.
Rhode Island University Marine Affairs Journal, No 4, October 1976. 18 p, 38 ref.

Descriptors: *Mining, *Environmental effects, *Baseline studies, Resources development, Economics, Legislation, *New England, Sands, Gravels, *Outer Continental Shelf, *Offshore mining.

Offshore mining will undoubtedly cause environmental changes in the immediate area of the mining site, and changes in a larger surrounding area may occur. Direct effects of marine mining on the environment include removal of substrate, introduction of fines into the water column, possible introduction or organics, toxins, and metals into the water column, possible burial of adjacent benthic organisms, possible alteration of bottom current patterns, and possible alteration of fish spawning patterns due to substrate removal. The presence of an offshore hard minerals mining operation may involve multiple use conflicts which would have to be resolved before mining could commence. As the offshore mining industry matures, the scope of mining operations on the continental margin will greatly increase. There-

fore, the management capabilities of the Conservation Division of the U.S. Geological Survey, which manages mining operations in this area, will have to be expanded. Factors other than pure market considerations, such as environmental concerns and jurisdictional-management problems, will have a large part in determining whether or not the sand and gravel industry will move offshore in New England. (Sinha-OEIS)
W78-01714

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT,
South Carolina Univ., Columbia.
F. J. Vernberg.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 29-39, 5 fig, 38 ref.

Descriptors: *Estuaries, *Ecosystems, *Water pollution effects, Baseline studies, Environmental effects, Model studies, Energy flow.

An estuary is a complex ecosystem which is subjected to a wide range of environmental fluctuation in 'normal' parameters, such as salinity, temperature, and rhythmical tidal action. In today's world more and more estuaries are being assaulted by man-induced factors. Many factors make estuaries an important biological and economic resource, but perhaps the most important of all is the amount of energy in these systems. In order for man to manage this habitat for the greatest benefit to man and the earth's ecosystem, a thorough understanding of the energy budget of estuaries is vital. Comparative models must be developed for characteristic types of estuaries to assess their essential common and distinctive features. This will enhance the ability of man to predict the effects of a proposed environmental change in other estuaries without the need for excessively costly environmental impact investigations. (Sinha-OEIS)
W78-01766

IMPACT OF ESTUARINE POLLUTION ON BIRDS,
Fish and Wildlife Service, Laurel, MD.
L. J. Blus, S. N. Wiemeyer, J. A. Kerwin, R. C. Stendell, and H. M. Ohlendorf.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 57-71, 12 fig, 3 tab, 62 ref.

Descriptors: *Estuaries, *Birds, *Water pollution effects, *Environmental effects, *Heavy metals, Mercury, Lead, Oil pollution, Mortality.

Pollution of estuaries affects birds directly, through chemical toxication, which may result in outright mortality or in reproductive impairment. Lead from industrial sources and roadways enters the estuaries and is accumulated in tissues of birds. Lead pellets deposited in estuaries as a result of hunting are consumed by ducks with sufficient frequency to result in large annual die-offs from lead poisoning. Fish in certain areas, usually near industrial sources, may contain levels of mercury high enough to be hazardous to birds that consume them. Other heavy metals are present in estuarine birds, but their significance is poorly known. Oil exerts lethal or sublethal effects on birds by oiling their feathers, oiling eggs and young by contaminated parents, and by ingestion of oil-contaminated food. Organochlorine chemicals, of both agricultural and industrial origin, travel through the food chains and reach harmful levels in susceptible species of birds in certain estuarine ecosystems. Both outright mortality and reproductive impairment have occurred. (Sinha-OEIS)
W78-01768

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY,
Mann (Roy) Associates, Inc., Cambridge, MA.
R. Mann.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 73-82, 1 fig, 5 ref.

Descriptors: *Estuaries, *Land use, *Water quality, *Aesthetics, Environmental effects, Resource development, Baseline studies.

Although advances in identification and management of aesthetic resources have been made possible through recent legislation and administrative guidelines dealing with the estuarine environment, new measures are needed if significant impacts on aesthetic resources and resulting effects on water quality are to be avoided. This paper recommends the adoption of expanded review responsibilities and standards on the part of federal and state agencies, and the creation of new funding elements to achieve improved estuarine aesthetic resource protection and management. (Sinha-OEIS)
W78-01769

FISH PRODUCTIVITY OF VOLGA RESERVOIRS AND WAYS TO INCREASE IT UNDER COMPLEX UTILIZATION OF WATER RESOURCES, (IN RUSSIAN),
A. S. Konstantinov, G. V. Nikol'skii, A. G. Poddubnyi, V. I. Romanenko, and N. S. Stroganov.
Vopr Ikhtiol 16(2), p 233-246, 1976.

Descriptors: *Fish productivity, Energy, *Eutrophication, Fish, Pollution, *Primary productivity, Reservoirs, Salmon, Sturgeon, USSR(Volga Reservoirs), Water pollution effects.

Productivity and clean water are viewed as conjugated functions of the same ecosystem. Levels of primary and secondary productivity production of Volga reservoirs (USSR) and natural fish breeding and fish production particularly for species such as sturgeon and salmon) are reviewed. Interaction of pollution, eutrophication and heat energy development is discussed.--Copyright 1977, Biological Abstracts, Inc.
W78-01777

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS,
Ecological Analysts, Inc., Baltimore, MD.
L. D. Jensen.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 359-372, 35 ref.

Descriptors: *Estuaries, *Thermal pollution, *Water pollution effects, Cooling water, Thermal stress, Aquatic life, Ecosystems.

A descriptive summary of both thermal and nonthermal power plant effects is presented with an attempt to provide an insight into the total ecological impact of power generating stations operating in estuarine systems. Specific effects of thermal and other plant associated stresses are summarized for aquatic organisms exposed to a range of time and temperature exposures resulting from once-through cooling systems. This review presents specific summaries of representative case histories of thermal effects in east coast, gulf coast, and west coast estuarine systems with an attempt to identify regional characteristics that may influence the response of aquatic populations to thermal effluents. (Sinha-OEIS)
W78-01790

OIL POLLUTION IN THE COASTAL ENVIRONMENT,
Woods Hole Oceanographic Institution, MA.
J. W. Farrington.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 385-400, 3 fig, 2 tab, 56 ref.

Descriptors: *Estuaries, *Oil spills, *Oil pollution, *Water pollution effects, Baseline studies, Biodegradation, Ecosystems, Aquatic life, *Outer Continental Shelf, *Coastal zone, Biological effects.

Petroleum and petroleum products such as fuel oil and lubricating oil are very complex mixtures of chemicals with individual compounds numbering at least in the tens of thousands. This very complex chemical mixture is introduced into the already complex system of interacting physical, chemical, biological, and geological components which constitute the marine environment. Thus, the investigation of the impact of oil pollution on the marine environment is a difficult undertaking which will require much more research before some of the potentially most serious problems are fully understood. (Sinha-OEIS)
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO,
Mississippi State Univ., Mississippi State.
L. R. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 401-408, 50 ref.

Descriptors: *Estuaries, *Oil pollution, *Water pollution effects, *Gulf of Mexico, Environmental effects, Toxicants, Ecosystems, Aquatic life, *Outer Continental Shelf, Coastal zone management, Environmental factors, Carcinogens.

The purpose of this report is to comment on the usefulness of available information on oil pollution from a standpoint of estuarine management; highlight some of the developing areas of concern; and make concrete recommendations concerning future research needs. (Sinha-OEIS)
W78-01793

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, FL.; and Eco-Analysts, Inc., Sarasota, FL.
J. L. Lincer.

Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 425-443, 5 tab, 133 ref, 3 append.

Descriptors: *Estuaries, *Ecosystems, *Pesticides, *Water pollution effects, *Organic compounds, Toxins, Polychlorinated biphenyls, DDT, Biological effects, Synthetic organics, Hexachlorobenzene, Phthalate esters.

The presence and effects of synthetic organic compounds is briefly reviewed with reference to the recent literature on the estuarine ecosystem. Pesticides and industrial toxicants are discussed in general with some attention given to synergistic and modifying effects. Recommendations for future research are made which include elucidating the effects of synthetic organics at the ecosystem level. (Sinha-OEIS)
W78-01796

TRACE METALS IN THE OCEANS: PROBLEM OR NO,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-01797

POLLUTION IN NATION'S ESTUARIES ORIGINATING FROM THE AGRICULTURAL USE OF PESTICIDES,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W78-01798

THE EFFECT OF ESTUARINE CIRCULATION ON POLLUTION DISPERSAL,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-01800

THE CRUCIAL ROLE OF SYSTEMATICS IN ASSESSING POLLUTION EFFECTS ON THE BIOLOGICAL UTILIZATION OF ESTUARIES,
Delaware Univ., Lewes.
M. R. Carriker.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proc of a Conf held at Pensacola, FL, on Feb 11-13, 1975. EPA Rept No 440/1-77-007B, Mar 1977. Vol 2, p 487-506, 2 tab 101 ref. Also as: Del Univ, Coll of Marine Studies Contribution No 103.

Descriptors: *Water pollution effects, *Systematics, *Estuarine environment, Ecosystems, Coasts, *Biological effects, Environmental impact.

The data of systematics form the essential foundation for pollutional biology. Living targets of pollution must be identified precisely; imprecision nullifies results and renders them nonreplicable. Most estuarine and coastal marine plant and animal groups are poorly known systematically. Major bottlenecks in the application of systematics to the problems of environmental pollution result from the critical shortage of experienced systematic specialists and technicians, as well as lack of inventories of specialists, identification publications, and identification services. Although water quality legislation implies the need for identification of organisms involved in analyses of the biological impacts of pollutants, there has been no conspicuous financial support for systematic work. Because basic and applied environmental research and its application to the practical problems of pollution have grown far more rapidly than the supporting base of systematic biology, it is imperative that existing human and material systematic resources be conserved, and their further development be encouraged. Specific recommendations are offered to maximize the service role of biological systematics in the identification and assessment of the effects of pollution on the biological utilization of estuaries and coastal waters in the United States. (Sinha-OEIS)
W78-01801

BACTERIA AND VIRUSES--INDICATORS OF UNNATURAL ENVIRONMENTAL CHANGE OCCURRING IN THE NATION'S ESTUARIES,
Maryland Univ., College Park.
R. R. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 507-518, 77 ref.

Descriptors: *Estuarine environment, *Bacteria, *Viruses, *Bioindicators, Microorganisms, Water pollution effects, Ecosystems, Biological effects.

Microorganisms are useful indicators of alterations in the natural environment. As presently employed, however, 'indicator organisms' such as fecal coliforms and total coliforms have severe limitations. Other organisms have been proposed in recent years as potential inidcator organisms, viz., sterptococci, clostridia, and pseudomonads. The indicator organism concept is reviewed and recommendations for future studies are made. In particular, detection, isolation, and identification of viruses, effects of pollutants on the natural microbial flora, and reevaluation of microbial indicators are critical areas requiring research. (Sinha-OEIS)
W78-01802

A BRIEF ASSESSMENT OF ESTUARY MODELING--RECENT DEVELOPMENTS AND FUTURE TRENDS,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 2L.
W78-01804

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
L. E. Cronin.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 739-756, 2 fig, 4 tab, 54 ref, 2 append.

Descriptors: *Estuaries, *Estuarine environment, *Pollutant identification, *Water pollution effects, *Environmental effects, Ecosystems, Ecology, Water resources, *Outer Continental Shelf, Coastal zone.

Twelve principal uses are made of estuaries, providing exceptional value of human interests. In the United States every one of these uses is expected to increase in the next 20 years above its present high level. At present, at least 16 major classes of pollutants are placed in estuaries, with effects that range from minor inconvenience to serious reduction in the usefulness of the system for other purposes. Some present pollutants have high potential for beneficial introduction if the quantity, site, and characteristics of the material are appropriate. In this overview, the uses and pollutants are identified, the trend for each is noted, the principal deleterious effects of pollutants in coastal waters are summarized, and visual summaries are presented to suggest which of the uses may be affected by each class of pollutant. (Sinha-OEIS)
W78-01820

KEY TO THE CHAROPHYTES OF SOUTH AFRICA,
Rhode Island Univ., Kingston. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W78-01825

PHYTOPLANKTON PRODUCTION IN LANGEBAAN LAGOON AND SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
For primary bibliographic entry see Field 2L.
W78-01837

THE ALGAL FLORA OF SALDANHA BAY,
Department of Industries, Sea Point (South Africa). Sea Fisheries Branch.
For primary bibliographic entry see Field 2L.
W78-01840

STUDIES ON THE SOUTH AFRICAN STRAIN OF SCHISTOSOMA MANSONI - PART 3: NOTES ON CERTAIN HOST-PARASITE RELATIONSHIPS BETWEEN INTRA-MOLLUSCAN LARVAE AND INTERMEDIATE HOST,
Bilharzia Field Research Unit, Nelspruit (South Africa).
C. H. J. Schutte.
South African Journal of Science, Vol 71, p 8-20, January 1975. 40 ref.

Descriptors: Feeding habits, Longevity, Intermediate hosts, Animal growth, Mortality, Animal survival, Sporocysts, Bilharzia, *Host-parasite relationships, Human parasites, Cercariae, *Mollusks, Larvae, *Snails, Biomphalaria, *Schistosoma mansoni, *South Africa.

Host-parasite relationships between freshwater snails and Schistosoma spp., relating to growth, mortality and survival, longevity, oviposition and food-consumption of snails, are reported for the South African strain of S. mansoni and the snail B. salinarum. Materials and methods were the same as those used in conjunction with a study on the intra-molluscan larval stages. (Part 2.) Cercarial counts were made according to the method described by Pitchford et al (1969). (So African Water Info Center)
W78-01847

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA.
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 10C.
W78-01852

EFFECTS AND PERSISTENCE OF ENDOTHALL IN THE AQUATIC ENVIRONMENT,
Wisconsin Univ.-Madison. Water Chemistry Program.
D. J. Holmberg, and F. G. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2738-2746, December 1976. 5 fig, 2 tab, 17 ref. EPA T-900114.

Descriptors: *Herbicides, *Water pollution effects, *Pesticide toxicity, Water pollution sources, Chlorophyll, Dissolved oxygen, Chara, Fish, Sunfishes, Degradation(Decomposition), Persistence, Aquatic weed control, Wisconsin, Ponds, *Endothall, Aquathol K, Myriophyllum spicatum, Water milfoil, Coontail, Ceratophyllum demersum, Elodea canadensis, Lepomis macrochirus.

Treatment of a pond with the herbicide endothall killed all aquatic plants except Chara; after a slow 12-day degradation period, the herbicide rapidly broke down, reaching the 0.1 mg/l level of detection in 18 days. Two ponds at the Delafield Station of the Wisconsin Department of Natural Resources were used. Both ponds, created about 65 years ago with an average depth of 1 m, were drawn down in October 1972 and refilled in early spring 1973. Plant life in the 0.32 ha treatment pond at the time of the experiment consisted of 80% water milfoil (Myriophyllum spicatum), with the remainder composed of Chara spp., coontail (Ceratophyllum demersum), Elodea canadensis, flat-stemmed pondweed (Potamogeton zosteriformis), and sago pondweed (P. pectinatus). The control pond (0.43 ha) contained 90% Chara and 10% sago pondweed. The ponds were stocked with bluegills (Lepomis macrochirus) soon after refilling. The 0.32 ha pond was treated with the dipotassium endothall formulation Aquathol K on May 31, 1973 at the maximum recommended dosage of 5 mg/l. Various water quality parameters were monitored from May 17 to the end of June. By June 9 the pondweed, coontail, and most of the water milfoil were down. The elodea eventually all but disappeared, and the whole pond was taken over by Chara. No fish mortalities were detected. A decrease in chlorophyll content was observed, and dissolved oxygen dropped to below saturation; there was no serious oxygen depletion, however. (Lynch-Wisconsin)
W78-01906

ADSORPTION OF INORGANIC PHOSPHORUS BY LAKE SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-01907

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 6G.
W78-01908

RAINWATER: NUTRIENT ADDITIONS TO A HYPEREUTROPHIC LAKE,
North Dakota Univ., Grand Forks. Dept. of Biology.
D. F. Brakke.
Hydrobiologia, Vol. 52, No. 2-3, p 159-163, 1977. 1 fig, 3 tab, 21 ref.

Descriptors: *Fallout, *Rainfall, *Chemistry of precipitation, Lakes, Phosphorus, Nitrogen, Ammonia, Nitrates, Hydrogen ion concentration, Trophic level, Precipitation(Atmospheric), Minnesota, *Wind-borne loading, *Lake Sallie(MN).

Rainwater was collected near the shores of eutrophic Lake Sallie, Minnesota and chemically analyzed in efforts to describe the magnitude of wind-borne loading of nitrogen to the lake. Rainwater pH ranged from 3.10 to 7.25, with values commonly below 4.50. Despite low pH, it contained less than 2 micrograms/l sulfate, was soft (20 micrograms/l calcium carbonate alkalinity), and had insignificant effects on the pH of well-buffered lake water. The range of total phosphorus was 0-250 micrograms/l, and the soluble reactive phosphorus range was 0-200 micrograms/l. Both were usually less than 40 micrograms/l, and often declined with continuing precipitation. The likely source of the loading is dust contamination from the fertile plains area to the west. Phosphorus inputs reached a maximum of 18.5 kg per rainfall. Ammonia was usually greater than nitrate-nitrogen. Ammonia/nitrate ratios varied from 0.3 to 10.0, and were usually 2.0 to 6.5. The range of ammonia was 100-2600 micrograms/l and nitrate 26-2060 micrograms/l. Washouts of ammonia nitrogen, and nitrate-nitrogen, followed by an increase, could be detected within a single rainfall. On many occasions, increase in primary production occurred following rainfall. (Spaeth-Wisconsin)
W78-01909

TRACE METAL CONCENTRATIONS OF SELECTED MACROFAUNA FROM A SOUTHEAST TEXAS ESTUARY,
Texas A and M Univ., Galveston. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5A.
W78-01911

A NEW TYPE OF THIOSULPHATE OXIDIZING, NITRATE REDUCING MICROORGANISM: THE OMICROSPIRA DENTRIFICANS SP. NOV.,
Nederlands Inst. voor Onderzoek der Zee, Texel.
A. Timmer-Ten Hoor.
Netherlands Journal of Sea Research, Vol. 9, No. 3-4, p. 344-350, December 1975. 2 fig, 8 ref.

Descriptors: *Denitrification, Microorganisms, Anaerobic conditions, Tidal marshes, Mud, *Thiomicrospira denitrificans, *Thiosulphate oxidation, Thiobacillus denitrificans, Netherlands.

Thiomicrospira denitrificans, a new species of thiosulphate-oxidizing, nitrate-reducing microorganisms, was isolated from a mixture of brown and black mud from tidal flats of the Dutch Wadden Sea in an anaerobic chemostat enrichment culture. The isolation of thiomicrospira was a byproduct of an effort to obtain a culture of Thiobacillus denitrificans. Thiomicrospira denitrificans is spiral-shaped, brown-colored in colonies, not motile, and is variable in length. Cells are 0.3 microns thick. It appears to be an obligate anaerobe, as well as an obligate denitrifier; this latter fact is peculiar since previously isolated nitrate-reducing organisms are normally regarded as facultatively aerobic. Although the microorganism has been isolated only once so far, future isolations should be relatively easy, as long as care is taken to ensure the complete removal of oxygen from the enrichment culture. (Lynch-Wisconsin)
W78-01912

PHYTOPLANKTON NITROGEN METABOLISM, NITROGEN BUDGETS, AND OBSERVATIONS ON COPPER TOXICITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. G. Harrison, R. W. Eppley, and E. H. Renger.
Bulletin of Marine Science, Vol. 27, No. 1, p. 44-57, 1977. 6 fig, 9 tab, 37 ref. NSF GX-42579.

Descriptors: *Copper, *Nitrogen, *Phytoplankton, Nitrate, Ammonium compounds, Metabolism, Nutrients, Toxicity, Eutrophication, Ecosystems, Pollutants, Water pollution, Carbon, Radioisotopes, *Canada, Research equipment, Testing procedures, *Nitrogen budgets, *Nitrogen metabolism, CEPEX program, Controlled Experimental Ecosystem, *Saanich Inlet(Canada).

The effects of pollutants of assimilation of nitrogen by phytoplankton were studied in three experiments of the CEPEX program, in which water columns were entrapped in 0.25-scale Controlled Experimental Ecosystem enclosures (CEEs) at Saanich Inlet, B. C., Canada. Assimilation rates were measured isotopically with 15N-labelled nitrate and ammonium using water samples from the CEEs. Assimilation rates of both nitrate and ammonium were regulated daily, primarily by the ambient concentrations and overall by the rate of nutrient loading, except in the two to three days following copper addition, when acute inhibition of nitrate assimilation was noted; ammonium assimilation was barely affected. Rates returned to normal a few days after the copper addition. Other acute effects of copper included inhibition of photosynthetic carbon assimilation and synthesis of nitrate reductase, and cell disruption and loss of accumulated ammonium in Noctiluca sp. Evidence indicates that copper severely limits phytoplankton growth, and results in a change from the initial species composition to a copper-resistant assemblage. Even after this selection process, the copper in the CEEs remained in a chemical form toxic to control phytoplankton. The degree of copper tolerance of the phytoplankton was related to ambient copper concentrations. Overall phytoplankton levels and settlement rates were related to the rate of nutrient loading. Remineralization of nitrogen to ammonium was rapid and important. (Lynch-Wisconsin)
W78-01915

BIOLOGICAL TRANSPORT OF COPPER AT LOCH EWE AND SAANICH INLET: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Marine Lab., Aberdeen (Scotland).
G. Topping, and H. L. Windom.
Bulletin of Marine Science, Vol 27, No 1, p 135-141, 1977. 6 fig, 5 tab, 10 ref. NSF OCE 73-09763.

Descriptors: *Translocation, *Copper, Phytoplankton, Zooplankton, Primary productivity, Carbon, Water pollution, Pollutants, Sea water, Ecosystems, Grazing, Adsorption, Canada.
Identifiers: Scotland, Saanich Inlet(Canada), Loch Ewe(Scotland), CEPEX program, Uptake, Controlled Experimental Ecosystem.

Controlled Experimental Ecosystem enclosures (CEEs) were used to relate translocation of added copper to phytoplankton and zooplankton activity. Copper sulfate solutions was injected into CEEs containing seawater (three at Saanich Inlet, Vancouver Is., Canada, and two at Loch Ewe Scotland). At Saanich Inlet, a 50 microgram cu/l concentration decreased to 30 micrograms/l during the first day, and then gradually decreased over the next 24 days to just over 40% of the originally-added amount. Settlement material generally showed a continuing accumulation of copper. The material consisted almost entirely of phytoplankton which settled rapidly out of the water after addition of the copper. However, only 13% of the loss from the water could be accounted for by uptake; 45% of the loss was unexplained, possibly due to water exchanges over the sides of the CEE. At Loch Ewe both CEEs were dosed with 10 micrograms Cu/l; severe losses of copper took place in both. Percentages of copper in settlement material were 0.8% and 1.1%. Copper loss at both sites seemed directly proportional to the level of phytoplankton primary production, and correlated significantly with carbon and the concentration of soluble copper added. Copper:carbon ratios were higher at Loch Ewe where sediments consisted mainly of fecal pellets, than at Saanich Inlet, whose sediments were mostly phytoplankton, indicating the importance of zooplankton grazing. (Lynch-Wisconsin)
W78-01916

FLOOD EFFECTS ON STREAM ECOSYSTEMS,
Soil Conservation Service, Little Rock, AR.
For primary bibliographic entry see Field 2E.
W78-01919

THE INFLUENCE OF A DEEP-STORAGE AND AN UNDERGROUND RESERVOIR ON THE PHYSIOCHEMICAL LIMNOLOGY OF A PERMANENT CENTRAL TEXAS RIVER,
Southwest Texas State Univ., San Marcos. Aquatic Station.
H. H. Hannan, and L. Brox.
Hydrobiologia, Vol. 5, No. 1, p 43-64, 1976. 10 fig, 5 tab, 32 ref.

Descriptors: *Reservoirs, *Limnology, *Physicochemical properties, Water quality,

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Rivers, *Texas, Underground storage, Dissolved oxygen, Thermal stratification, Water quality, Nutrients, Water temperature, Cations.
Identifiers: Guadalupe River(TX), Comal River(TX), Canyon Reservoir(TX), Edwards Underground Reservoir(TX).

A 98-km segment of the Guadalupe River (Texas) and a tributary, the Comal River, were studied to determine the influence of two reservoirs on the physiochemical limnology of the river. Canyon Reservoir is a deep-storage bottom-draining reservoir in Comal County. Depth ranges from 37-40 m, and the reservoir holds 5000 million cu m. Edwards Underground Reservoir is a limestone aquifer in south-central Texas. It is 282 km long by 8-65 km wide, and contains 3.5 billion cu m. The Comal River fed by springs from the underground reservoir, enters the Guadalupe downstream from Canyon Reservoir, which impounds the Guadalupe waters. Six stations on the two rivers were sampled between March 1973 and February 1974 for total phosphate phosphorous, dissolved orthophosphate phosphorus, dissolved nitrate nitrogen, chlorophyll a, dissolved oxygen, percent saturation of oxygen, pH total alkalinity, turbidity, specific conductance, water temperature, calcium, magnesium, sodium, potassium, iron, and copper. In general, impoundment in Canyon Reservoir improved water quality of the Guadalupe River, while inflow from the underground reservoir via the Comal River resulted in deterioration of the river. The combined effect of the two reservoirs included decreases in nitrate nitrogen, pH, alkalinity, specific conductance, calcium, magnesium, and sodium, and increases in percent saturation of oxygen, and potassium. (Lynch-Wisconsin)
W78-01920

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
T. K. Van, W. T. Haller, G. Bowes, and L. A. Garrard.
Journal of Aquatic Plant Management, Vol.15, p 29-31, June, 1977. 1 fig, 3 tab, 12 ref.

Descriptors: *Chlorophyll, *Plant growth, *Light quality, Submerged plants, Growth rates, Florida, Aquatic plants, Aquatic weed control.
Identifiers: *Hydrilla verticillata, *Vallisneria neotropicalis, Hydrocharitaceae, Rodman Reservoir(FL), Orange Co.(FL).

Hydrilla verticillata and Vallisneria neotropicalis plants were collected at various depths in adjoining earthen ponds in Orange County, FL to measure effects of water depth on chlorophyll content. A general decrease in total chlorophyll content at increasing water depths was observed in both plants. However, while chlorophyll a:b ratios remained constant at all depths for vallisneria, the a:b ratio for hydrilla decreased from 1.77 at the water surface to 1.15 at a depth of 1.5 m. Hydrilla had longer internodes at greater depths, and this increase in the proportion of stem to leaf may contribute to the lower chlorophyll content and lower chlorophyll a:b ratio at greater depths. The change in favor of chlorophyll-b suggests an adaptation of hydrilla to spectral changes in deeper waters. To determine whether pigment adaptation occurs, hydrilla tubers collected in Rodman Reservoir, FL, were germinated and grown under white, green, blue, and red light. Stem elongation was most pronounced under green light, while plants under red light were shorter, stockier, and highly branched. Dry weight yields were higher under red and blue light; green and white light produced the lowest yields. Total chlorophyll content was not affected, but the chlorophyll a:b ratio was lower in plants grown under green light. (Lynch-Wisconsin)
W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
G. Bowes, T. K. Van, L. A. Garrard, and W. T. Haller.
Journal of Aquatic Plant Management, Vol. 15, p 32-35, June, 1977. 4 fig, 2 tab, 9 ref.

Descriptors: *Light intensity, *Growth rates, Chlorophyll, Florida, Respiration, Photosynthesis, Weight, Aquatic weeds, Submerged plants, Aquatic weed control.
Identifiers: *Hydrilla verticillata, Orange Lake(FL), Rodman Reservoir(FL).

Mature apical stem sections of hydrilla verticillata and shoots developing from tubers, subjected to low light levels, similarly adapted their photosynthetic and respiratory characteristics to the lower light conditions. Stem sections were collected in Orange Lake, FL and tubers from Rodman Reservoir. In the 15 years since its introduction, hydrilla has become Florida's most serious aquatic weed problem; its rapid spread in a body of water and dominance over native plants are probably related to its low photosynthetic light requirement. Four quantum flux density levels (6, 30/120 and 300 microeinsteins/sq m/sec--low, intermediate, and high) were obtained using fluorescent and incandescent lamps varied with neutral density filters. For apical stem sections, photosynthetic rates were higher under low and intermediate light than under high light, and the light saturation point was four times as great under light than under low light. The light-saturated photosynthetic rate under high light was 5.4 micromoles CO2/mg Chl/hr, and only 2.6 under low light. Photorespiration rates seemed unaffected by the light levels, but chlorophyll concentration increased as light level decreased, except at the lowest level. All plants increased in length and fresh weight, although at the lowest level a decrease in dry weight occurred; below 10-12 microeinsteins/sq m/sec plants were incapable of increasing in dry weight. Larger tubers produced shoots that were both longer and had a higher survival rate than smaller ones. (Lynch-Wisconsin)
W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
T. R. Batterson.
Journal of Aquatic Plant Management, Vol. 15, p 36-40, June, 1977. 4 fig, 1 tab, 21 ref. EPA T-900331.

Descriptors: *Aquatic weed control, *Calcium, *Phosphorus, *Calcium compounds, Salts, Nutrients, Nutrient requirements, Growth rates, Absorption, Michigan.
Identifiers: *Coontail, *Ceratophyllum demersum.

A study of calcium salts (carbonate and sulfate) for controlling coontail (Ceratophyllum demersum) through phosphorus inactivation in lake water showed that a compound currently being developed for commercial aquatic weed control, composed of 80% calcium sulfate (by weight), 17% aluminum sulfate, 1% boric acid, and 2% inert ingredients, would be ineffective against the plant at the specified maximum dosage of 21 ppm. Experiments were conducted using plastic bags in an aerobic waste stabilization pond at Belding, MI. Coontail was selected as the test plant because its tissue concentration of phosphorus is known to respond proportionally to available ambient phosphorus concentrations. Total alkalinity, phenolphthalein alkalinity, total hardness, orthophosphate, total phosphate, pH, and temperature were monitored in the water, and coontail were analyzed for dry weight, ash-free dry weight, and tissue phosphorus concentration. Calcium salts (CaCO3, CaCO4, and a combination at 1:1) were applied at 0, 7, 14 and 21 ppm in triplicate for each of 12 treatment combinations. Coontail showed no response to these treatments, in either productivity or tissue concentration of phosphorus. Although total phosphorus in the ambient water declined significantly, plants responded as though concentrations were constant. (Lynch-Wisconsin)
W78-01928

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS,
Florida Game and Fresh Water Fish Commission, Eustis.
C. C. Carter, and R. S. Hestand.
Journal of Aquatic Plant Management, Vol. 15, p. 47-56, June, 1977. 3 fig, 6 tab, 19 ref.

Descriptors: *Herbicides, *Aquatic weed control, *Diquat, Environmental effects, Phytoplankton, Sulfur bacteria, Bacteria, Toxicity, Florida, Submerged plants, Chara, Succession.
Identifiers: *TD-1874, *Hydrothol 191, *System E, Endothall, Hydrilla verticillata, Water milfoil, Myriophyllum spicatum, Coontail, Ceratophyllum demersum, Vallisneria americana, Najas guadalupensis.

Effects of four herbicides on six submerged plant species were tested in plastic pools in central Florida. The herbicides included three salt formulations of endothall (TD-1874, Hydrothol 191, and System E) and Diquat with Cutrine Plus. Plants tested were Hydrilla verticillata, Eurasian water milfoil (Myriophyllum spicatum), coontail (Ceratophyllum demersum), muskgrass (Chara sp.), Vallisneria americana, and southern naiad (Najas guadalupensis). All except System E resulted in 100% control of the submerses macrophytes, high turbidity due to dense sulfur bacteria and phytoplankton blooms, and putrid odors of H2S gas from decaying fish, invertebrates, and macrophytes. Pools treated with System E, the dihydroxy aluminum salt of endothall, were characterized by low turbidity and no unpleasant odor. Muskgrass, the only plant not eliminated by System E, instead persisted and crowded out the affected plants, utilizing nutrients released during decomposition. Muskgrass capacity for nutrient removal hindered planktonic algal growth, not only eliminating high bacteria counts as plants decomposed, but phytoplankton populations as well. The succession of bacteria, flagellates, and green, blue-green, and yellow-green phytoplankton in control and treated pools is presented in tabular form. (Lynch-Wisconsin)
W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO EGGS, ALEVINS, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES,
Agricultural Research Service, Washington, DC.
R. R. Yeo, and N. Dechoretz.
Journal of Aquatic Plant Management, Vol. 15, p. 57-60, June, 1977. 3 tab, 25 ref.

Descriptors: *Rates of application, *Herbicides, *Diquat, *Rainbow trout, Copper, Ions, Algae, Toxicity, California, Spawning, Fry, Mayflies, Chinook salmon, Fish, Fish hatcheries.
Identifiers: *Copper ion, *Salmo bairdneri, Baetis baetis bicaudatus, Tropisternus lateralis, Cladophora glomerata, Oncorynchus tshawytscha, Alevins.

A combination of the herbicide diquat plus copper ion, which has been used to control algae in chinook salmon artificial spawning channels, was tested for lethal effects on eggs, alevins, and fry of steelhead rainbow trout (Salmo gairdneri), and on mayfly nymphs (Baetis bicaudatus) and immature water scavenger beetles (Tropisternus lateralis), common in the channels. Eggs of steelhead rain-

bow trout, a salmoid fish, were used in the study because fertilized salmon eggs were unavailable. Experiments were conducted at the downstream end of the fish access channel at the Tehama-Colusa Fish Facility at Red Bluff, California. The recommended application rate of the herbicide for algae control is 100 ppbw diquat plus 150 ppbw copper ion applied for three hours. Various concentrations of diquat (25-8,000 ppbw) plus copper ion (35-12,000 ppbw) were used. Concentrations up to 800 ppbw diquat plus 1,200 ppbw copper ion did not significantly affect the number of viable or hatched eggs, or alevins (6-9%, 8-12%, and 0% mortality respectively. At 4,000 plus 6,000 ppbw all alevins were killed. A significant number of fry (20%) and mayfly larvae (34%) were killed at 400 plus 600 ppbw, but not at the dosage recommended for algae control. Up to 800 plus 1,200 ppbw water scavenger beetles were unharmed; at 4,000 plus 6,000 ppbw mortality was 17%. (Lynch-Wisconsin)
W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES,
Florida Game and Fresh Water Fish Commission, Eustis.
R. S. Hestand, and C. C. Carter.
Journal of Aquatic Plant Management, Vol. 15, p. 60-64, June, 1977. 5 fig, 11 ref.

Descriptors: *Herbicides, *Succession, *Diquat, *Aquatic weed control, Florida, Chara, Submerged plants, Toxicity.
Identifiers: *System E, *TD-1874, *Hydrothol 191, Endothall, Coontail, Ceratophyllum demersum, Vallisneria americana, Hydrilla verticillata, Myriophyllum spicatum, Water milfoil, Najas guadalupensis.

Tests with four herbicides--TD-1874, Hydrothol 191, System E, and Diquat with Cutrine Plus--applied to six submersed plant species in plastic pools to document resultant lethal effects and plant succession, showed that selective management of species composition is possible. Treatment with TD-1874 and Hydrothol 191 caused eventual hydrilla dominance; System E resulted in muskgrass dominance; and Diquat with Cutrine Plus caused eelgrass dominance. The experiment in central Florida involved coontail (Ceratophyllum demersum), muskgrass (Chara sp.), eelgrass (Vallisneria americana), Hydrilla verticillata, Eurasian water milfoil (Myriophyllum spicatum), and southern naiad (Najas guadalupensis). Each pool was planted with equal amounts of each species and allowed to stabilize for a year. Average cover before treatment was 37% hydrilla, 26% southern naiad, 18% water milfoil, 14% muskgrass, 14% eelgrass, and 4% coontail. All herbicides except System E rapidly controlled all plants; System E worked more slowly and did not affect muskgrass. With Hydrothol 191 and TD-1874 hydrilla ultimately achieved 75% and 70% dominance after 90 days followed by southern naiad at 25% and 30%. Diquat with Cutrine Plus resulted in long-term control, with eelgrass (50%) and hydrilla (35%) eventually becoming dominant. With System E long-term control was evident, but the immunity of muskgrass resulted in its dominance (50% cover); southern naiad and hydrilla each achieved 15% cover. (Lynch-Wisconsin)
W78-01932

THE EARLY SUMMER BLOOM OF DINOFLAGELLATES IN THE NORTH SEA SPECIAL REFERENCE TO 1971,
Birbeck Coll., London (England). Dept. of Botany.
J. D. Dodge.
Marine Biology, Vol. 40, No. 4, p. 327-336, 1977. 4 fig, 1 tab, 19 ref.

Descriptors: *Data collections, *Dinoflagellates, *Phytoplankton, Diatoms, Algae, Aquatic algae, Aquatic plants, Distribution, Plankton, Stratification, Turbidity.
Identifiers: *North Sea, Chaetoceros, Gonyaulax tamarensis, Dinophysis norvegica.

Observations since 1968 in the North Sea adjacent to the NE coast of England show an annual bloom of dinoflagellates in late May and June. During Spring, 1971 the entire water column in the study area was sampled using a 256 mesh net. In March, when the spring diatom burst would be expected, turbulent and turbid water prevented stratification, indicating low temperature throughout the water column. Only away from shore in deeper water was there an appreciable production of diatoms and dinoflagellates during March. By early May, when the calmer and less turbid water became stratified, a massive bloom of diatoms (mainly Chaetoceros spp.) had spread across the northern half of the area. Fairly large numbers of dinoflagellates were included (e.g., Gonyaulax tamarensis). The diatom bloom died away, including G. tamarensis, followed by extensive growths of other dinoflagellates dominated by Dinophysis norvegica. Maximum counts of over 28 million dinoflagellates/cu m were recorded. In the southern part of the survey area, which does not become appreciably stratified, few dinoflagellates were produced, except in the southern swirl. There may be a critical salinity for the growth of Ceratium furca and C. tripos, which aligned along the 34.5% isohaline. A total of 61 species of dinoflagellates were found during the survey. (Lynch-Wisconsin)
W78-01934

HYDROCARBON STATUS IN FLORIDA REAL ESTATE CANALS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. G. Hansen, G. Bitton, J. L. Fox, and P. L. Brezonik.
Marine Pollution Bulletin, Vol 8, No 3, p 57-62, March, 1977. 3 fig, 4 tab, 27 ref. Dept. of Environ. Regulation, Florida.

Descriptors: Organic compounds, *Sediments, *Florida, *Canals, Water pollution sources, Aerobic bacteria, Urban runoff, Gas chromatography, Storm runoff.
Identifiers: *Punta Gorda(FL), *Port Charlotte(FL), *Lexahatchee River(FL), *Pompano Beach(FL).

Levels of hydrocarbons and related bacterial populations in Florida real estate canal sediments were studied. Canals at Punta Gorda and Port Charlotte on the west coast of southern Florida and at Pompano Beach and the Loxahatchee River on the east coast were examined. The highest level of total hydrocarbons observed, was 4.60 mg per 100 g of wet sediment, at a station in the Port Charlotte canals. Gas chromatography indicated that 10 of the 16 components found at various localities were n-paraffins ranging from tetradecane to heptacosane. The number present at each locality varied. A significant difference at the 95% confidence level was observed in the hydrocarbon content between the east and west coast canals. Petroleum hydrocarbons usually have a ratio of the sum of the amounts of even carbon numbered alkanes to odd carbon numbered alkanes approaching 1.0, while those from biological sources show ratios nearer to zero. The ratio at the Loxahatchee River sediments was 0.29, at Pompano Beach 0.50, and at Punta Gorda and Port Charlotte were 0.82. This indicates some possible cultural input at the latter sources. The percentage of aerobic, hydrocarbon degrading bacteria relative to the total number of aerobic bacteria was higher at Punta Gorda (3.8%), and Port Charlotte (16.7%), than at Pompano Beach (0.2%), and Loxahatchee River (0.04%). (Spaeth-Wisconsin)
W78-01935

THE EFFECTS OF DIMETHYL PHTHALATE ON THE GROWTH OF PSEUDOMONAS AERUGINOSA,
Our Lady of the Lake Coll., San Antonio, TX.
J. A. Perez, J. E. Downs, and P. J. Brown.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 4, p 486-490, 1976. 3 fig, 19 ref. NIH 5-S06-RR-80877-03.

Descriptors: *Pseudomonas, *Degradation(Decomposition), *Biodegradation, Bacteria, Assay, Pollutants, Water pollution, Industrial wastes, Plastics.
Identifiers: *Phthalic acid esters(PAE), *Dimethyl phthalate(DMP), Plasticizers, Phthalates.

Phthalic acid esters (PAEs), persistent environmental contaminants used as plasticizing agents that reach the environment via waste plastics or directly from industrial manufacturers, are known to be rapidly biodegraded by microbes. In this study the effect of the PAE dimethyl phthalate (DMP) on the growth rate of the bacterium Pseudomonas aeruginosa is examined. DMP was incorporated into media containing P. aeruginosa at concentrations of 10, 100, 500, 1000, and 1500 ppm. After 0 and 10 hours of incubation growth of P. aeruginosa was not inhibited at concentrations of 10 to 1000 ppm, but was only slightly inhibited at 1500 ppm. After 24 hours of incubation no inhibition at any concentration was observed. In fact, growth increase over the control was noted at concentrations of 10 to 1000 ppm after 0, 10, and 24 hours of incubation at rates of 5.5-15.8%. Even after 48 hours of incubation (death phase) the cell concentrations of P. aeruginosa in the 10 and 100 ppm cultures still exceeded the control by 4.9 and 2.9%. These results suggest that the bacterium may be utilizing DMP as a carbon source, and therefore P. aeruginosa would be a likely candidate for the utilization and degradation of DMP. (Lynch-Wisconsin)
W78-01937

TIDAL VARIATIONS IN THE MOVEMENT OF ORGANIC CARBON IN NEW JERSEY SALT MARSHES,
New Jersey Agricultural Experiment Station, New Brunswick.
For primary bibliographic entry see Field 5B.
W78-01938

TRANSFER OF THE CHLORINATED HYDROCARBON PCB IN A LABORATORY MARINE FOOD CHAIN,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-01939

ZOOPLANKTON SAMPLING VARIABILITY: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5A.
W78-01941

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN I. EFFECTS OF PHYTOPLANKTON,
Saint Andrews Univ. (Scotland). Dept. of Botany.
B. P. Jupp, and D. H. N. Spence.
Journal of Ecology, Vol 65, No 1, p 175-186, 1977. 4 fig, 2 tab, 35 ref.

Descriptors: *Eutrophication, *Submerged plants, *Algae, *Phytoplankton, Aquatic plants, Phosphorus, Nutrients, Turbidity, Biomass, Lakes.
Identifiers: *Loch Leven(Scotland), Scotland, Macrophytes, Species diversity, Chara Aspera, Nitella opaca, Potamogeton filiformis, Zannichellia palustris, Anabaena.

The decline in both abundance and diversity of submerged macrophytes in Loch Leven (Scotland), a shallow, nutrient-enriched lake near Edinburgh, is attributed to high phytoplankton densities resulting from cultural eutrophication. About 67% of its catchment is agricultural land used for grassland, cereals, vegetables, fruit, and poultry farming. In 1910, 23 species of submerged macrophytes were recorded, many abundant, which colonized to a depth of 5 m. Now there are only 12 species, of which only four are abundant: Chara aspera, Nitella opaca, Potamogeton filiformis, and Zannichellia pallustris. All 12 are restricted to water less than 1 m deep. P. filiformis and Z. pallustris are indicators of cultural enrichment. The present study, covering 1972-74, analyzed data on biomass, light intensity and penetration, temperature, pH, nitrate-N, phosphate-P, total P, and chlorophyll. In 1972-73, competition from algal blooms between May and October adversely affected the biomass of P. filiformis. This could be partly explained by underwater light attenuation by high chlorophyll levels. The attenuation was particularly serious when the bloom consists of buoyant blue-green algae such as Anabaena spp., which can form dense floating scums over macrophyte beds. Where levels of phosphorus (phosphate plus total P) exceed 0.05 mg/l during summer months, blue-green algae blooms which may retard macrophyte growth are likely to occur. (Lynch-Wisconsin)
W78-01942

RESPONSES OF CONTINUOUS-SERIES ESTUARINE MICROECOSYSTEMS TO POINT-SOURCE INPUT VARIATIONS,
Battelle Columbus Labs., OH.
D. C. Cooper, and B. J. Copeland.
Ecol Monogr. 43(2), p 213-236, 1973.

Descriptors: Water pollution sources, Microorganisms, Chlorophyta, Chrysophyta, Cladocera, Copepoda, Cyanophyta, *Ecosystems, Effluents, Environmental effects, Estuarine environment, Euglenophyta, Nematoda, Ostracoda, Polychaeta, Primary productivity, Protozoa, Respiration, Rotifers, Standing crops, Industrial wastes.

Six continuous-series microecosystems, each containing 5 cells, were constructed to simulate hydrological factors of estuarine regions. Exchange and retention characteristics were adjusted to closely model the hydrological conditions of Trinity Bay, Texas. The metabolic and structural responses of the microecosystem communities to quantitative and qualitative changes in freshwater input were investigated. Primary production and community respiration in the 1st 3 cells of the microecosystems were dependent on both quantity and quality of freshwater input, whereas primary production and community respiration in the saltwater portions (cells 4, 5) of the microecosystems were virtually independent of the quantity and quality of freshwater input. Metabolism of the freshwater portions of the microecosystems was heterotrophic under normal flow conditions and autotrophic under drought conditions. Addition of an industrial effluent to the freshwater inputs resulted in extensive shifts towards metabolic heterotrophy of the more freshwater portions of the microecosystems. Metabolism of the saltwater cells was heterotrophic under all conditions of freshwater input. The upstream communities were adapted to a dependency on allochthonous materials input for production and respiration maintenance. Retarding freshwater input resulted in tying up larger portions of the nutrient pool within the systems in living components. Addition of industrial effluent increased the community maintenance requirements. Retarding freshwater input acted as an environmental stress on the 1st 3 cells of the microecosystems. Magnitudes of production and respiration were significantly lower, and zooplankton standing crops and species diversity decreased significantly. Addition of industrial effluent produced similar effects. Decreased freshwater input rate (primary stress) rendered the receiving communities more susceptible to the industrial effluent addition (secondary stress). The organismal composition of the microecosystems was qualitatively similar but quantitatively dissimilar to the organismal composition of Trinity Bay. Because of fundamental similarities in all living systems, the observed responses might be especially representative of those which would occur in Trinity Bay if subjected to similar hydrological alterations.—Copyright 1974, Biological Abstracts, Inc.
W78-01944

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY,
Old Dominion Univ. Research Foundation, Norfolk, VA.
For primary bibliographic entry see Field 5A.
W78-01946

SOME PRELIMINARY OBSERVATIONS ON THE ENHANCEMENT OF PHYTOPLANKTON GROWTH BY LOW LEVELS OF MINERAL HYDROCARBONS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
T. R. Parson, W. K. W. Li, and R. Waters.
Hydrobiologia, Vol 51, No 1, p 85-89, 1976. 4 fig, 1 tab, 8 ref.

Descriptors: *Organic compounds, *Photosynthesis, *Oily water, *Phytoplankton, Fuels, Nannoplankton, Environmental effects, Adsorption, Marine algae.
Identifiers: *Chrysochromulina kappa, Nitzchia sp., Olisthodiscus luteus, Skeletonema costatum, Dunaliella tertiolecta, Isochrysis galbana, Alkanes.

Effects of low hydrocarbon concentrations on marine algae under laboratory and field conditions were examined. In laboratory experiments, Nitzchia sp. and Olisthodiscus luteus, showed increased photosynthesis at low hydrocaron concentrations, which decreased with increasing hydrocarbon concentration. Skeletonema costatum showed increased photosynthesis when treated with aromatics or alkanes, but decreased photosynthesis when treated with alkenes. Dunaliella tertiolecta decreased photosynthesis as concentrations of alkanes, alkenes, or aromatics increased. Isochrysis galbana showed decreased photosynthesis at all hydrocarbon concentrations. An increase of aromatic hydrocarbons to concentrations between 75 and 220 ppb, caused an increase in nanoplankton of 6-16 millimicron diameter. Increases in chlorophyll-a concentrations were mainly caused by Chrysochromulina kappa, which was further cultured in the laboratory. In the latter, photosynthesis increased by treatment with low concentrations of hydrocarbons, when bicarbonate uptake was measured 72 hours after treatment. Enhancement of carbon-14 uptake by number 2 fuel oil tends to maximize at about 50 ppb, and then declines. Twelve hour incubations gave either no response, or slight inhibition of photosynthetic activity. (Spaeth-Wisconsin)
W78-01951

LOCH EWE BAG EXPERIMENT, 1974,
Marine Lab., Aberdeen (Scotland).
J. C. Gamble, J. M. Davies, and J. H. Steele.
Bulletin of Marine Science, Vol. 27, No. 1, p 146-175, 1977. 25 fig, 6 tab, 48 ref.

Descriptors: *Plankton, *Ecosystems, Ecology, Phytoplankton, Zooplankton, Copper, Primary productivity, Diatoms, Research equipment, Predation.
Identifiers: *Controlled Experimental Ecosystems, CEPEX program, Ctenophores, Bolinopsis infundibulum, Cerataulina pelagica, Chaetoceros, *Loch Ewe(Scotland), Scotland.

Four clear polyethylene enclosures (Controlled Experimental Ecosystem enclosures, or CEEs) 17 m long were used during Spring 1974 to study planktonic ecosystems in Loch Ewe, Scotland. Studies included rates of nutrient enrichment, variations in predator numbers and additions of copper. Mean water depth in the area of the experiment was about 26 m. Differences in rates of nutrient enrichment altered the rate of primary production without greatly altering phytoplankton biomass. For the two bags with only small nutrient additions, the primary production rate was about half that in the natural environment. Variations in phytoplankton population structure and herbivore biomass were apparently due to varying predator numbers. The dominant carnivore was the lobate ctenophore Bolinopsis infundibulum. Experiments showed that an average-sized (6 mg dry wt) individual can consume over 100 adult copepods, such as Acartia and Temora, per day. In all bags and in the sea, a bloom of the diatom Cerataulina pelagica occurred during May, 1974, accompanied by Rhizosolenia spp. Disappearance of the bloom by July was correlated to an infection by an intracellular chytrid parasite. Evidence of an effect of copper was at best circumstantial; any effects were probably less than those arising from nutrient addition or predator variations. (Lynch-Wisconsin)
W78-01954

EFFECTS OF ORGANIC PHOSPHATE ON THE GROWTH AND MORPHOLOGY OF SCENEDESMUS OBTUSIUSCULUS (CHLOROPHYCEAE),
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Botany.
T. J. Monahan.
Phycologia, Vol. 16, No. 2, p 133-137, 1977. 2 fig, 1 tab, 12 ref. RURC 07-2177, BSSG RR7059.

Descriptors: *Scenedesmus, *Growth rates, *Phosphates, Population, Cultures, Density.
Identifiers: *Scenedesmus obtusiusculus, *Glycerophosphate medium, *Bristol's medium, Colony formation, Unicells, Polymorphism.

A study of the effects of organic and inorganic phosphate on the growth and morphology of the spineless, polymorphic green alga Scenedesmus obtusiuscul in laboratory cultures showed that organic phosphate (as glycerophosphate) supports a higher rate of growth than does inorganic phosphate. In limited volume cultures, in Bristol's medium, maximum colony formation of about 60 cents occurred, while cultures were in logarithmic or near logarithmic growth. Maximum colony formation of about 80% occurred while the cultures were in a declining phase of growth in glycerophosphate medium. Glycerophosphate cultures maintained about 93% colonies, and averaged 1.13 doubling-day-1 in cell number, while Bristol cultures showed a gradual increase in colony production, reaching a maximum of 70% colonies, and averaged 0.90 doublings-day-1 in cell number. Comparison of S. obtusiusculs grown in media containing inorganic and organic phosphate sources, demonstrates that the form of phosphate is a morphogenic factor in growth and colony formation. Phosphate in freshwaters is usually associated with organic matter. Most laboratory studies of fresh water micro-algal morphology, are made with media containing inorganic phosphate. In field collections, spineless Scenedesmus similar to S. obtusiusculus are often observed in colonies. Unicellular populations are common in laboratory culture. (Spaeth-Wisconsin)
W78-01955

EDAPHIC DIATOM COMMUNITIES ASSOCIATED WITH SPARTINA ALTERNIFLORA AND S. PATENS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Entomology and Economic Zoology.
M. J. Sullivan.
Hydrobiologia, Vol. 52, No. 2-3, p 207-211, 1977. 3 tab, 8 ref.

Descriptors: *Diatoms, *Salt marshes, Communities, New Jersey, Grasses, Brackish water.
Identifiers: *Spartina alterniflora, *Spartina patens, Tuckerton(NJ), Edaphic diatom communities.

A study describes the composition of edaphic diatom communities of sediments underlying the marsh grasses Spartina alterniflora and S. patens in the Great Bay salt marsh, Tuckerton (NJ). Forty-nine diatom taxa collected in the study were constituents of the edaphic communities associated with dwarf S. alterniflora and 83 taxa with S. patens. There were eight taxa in the dwarf S. alterniflora community and 42 in the S. patens community. Forty-one taxa were common to both. Endemic taxa made up 1.8% of the S. alterniflora community and 18.8% of all individuals counted in the S. patens community. A highly significant relationship (P less than 0.001) between the number of diatom taxa and the marsh surface salinity at the S. patens habitat was demonstrated by least-squares regression analysis. Thus it was assumed that dissimilarity in the structure of the two edaphic diatom communities was primarily due to the very low marsh surface salinities at the S. patens habitat from January through June, and that this sustained low-salinity regime allowed a very large number of taxa to coexist only in the S. patens community. Values for species diversity (H'), and evenness (J') indices and the number of diatom taxa contained in each sample, were averaged for the twelve collection dates, and given for each habitat. The S. patens community was much larger for all three values than S. arterniflora. The calculated value of SIMI (similarity index) was 0.746 for a comparison between edaphic diatom communities associated with dwarf S. arterniflora and S. patens on a yearly basis. (Spaeth-Wisconsin)
W78-01956

THE EFFECTS OF SOME DETERGENTS ON THE GROWTH OF NITZSCHIA HOLSATICA HUST. (DIATOMEAE),
Helsinki Univ. (Finland). Dept. of Botany.
H. Nyberg.
Annales Botanici Fennici, Vol. 13, No. 2, p 65-68, 1976. 6 fig, 14 ref.

Descriptors: *Inhibition, *Growth rates, *Detergents, Toxicity, Temperature, Vegetation effects.
Identifiers: *Sodium dodecyl sulphate, *Triton X-100, *Sodium desoxycholate, *Cetyl trimethylammonium bromide, *Nitzschia holsatica.

The effect of the four detergents sodium dodecyl sulphate (SDS), Triton X-100, sodium desoxycholate (NaDOC), and cetyl trimethylammonium bromide (CTAB) on the growth of pure culture of the planktonic diatom Nitzschia holsatica Hust. from the Gulf of Finland were studied. The detergents were either alone, or in two-compound mixture. The detergents usually retarded the growth of N. holsatica to a varying degree. CTAB is the most inhibitory of the four compounds at both 15 C and 25 C; SDS, Triton X-100, and NaDOC are slightly less harmful. Triton X-100 has temperature-dependent effects. At low concentrations at 25 C, very slight growth promotion can be seen. SDS moderately inhibits growth but is not as harmful as Triton X-100 at higher concentrations. All mixtures containing CTAB were very toxic at 15 mg/l at 15 C and their toxic effect could already be observed at 5 mg/l at both temperatures. Growth curves of mixtures not containing CTAB show no great difference between them, but differ quite clearly from CTAB mixture curves, especially at 15 C. Several mixtures exhibited more toxicity than their separate components at corresponding concentrations. (Spaeth-Wisconsin)
W78-01958

THE RELATIONSHIP BETWEEN PLANKTONIC ALGAE AND BACTERIA IN SMALL LAKE,
Alberta Univ., Edmonton. Dept. of Botany.
M. Hickman, and I. D. Penn.
Hydrobiologia, Vol 52, No 2-3, p 213-219, 1977. 3 fig, 62 ref.

Descriptors: *Phytoplankton, *Aerobic bacteria, *Anaerobic bacteria, *Depth, *Seasonal, Chemical stratification, Thermal stratification, Hypolimnion, Organic matter, Reproduction.
Identifiers: *Bacterioplankton, *Abbot's pond(England), Oxygen depletion.

Studies were made on Abbot's Pond, near Somerset, England, a small, edaphically eutrophic lake to determine the relationship between bacterioplankton and phytoplankton during different seasons and at different depths. Thermal and chemical stratification occur annually with strong summer oxygen depletion in the hypolimnion. Anaerobic bacteria show almost no change with depth until June stratification, when they begin to increase with increasing depth below two meters. After stratification breakdown in autumn, anaerobic bacteria numbers decrease and show almost no change with depth. Aerobic bacteria and phytoplankton exhibit a more-irregular distribution with increasing depth. On April 8, May 6, Aug. 19, October 28, and November 25, 1969 only, vertical distribution of algae correlated closely with aerobic bacteria. During the stratified period, aerobic bacteria increased with increasing depth, especially below two meters. All three groups of organisms showed numerical increase on August 19th and September 9th. Bacterial populations are dependent on the amount of organic matter in the water. Larger summer bacterial could be due to increased water temperatures. Some of the irregular vertical distributions may be due to the fast speed with which some bacteria reproduce. (Spaeth-Wisconsin)
W78-01960

NITROGEN FIXATION BY BLUE-GREEN ALGAL COMMUNITIES IN THE INTERTIDAL ZONE OF THE LAGOON OF ALDABRA ATOLL,
Durham Univ. (England). Dept. of Botany.
M. Potts, and B. A. Whitton.
Oecologia, Vol 27, No 4, p 275-283, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Cyanophyta, *Nitrogen fixation, *Algae, *Reduction(Chemical), *Intertidal areas, *Lagoons, Photosynthetic bacteria, Sulfur bacteria, Light, Temperature, Indian Ocean.
Identifiers: *Acetylene, *Aldabra Atoll(Indian Ocean), Hyella balani, Scytonema sp, Rivularia sp, Purple sulfur, Photosynthetic bacteria, Varying media, Gas regimes.

Nitrogen fixation by blue-green algae of the intertidal zone of the lagoon at Aldabra Atoll, Indian Ocean, was studied. Locally-uniform areas of blue-green algae or mixed blue-green algae-purple sulfur photosynthetic bacteria community were selected and acetylene reduction by community samples were measured in both light and darkness. In the field, all experiments showed higher acetylene reduction rates in the light than in dark, except for two of the three experiments on the Hyella balani-purple sulfur bacterial community. Or 31 experiments, 21 showed a statistically significant differences between light and dark ($P<0.05$). The rate of acetylene reduction was greater in light than in dark with the seven communities dominated by blue-green algae. There was no clear difference between the rates obtained with brackish water in contrast to sea water. Wide ranges of laboratory experiments were carried out with re-wetted materials of Hyella balani, Scytonema sp., and Rivularia sp. Various temperature, light, media and gas regimes were used. Detectable rates of acetylene reduction were found with only one population of Scytonema sp. Tests with this population showed a mean rate of reduction under light of approximately 10%. (Spaeth-Wisconsin)
W78-01961

THE ROLE OF MAN IN THE EXCESSIVE FERTILIZATION OF SURFACE WATERS,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
M. D. Piwoni, and F. G. Lee.
The Texas Journal of Science, Vol 27, No 4, p 477-487, December, 1976. 3 tab, 14 ref.

Descriptors: *Eutrophication, *Nutrients, *Phosphorus, *Nitrogen, *Impoundments, Water quality, Lakes, Algae, Water pollution sources, Pollutants, Runoff, Sewage, Texas, Wisconsin, Colorado River, Watersheds(Basins), Rivers, Human population.
Identifiers: Trinity River(TX), Lake Mendota(WI).

The general nature of eutrophication is discussed with reference to pioneering studies of the Lake Mendota (WI) watershed, and then studies of nutrient sources and contents of Texas impoundments are reviewed. It is concluded that data for sound eutrophication management in Texas is lacking. Tables present data on nitrogen and phosphorus runoff sources in Dane Co., WI; surface area-to-depth ratios for Texas impoundments; and phosphate loading to Texas rivers from municipal sewage sources. The flow of the Trinity River, one of the major streams in east-central Texas, is controlled by several impoundments. During low-flow periods, sewage effluent constitutes a 90% of the river's flow in the Dallas area. Ninety per cent of the phosphorus below Dallas during low flow is ortho or soluble phosphate. Sewage treatment plants, accounting for 25% of the annual phosphorus load are also the main source of nitrogen during low flows, contributing 40,000 lbs/day. Nuisance algal levels have been kept down so far because of insufficient concentrations of available nitrogen, but this situation could change. Seven impoundments on the Colorado River in central Texas are discussed; other Texas rivers are also mentioned. Studies are needed to determine if removal of nitrogen and phosphorus at pollution sources would be important in slowing eutrophication in Texas impoundments. (Lynch-Wisconsin)
W78-01963

DRAPARNALDIOPSIS: A FILAMENTOUS ALGA (CHLOROPHYTA, CHAETOPHORACEAE) REQUIRING VITAMIN B12,
Kansas Univ., Lawrence. Dept. of Botany.
I. M. Johnstone.
Phycologia, Vol. 16, No. 2, p 183-187, 1977. 2 fig, 2 tab, 34 ref.

Descriptors: *Nutrient requirements, *Chlorophyta, *Vitamin B, Algae, Light intensity, Temperature, Light, Frequency, Montand.
Identifiers: *Draparnaldiopsis, *Vitamin B12, Draparnaldia, Chaetophoraceae, Biotin, Thiamine.

Research on the nutritional needs of Draparnaldiopsis salishensis Prescott shows that this trophical and temperature freshwater alga requires an external source of vitamin B12 for growth–the first report of a member of the Chaetophorales having any vitamin requirement. When an attempt was made to compare the behavior of Draparnaldiopsis and Draparnaldia in culture during earlier research, it was found that the former could not grow successfully on media used for the latter. This failure led to the discovery of the vitamin requirement of D. salishensis. Cultures of the green alga were grown under 14 hours light to 10 hours dark, 20 C, and light intensities of 1000 and 5000 lux. Chlorophyla analyses were used to estimate the total growth after twenty days. The response to biotin, thiamine, and B12 (cyanocobalamin) was determined by adding each vitamin individually and in combination. Vitamin B12 at 10(-4) mg/l is enough for twenty days active growth. Small amounts of growth occurring in test culture lacking B12 were probably caused by the

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presence of some of the vitamin in the quite large thallus of the innoculum. D. salishensis does not require biotin or thiamine. The requirement for vitamin B12 probably evolved independently in Draparnaldiopsis. (Spaeth-Wisconsin)
W78-01965

OXYGEN DEFICITS, CLARITY, AND EUTROPHICATION IN SOME MADISON LAKES,
State Univ. of New York at Buffalo. Dept. of Biology.
K. M. Stewart.
International Revue Der Gesamten Hydrobiologie, Vol. 61, No. 5, p 563-579, 1976. 9 fig, 59 ref. NSF G-14530.

Descriptors: *Eutrophication, *Trophic level, *Dissolved oxygen, Oxygen, Secchi disks, Turbidity, Water temperature, Phytoplankton, Ice cover, Algae, Water quality, Wisconsin, Productivity.
Identifiers: *Lake Mendota(WI), *Lake Monona(WI), *Lake Waubesa(WI), Madison(WI), Oxygen deficit, Oxygen depletion.

Oxygen deficit, oxygen depletion rates, Secchi disk measurements, and other trophic indices were used in an attempt to document eutrophication in lakes Mendota, Monona, and Waubesa at Madison (WI). Data from 1906-07, 1961-63, 1966-67, and 1970-71 proved inadequate for determining trophic trends in the lakes. Possible reasons given include: (1) the Madison lakes were as eutrophic several decades ago as they are now; (2) the systems are too complex and data and understanding too limited to make definite judgments; (3) the years represented or compared are inadequate; (4) thinking in terms of oligotrophic, mesotrophic, and eutrophic may obscure subtle changes within one category; (5) core samples may be more useful for measuring trophic trends; and (6) oxygen deficits may be of a limited value as indicators of productivity in lakes that are already eutrophic. The data indicated that in all but one year (1907 in Lake Mendota), the rates of oxygen depletion in the Madison lakes (3.6-10.2 mg/l/month) exceeded that estimated for Lake Erie (3.6 mg/l/month). Judged on this basis alone, the Madison lakes have been considerably more eutrophic than Lake Erie for several decades. The oxygen deficits show variations between years, but no trends; these variations may reflect differences in mean hypolimnetic temperatures as much as man's cultural influences. Lateness of ice out was found to correlate significantly with oxygen deficit or depletion during summer stratification. (Lynch-Wisconsin)
W78-01966

DETERMINATION OF SAMPLING STRATEGY FOR BENTHIC MACROPHYTES IN POLLUTED AND UNPOLLUTED COASTAL AREAS,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5A.
W78-01967

TOXIC EFFECTS OF CADMIUM ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTIMALIS),
Environmental Research Lab., Duluth, MN.
D. A. Benoit, E. N. Leonard, G. M. Christensen, and J. T. Fiandt.
Transactions of the American Fisheries Society, Vol. 105, No. 4, p 550-560, July, 1976. 3 fig, 2 tab, 32 ref.

Descriptors: *Cadmium, *Brook trout, *Pesticide residues, *Lake Superior, Fish genetics, Fishkill, Water pollution effects, Reproduction.
Identifiers: *Salvelinus fontinalis.

Three generations of the brook trout (Salvelinus fontinalis) were exposed to seferal concentrations of total cadmium (0.06-6.4 mg Cd/liter). At concentrations of 3.4 mg Cd/liter, a significant number of first and second generation males died during spawning. The same concentration also greatly retarded growth of juvenile second- and third-generation offspring. The maximum acceptable toxicant concentration (MATC) for brook trout exposed to cadmium in Lake Superior water (hardness 44 mg/liter as CaCo3, pH 7-8) occurs somewhere between 1.7 and 3.4 mg Cd/liter. Cadmium residue analyses of kidney, liver, gills, gonads, spleen, muscle, and red blood cells were made from first and second generation trout. Kidney, liver, and gill tissue accumulated the largest amounts of cadmium at each water exposure concentration. There was no significant increase in cadmium measured in edible muscle at any cadmium water concentration tested. Cadmium residues in kidney, liver, and gill tissue of fish from all exposure concentrations came to an equilibrium (mg Cd/g) tissue in both first and second generation trout after 20 weeks. There was a rapid loss of cadmium from gill tissue of second generation trout placed in control water for twelve weeks, but no loss was observed from the liver and kidney. (Spaeth-Wisconsin)
W78-01969

HISTORY OF HEAVY METAL POLLUTION IN SOUTHERN CALIFORNIA COASTAL ZONE--REPRISE,
San Diego State Univ., CA.
For primary bibliographic entry see Field 5B.
W78-01970

FOOD HABITS OF CHANNEL CATFISH IN A RESERVOIR RECEIVING HEATED WATERS,
North Texas State Univ. Denton. Dept. of Biological Sciences.
D. L. McNeely, and W. D. Pearson.
Hydrobiologia, Vol. 52, p. 243-249, 1977. 1 fig, 4 tab, 16 ref.

Descriptors: *Channel catfish, *Thermal pollution, *Food habits, Heat, Texas, Seasonal, Reservoirs.
Identifiers: *Ictalurus punctatus, Dallas County(TX).

Food habits of channel catfish, Ictalurus punctatus, are studied in North Lake (Dallas County, TX), a 330 ha reservoir, which provides cooling water for a 700 Mw steam electric generating plant located at its northeast corner. Five sampling stations were established in littoral zones, one at the mouth of the canal which discharges heated water into the reservoir and the others in areas not directly affected by the effluent. Stomachs of 214 fish were removed and examined. During summer months, catfish captured at the mouth of the effluent canal contained more fish and less aquatic vegetation than catfish obtained at the other four stations. Calculated overlap indices indicated no significant differences between diets of catfish captured at the mouth of the effluent canal, compared to those captured at the other four locations during fall, winter and spring months. During the summer, catfish in the vicinity of the canal mouth were concentrated in cooler waters beneath the thermal plume. They appeared to feed primarily on fish and benthos, and where aquatic vegetation wasn't available. (Spaeth-Wisconsin)
W78-02001

THERMAL DISCHARGE FROM A NUCLEAR POWER PLANT: PREDICTED EFFECTS ON LAKE ERIE FISH,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
J. M. Reutter, and C. E. Herdendorf.
The Ohio Journal of Science, Vol. 76, No. 1, p. 39-45, January 1976. 2 tab, 13 ref. Federal Aid in Fisheries Restoration F-41-R.

Descriptors: *Lake Erie, *Fish, *Thermal pollution, Effluent, Water pollution, Nuclear powerplants, Water temperature, Water pollution sources, Ohio, Lakes, Fishkill.
Identifiers: *David-Besse Nuclear Power Station(Toledo OH).

Water from Lake Erie to be used in the closed condenser cooling system of the Davis-Besse Nuclear Power Station near Toledo, OH will be returned to the lake at a maximum of 11.1C above ambient lake temperature. This effluent will be discharged from the lake bottom through a high velocity nozzle over a rockfill 305 m offshore. In this study fish were subjected to laboratory experiments to determine their seasonal final temperature preferences, effects of heat and cold shock, and Critical Thermal Maximum (CTM) for each species. The CTM is the temperature at which the fish loses locomotor control. The final temperature preferences of 24 species tested were above lake temperature during fall, winter, and spring, and about the same as lake temperature in summer, indicating an attraction or indifference to thermal plumes. The CTM of each of 33 species and one hybrid tested was well above the maximum plume temperature during late fall, winter, and early spring; during late spring, summer, and early fall the maximum plume temperature will be above or very close to the CTM of every species tested. About 92% of fish subjected to heat shocks above their CTM survived after return of ambient lake temperature. Sudden temperature change tests showed that the absolute temperature was more important than the size of the change. (Lynch-Wisconsin)
W78-02002

PLUTONIUM AND AMERICIUM: UPTAKE FROM CONTAMINATED SEDIMENTS BY THE POLYCHAETE NEREIS DIVERSICOLOR,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
T. M. Beasley, and S. W. Fowler.
Marine Biology, Vol. 38, No. 2, p. 95-100, 1976. 3 tab, 16 ref.

Descriptors: *Worms, *Annelids, *Adsorption, *Nuclear waste, Sediments, Water pollution sources, Path of pollutants.
Identifiers: *Polychaete, *Nereis diversicolor, *Americium, *Plutonium, Bravo Crater(Marshall Islands), Bikini Atoll(Marshall Islands), Irish Sea(United Kingdom), Cumbrian coast(United Kingdom), Orne estuary(Northern France), Ouistreham(Northern France).

Effects of plutonium and americium on the polychaete sandworm Nereis diversicolor, exposed to sediments contaminated through the testing of nuclear devices, or by release of liquid waste from a nuclear fuel reprocessing plant were examined. The sediment sample contaminated by nuclear device testing was collected from Bravo Crater at Bikini Atoll, Marshall Islands. The sediment sample contaminated by fuel reprocessing wastes was obtained from the Irish Sea, some 4.6 nautical miles north of the Windscale nuclear fuel reprocessing plant outfall, located on the Cumbrian coast of the United Kingdom. Worms were obtained from the mud flats of the Orne estuary near Ouistreham in northern France. Uptake of both plutonium and americium was small in both sediments, usually about 0.5%. Uptake of plutonium was similar after 40 days in both sediments. There was a definite preferred uptake of plutonium over americium in each case. The americium 241 in the Windscale sediment appears more biologically available than that from the Bravo Crater sediment. These experiments and results of earlier studies support the tentative conclusion that water could be the predominant pathway for deposit-feeding worms like Nereis diversicolor. (Spaeth-Wisconsin)
W78-02003

THE INFLUENCE OF CRUDE OIL AND MIXTURES OF CRUDE OIL/DISPERSANTS ON THE ONTOGENIC DEVELOPMENT OF THE

BALTIC HERRING, CLUPEA HARENGUS MEMBRUS L,
Swedish Water and Air Pollution Research Lab., Nykoping. Baltic Sea Lab.
O. Linden.
Ambio, Vol. 5, No. 3, p. 136-140, 1976. 8 fig, 1 tab, 17 ref.

Descriptors: *Emulsifiers, *Oil spills, Oil pollution, Water pollution effects, Herrings, Disasters, Fishkill, Embryonic growth stage, Cytological studies.
Identifiers: *Clupea marengus membras L, *Finasol SC, *Finasol OSR-2, *BP 1100-X, *Fish embryo malformation, Finland, Torrey Canyon Oil Spill(1967).

Toxicity of crude oil as it affects the early development of Baltic herring increases several hundred-fold if the oil is mixed with one of two supposedly non-toxic oil spill dispersants developed since 1967; if a pre-1967 dispersant is used to emulsify the oil, the toxicity increases by an additional factor of ten. Effects of a Venezuelan light oil, either alone or dispersed by three different oil-spill dispersants, were tested on spring-spawning Clupea harengus membras L. caught near the laboratory on the southwestern coast of Finland. Among laboratory-fertilized herring eggs exposed to a mixture of crude oil and Finasol OSR-2 (post-1967), strengths of 2.5, 25 and 250 ppm respectively caused 0.0, 10.1 and 19.2% embryo malformations. With BP 1100 X (also post-1967) at the same three mixture of strengths with crude oil, the respective embryo malformation rates were 0.0, 13.6 and 15.4%. But when the pre-1967 dispersant, Finasol SC, was applied with the crude oil to the fish eggs at 25 ppm, the embryo malformation rate rose to 94.6%. Crude oil alone at its highest tested concentration caused a malformation rate of 16.4%. In addition to these observations, studies were made of effects on hatching percentages, embryonic movements and embryonic heart beat. It is concluded that the use of an oil-spill dispersant may substantially aggrevate the deleterious effects of the oil; moreover, use of the more recently developed 'non-toxic' dispersants does not seem to substantially alleviate the toxicity associated with highly-toxic dispersants used with catastrophic biological effects on oil spilled from the Torrey Canyon tanker disaster in 1967. (Spaeth-Wisconsin)
W78-02005

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I., FLORA AND CHEMISTRY,
Cambridge Univ. (England). Dept. of Applied Biology.
M. P. Brooker.
Arch. Hydrobiol., Vol. 78, No. 3, September 1976, p. 396-412. 5 fig, 4 tab, 45 ref.

Descriptors: *Aquatic weed control, *Herbicides, *Dalapon, *2,4-D, Environmental effects, Biomass, Productivity.
Identifiers: *Phragmites comunis, Bradwell Brook, Essex, England, Dengie Penninsula, England, Floating macrophytes, Epipelic algae, England.

The first of a two-paper series describes a field experiment to compare ecological effects using herbicides for drainage channel maintenance, and the conventional method of hand clearance. Experimental sites were established January 1973 on Bradwell Brook, Essex, England, a land drainage channel, with a summer base flow, draining 16.2 sq km of agricultural land on the Dengie Penninsula. Autumn application of dalapon (25 kg/ha) succeeded in controlling growth of Phragmites communis, and application of dalapon 12 kg) and 2,4-D (1 kg) in the following spring restricted the growth of ditchbank vegetation. The maximum mean concentration of herbicide recorded in the experimental reach was from 29 mg/l for 2,4-D to 117 mg/l for dalapon. At each herbicide application it was calculated that the minimum mass of herbicide lost downstream from the experimental reach was less than 0.01% of the herbicide used. When herbicide application was used to control Phragmites, there was a development of replacement plant forms such as planktonic and epipelic algae and submerged and floating macrophytes. The changes correlated with changes in the light climate in the experimental reach. Some of the changes in water chemistry (i.e. SiO2 and O2) were correlated with changes in the dominant plant form. Estimates were made of the biomass and net productivity of the macrophytes. (Spaeth-Wisconsin)
W78-02007

RELATIVE IMPORTANCE OF FUNGI AND BACTERIA IN THE DECOMPOSITION OF PHRAGMITES LEAVES,
University of East Anglia, Norwich (England). School of Biological Sciences.
C. F. Mason.
Hydrobiologia, Vol. 51, No. 1, p 65-69, 1976. 4 tab, t ref.

Descriptors: *Bacteria, *Fungi, *Decomposing organic matter, Metabolism, Respiration, Fungicides, Bactericides.
Identifiers: *Phragmites communis, Alderfen Broad(Norfolk Eng.), Nystatin, Actidione, Benzylpenicillin, Streptomycin.

This study examines the relative importance of bacteria and fungi in the decomposition of Phragmites communis leaves in Alderfen Broad (Norfolk, Eng.). Leaves were collected in spring from the previous season's growth of Phragmites, and were placed in 20 mesh bags in the water at the edge of the lake. After 35 and again after 122 days 10 bags each were removed to the laboratory and treated with the antifungal agents nystatin and actidione, and the antibacterial agents benzylpenicillin and streptomycin sulphate. In this study bacteria were as important as fungi in both weight loss and respiration of dead Phragmites leaves after 35 days. At 122 days fungi accounted for very little of the litter respiration, whereas the importance of bacteria had increased. Overall community metabolism had not changed in this period; populations of both organisms had decreased, with fungi decreasing more than bacteria. It is postulated that in advanced stages of decomposition the substrate is no longer suitable for the growth of fungi. After antibiotics were applied there was a large residual respiration and weight loss of tissue. Population counts showed that bacterial and fungal populations were reduced by over 90%. Periphatic algae, protozoa, and nematodes were probably responsible for metabolic activity not suppressed by the antibiotics. (Lynch-Wisconsin)
W78-02019

THE SEAGRASSES IN THE WADDEN SEA, (IN DUTCH),
For primary bibliographic entry see Field 2L.
W78-02045

AN EXAMPLE FROM THE WESER: CHANGES IN THE BLOOD COUNT OF FISH EXPOSED TO HIGHER CONCENTRATIONS OF POTASSIUM (AM BEISPIEL DER WESER: VERAENDERUNGEN IM BLUTBILD DER FISCHE BEI HOEHEREN KALIUMKONZENTRATIONEN),
For primary bibliographic entry see Field 5A.
W78-02063

DAMAGING ACTION OF WATER POLLUTANTS TO DAPHNIA MAGNA (BEFUNDE DER SCHADWIRKUNG WASSERGEFAEHRDENDER STOFFE GEGEN DAPHNIA MAGNA),
Vienna Univ. (Austria), Inst. fuer Analytisches Chemie.
G. Bringmann, and R. Kuehn.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 10, No. 5, p 161-166, 1977. 1 tab.

Descriptors: *Toxicity, *Bioassay, Environmental effects, *Daphnia, Aquatic life, Lethal limit, Heavy metals, Organic wastes, *Water pollution effects, Waste water treatment, *Pollutant identification.

A standardized procedure with 24-hr-old animals from a clone of Daphnia magna was used to determine the concentrations of 173 substances hazardous in water at which 0%, 50%, and 100% mortality would occur. The tests were conducted with tap water which was free from chlorine, saturated with respect to dissolved oxygen, and had a hardness of 16 deg (German), pH of 7.6-7.7, and temperature of 20-22C. Within the concentration range of 0.001 to less than 0.1 mg/liter for hidroquinone, silver, mercury, and copper and of 0.1-1.0 mg/liter for aniline, hydrazine hydroxide, Cd, and CN, 50% mortality was observed. Concentrations in the range of 1-10 mg/liter were necessary to produce 50% mortality with Cr, Tl, Pb, S, 2-ethyl hexly amine, 2,3-dinitro toluene, salicyl aldehyde, m-cresol, 4,6-dinitro-o-cresol, and benzyl chloride. The majority of the 173 compounds produced 50% mortality at concentrations ranging from 10-1000 mg/liter. (Schulz-FIRL)
W78-02067

THE TOXICITY OF FOOD PROCESSING EFFLUENTS TO FISH,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
D. W. Bisset.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 257-272, 1 fig, 6 tab, 4 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Toxicity, *Bioassay, *Fish, *Effluents, *Food processing industry, Potatoes, Poultry, Dairy industry, Canneries, Aquatic life, Environmental effects, Industrial wastes, Waste water disposal, Food processing effluent toxicity.

Results of an extensive program conducted by the Canadian Environmental Protection Service to evaluate the toxicity of industrial effluents, specifically those generated by the food processing industry, are presented. Testing procedures which have been standardized by the Environmental Protection Service for determinations of the LC(50) or the concentration of a particular substance which results in 50% mortality in rainbow trout are described. Results of toxicity studies are presented for five types of food processing effluents: potato processing, meat and poultry products, dairy products, fruit and vegetable processing, and associated industries. LC(50) values, BOD, TSS, type of effluent sample, and type of waste water treatment are presented for a variety of subdivisions of food processing categories. The toxicity studies will be used in preparation of a series of effluent guidelines for the food processing industry. (See also W78-02070) (Schulz-FIRL)
W78-02081

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
G. S. Braek, A. Jensen, and A. Mohus.
Journal of Experimental and Marine Biology Ecology, Vol. 25, No. 1, p 37-50, November, 1976. 8 fig, 5 tab, 12 ref.

Descriptors: *Copper, *Zinc, *Algae, Phytoplankton, Heavy metals, Diatoms, Dinoflagellates, Marine algae, Fjords, Phaeodactylum tricornutum, Thalassiosira pseudonana, Skeletonema costatum, Amphidimium carteri.

Very few studies deal with the combined toxic effects of two or more heavy metals on algae,

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despite the fact that heavy metals almost always interact in natural waters. This study describes combined effects of copper and zinc ions on the growth of three marine diatoms (Phaeodactylum tricornutum, Thalassiosira pseudonana, and Skeletonema costatum) and one dinoflagellate (Amphidimium carteri). According to previous research, there are three types of joint action of toxicants: (1) independent joint action, (2) similar joint action, and (3) synergistic action. This study shows that joint effects of copper and zinc on phytoplankton cannot be predicted on the basis of the toxicity of the individual metals. A. carteri and T. pseudonana illustrate clear cases of synergism, while an antegonistic effect was observed toward P. tricornutum. In the latter case, addition of zinc ions reduces the inhibition of growth by the more toxic copper ions. Zinc toxicity to this alga increases at low concentration of magnesium, indicating a common route for divalent metal ions. In the case of S. costatum it is evident that the effect of the metals in combination is greater than the sum of the effects of the metals applied separately. However the latter results are not as clear-cut as the results obtained with the other algae due to the sensitivity of S. costatum to copper. Addition of copper and zinc separately or in combination does not result in clearly extended lag phases in these experiments. (See also W74-11329) (Lynch-Wisconsin)
W78-02121

WISCONSIN DESMIDS. III. DESMID COMMUNITY COMPOSITION AND DISTRIBUTION IN RELATION TO LAKE TYPE AND WATER CHEMISTRY,
Wisconsin Univ.-Madison. Dept. of Botany.
W. J. Woelkerling, and S. B. Gough.
Hydrobiologia, Vol 51, No 1, p 3-32, 1976. 2 fig, 13 tab, 17 ref. WDNT-133-9129, 133-9847. WARF-140374.

Descriptors: *Wisconsin, *Biological communities, *Lakes, *Bogs, Chlorophyta, Frequency, Density, Distribution, Water chemistry, *Desmids, *Aufwuchs, Staurastrum, Cosmarium, Closterium, Macrophytes, Euplankton.

Data on the generic composition of the euplankton community of 49 Wisconsin lakes and the aufwuch desmid communities of 61 Wisconsin lakes were studied. The role of the various genera were analyzed in terms of: (1) frequency, density, and relative importance, (2) the suitability of various lake types as a habitat for desmid communities, and (3) the correlation between chemical parameters and desmid distribution. The five types of lakes studied for the euplankton were spring ponds, hard water lakes, soft water lakes, acid bogs and alkaline bogs. The aufwuchs were also studied in closed bogs, and aufwuchs communities of 107 macrophyte hosts were analyzed. The genera Staurastrum, Cosmarium, and Closterium occur widely, appear to have major roles in the communties of all lake types, and are extremely tolerant of varied chemical conditions. Most euplankton genera are only important in acid bogs but aufwuchs genera are usually more widely distributed. Both the euplankton and aufwuchs communities appear to contain 1-4 desmid assemblages, each with a different range of importance values. Using biological criteria, acid bogs seem the most suitable lake type for desmid communities, while calcareous spring ponds appear least suitable. High generic diversity of desmids can be correlated with low conductivity, calcium and alkalinity levels, pH values of 5.1 to 7.0, and the presence of free CO2. (Spaeth-Wisconsin)
W78-02122

PHYCOLOGICAL NOTES IV. SUCCESSIVE WATER BLOOMS OF FOUR GREEN ALGAE,
Slippery Rock State Coll., PA. Dept. of Biology.
P. A. Archibald, and H. C. Bold.
The Texas Journal of Science, Vol 27, No 3, p 353-360, September, 1976. 16 fig, 7 ref.

Descriptors: *Eutrophication, *Ponds, *Chlorophyta, Texas, Systematics.
Identifiers: *Euglena granulata(Klebs), Schmitz, *Chlamydomonas incerta Pascher var. medio-stigma var. nov., *Chlorogonium sp., *Nautococcus emersus Geitler.

Water blooms of Euglena granulata, chlamydomonas incerta var. media-stigma var. nov, Chlorogonium sp., and a species tentatively identified as Nautococcus emersus (Chlorophyceae), appeared successively on three lily polls on the campus of the University of Texas at Austin. The species were studied from fresh collections, and unialgal cultures were made. Brief taxonomic descriptions are given. E. granulata bloomed from December 1965 through January 1966, and at the same time in 1966-1967 in one of the ponds. A species tentatively identified as N. emersus appeared during November 1973, when repairs and a water bloom of Wolfiella in one pond made it necessary to turn off the flowing water source. The Nautococcus bloom appeared soon after the water flow had stopped, and after the water level of the ponds had fallen through leakage and evaporation. This record appears new for the United States. The bloom of N. eversus was dissipated by heavy rain, and followed by several weeks where water was again allowed to flow through the pools, and then stopped again for repairs. Chlorogonium sp. appeared as water flow ceased in December 1973. C. inserta occured in one pond in January 1974, after heavy rains dissipated the bloom of Chlorogonium. It agreed in all morphological characteristics with C. inserta Pascher, except for the position of the stigma, which is medial, and not anterior. It is described as a new variety. (See also W74-06760) (Spaeth-Wisconsin)
W78-02123

REMARKS, REGION IX,
Environmental Protection Agency, San Francisco, CA. Region IX.
For primary bibliographic entry see Field 5A.
W78-02178

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION, (VOLUME 2),
National Marine Fisheries Service, Panama City, FL. Panama City Lab.; and National Marine Fisheries Service, Panama City, FL. Gulf Coastal Fisheries Center.
C. H. Saloman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 423, Price codes: A24 in paper copy, A01 in microfiche. June 30, 1974. 556 p.

Descriptors: *Aquatic animals, *Benthic fauna, *Invertebrates, *Dredging, *Beach erosion, *Erosion control, Shores, Littoral, Gulf of Mexico, Florida, Estuaries, Gulfs, Annelids, Nematodes, Erosion, Siltation, Turbidity, Beaches, *Sand Key(Fla), *Treasure Island(Fla), Polychaetes, Pinellas Co(Fla).

Each erosion from severe storms along the gulf shores of Pinellas Co., Florida has long been a problem. Normal wave action between storms only partially restores the beaches, and hydraulic dredging is necessary for beach restoration. This study defines characteristics of the Sand Key and Treasure Island littoral to gauge the environmental effects of the proposed dredging. Vol. II includes Part IX, Benthic Invertebrates; Part X, Effects of Hydraulic Dredging for Restoration of Sunset Beach; Part XI, Selected References (269 pp.); and Part XII, Summary and Recommendations. Samples of benthic animals were collected between January and December 1971. Twenty-six transect lines were established, each with 8 stations ranging from the beach to 640 m offshore. Thirty-nine major taxa were collected; the most abundant were polychaetes (31.3%), nematodes (17.2%), pelecypods (10.9%), amphipods (8.6%), gastropods (6.7%), and nemerteans (5.4%). Extensive tables accompany this section. On 19 June 1972 Hurricane Agnes caused serious beach erosion on the southern end of Treasure Island (Sunset Beach). Hydraulic dredging was begun in October 1972 to restore the beach; the creation of offshore borrow pits affected the habitat. Turbidity increased, and abundance and diversity of benthic animals decreased, due especially to siltation. Fish numbers and diversity increased slightly. Recommendations for sources of sand and for optimal dredging times and methods are given. (See also W76-03177) (Lynch-Wisconsin)
W78-02180

A PLANKTON PRODUCTION MODEL APPLIED TO THE BRIELSE MEER,
Waterloopkundig Lab., Delft (Netherlands).
J. H. G. Verhagen, J. C. H. Peeters, and R. Peelen.
Publication No 151, November 1975. Paper presented at the XVI IAHR Congress, Sao Paulo, Brazil, July 1975, 8 p. 2 fig, 2 tab, 3 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Algae, Phosphorus, Eutrophication, Trophic level, Lakes, *Brielse Meer(Netherlands), *Ditoro phytoplankton-zooplankton-nutrient model, Planktondynamics, Vertical transport, Hydraulic longitudinal transport, Retention time.

The ditoro phytoplankton-zooplankton-nutrient model is applied to data from the Brielse Meer, a hypertrophic lake in the delta of the rivers Rhine and Meuse in the southwestern part of the Netherlands. A 30-month experiment, was carried out to diminish the P-load in the lake by dephosphatizing inlet river water. Mathematical modelling was used to support field work and evaluate results. Discrepancies between model results and field observations are analyzed and points of general interest on developing ecological models are discussed. Evaluation of results suggests that vertical migration of phytoplankton, especially the blue green species, is an important mechanism in the plankton dynamics of a shallow turbid lake. Also, unrealistic zooplankton response is a result of the model being over-simplified. The model does not distinguish between phytoplankton species and zooplankton species. Lack of appropriate food in fact inhibits excessive growth of zooplankton predicted by the model. (Coyle-Wisconsin)
W78-02183

COMPETITIVE INHIBITION FOR AMINO ACID UPTAKE BY THE INDIGENOUS MICROFLORA OF UPPER KLAMATH LAKE,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
B. K. Burnison, and R. Y. Morita.
Appl Microbiol. 25(1), p 103-106, 1973.

Descriptors: *Amino-acid, Carbon-14, *Eutrophication, Flora, *Inhibition, *Klamath Lake(Ore), Lakes, *Absorption, *Microflora, Oregon

The uptake of a specific 14C-amino acid by the heterotrophic microorganisms in the epilimnion of an eutrophic lake (Klamath Lake, Oregon,) was influenced by the presence of other amino acids. The effect of unlabeled serine on 14C-glycine uptake was caused by competitive inhibition, which changed the interpretation of the kinetic parameters, the turnover time, Tt, and the sum of a transport constant, (Kt + Sn), and the natural substrate concentration. The maximum velocity of uptake, Vmax, is unaffected by the competitive inhibition.--Copyright 1973, Biological Abstracts, Inc.
W78-02187

COLLABORATIVE TESTS OF WATER ANALYSIS (THE CHEMAQUA PROGRAMME),
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.

For primary bibliographic entry see Field 5A.
W78-02188

NITROGEN FIXATION IN SALT MARSHES - A BUILT-IN PLANT FERTILIZER,
Hampshire Coll., Amherst, MA.
C. D. Van Raalte.
Oceanus, Vol 20, No 2, p 58-63, Summer 1977. 5 fig, 2 tab, 12 ref.

Descriptors: *Limiting factors, *Nitrogen, *Nitrogen fixation, *Salt marshes, Phosphate, Algae, Nitrogen fixing bacteria, Massachusetts, *Spartina alterniflora, *Digitaria, *Great Sippewissett Marsh(MA), Ammonia nitrogen, Algal mats.

The structure of salt marsh ecosystems and the effect of pollutants on them has attracted the interest of agricultural researchers looking for ways to maintain crop yields while reducing nitrogen requirements. The present research, of nitrogen fixation in such an ecosystem, studied a salt marsh cord grass, Spartina alterniflora. The grass roots fix nitrogen at high rates and the bacterial symbiont in the root is similar to that of Digitaria (crab grass). These studies, in the Great Sippewissett Marsh on Cape Cod in Massachusetts, found that in plots fertilized with sewage sludge and in plots fertilized only with nitrogen, marsh grass grew taller, looked greener, and was higher in nitrogen. There was no change in plots fertilized only with phosphate. It was presumed that nitrogen fixation must be important in salt marshes. In fact fixation rates were very high. Several years of study have produced a better understanding of nitrogen fixation in salt marshes, with major fixation sites identified and seasonal rates and environmental factors determining those rates determined. (Coyle-Wisconsin)
W78-02193

THE INTERACTION OF COMPONENTS CONTROLLING NET PHYTOPLANKTON PHOTOSYNTHESIS IN A WELL-MIXED LAKE (LOUGH NEAGH, NORTHERN IRELAND),
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.
D. H. Jewson.
Freshwater Biology, Vol. 6, No. 6, p. 551-576, 1976. 18 fig, 1 tab, 71 ref.

Descriptors: *Phytoplankton, *Photosynthesis, *Solar radiation, *Mixing, Lakes, Euphotic zone, Chlorophyll, Water temperature, Diatoms, Algae, Stratification, Turbidity, Seasonal, Cyanophyta, Standing crops, *Lough Neagh(Northern Ireland), Oscillatoria redekei, Oscillatoria agardhii, Melosira italica, Stephanodiscus astraea, Gross photosynthesis.

Control of gross photosynthesis of phytoplankton per unit area by (1) photosynthetic capacity, (2) phytoplankton content of the euphotic zone, and (3) the effective radiation input was studied in Lough Neagh, Northern Ireland, a shallow lake (mean depth 8.6 m) having the advantage of a well-mixed water column most of the year. Phytoplankton in a turbid lake is likely to be circulated into dark zones for long periods. Limits to growth caused by this mixing are assessed. Measurements of photosynthesis were made by the light and dark bottle method using Winkler oxygen determinations. Variations in photosynthetic capacity is governed largely by changes in temperature. Bluegreen algae were the dominant phytoplankton; important species were Oscillatoria redekei and O. agardhii. Spring diatom growths consisted mainly of Melosira italica and Stephanodiscus astraea. The two sites analyzed, the open lake and Kinnego Bay, had standing crops of up to 90 and 300 mg chlorophyll a/cu m respectively, and maximum daily rates of gross integral photosynthesis of 11.7 and 15.6 g 02/sq s/day. Nonalgal sources were responsible for much light attenuation, especially at low standing crops in winter when integral photosynthesis decreased to 0.5 g 02/sq m/day. This is the result of self-shading of the phytoplankton which alters crop content of the euphotic zone at different population densities. Changes in the irradiance function are largely responsible for the changes in daily rates of integral gross photosynthesis. (Lynch-Wisconsin)
W78-02195

ALGAL RECOLONIZATION OF SOME CLEARED SUBTIDAL AREAS,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
J. M. Kain.
The Journal of Ecology, Vol. 63, No. 3, p. 739-765, 1975. 6 fig, 11 tab, 53 ref.

Descriptors: *Algae, *Succession, *Seasonal, *Intertidal areas, Fluctuations, Depth, Biomass, Dominant organisms, *Recolonization, *Subtidal zone, Rhodophyceae, Phaeophyceae, Chlorophyceae, Port Erin, England, Isle of Man, Laminaria hyperborea forest, Saccorhizza polyschides.

Algal succession in a cleared subtidal environment was examined. Two groups of concrete blocks, at 0.8 and 4.4 meters below extreme low water, forming a ruined breakwater at Port Erin, Isle of Man, were manually cleared of virgin Laminaria hyperborea forest for five years at four seasons. These were then sampled from 0.25 sq m quadrats, usually at three month intervals. November-cleared blocks showed Saccorhiza polyschides dominant by the end of the first summer, L. hyperborea dominant after two years, and a return to a virgin forest after three years. There was a similar sequence with blocks cleared in February and June, with peak biomass in late summer. Saccorhiza was almost excluded and L. hyperborea dominance resulted earlier, in shallow water, on blocks cleared in August. Recolonization was more variable and slower on deeper blocks. When a single block at 1.3 meters was cleared repeatedly every two months for eighteen months, 41 species arose. Rhodophyceae contributed the most biomass in the winter, Phaeophyceae in the spring, and Chlorophyceae in late summer. Winter-sporing species arose throughout the year, except on sterilized stones placed in the sea for the same two month period. Annual dry matter production was lower on cleared areas than in virgin forest. (Spaeth-Wisconsin)
W78-02196

FACTORS RELATED TO THE DISTRIBUTION OF MICROBIAL BIOMASS IN SALT-MARSH-CREEKS,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
C. W. Erkenbrecher, and L. H. Stevenson.
Marine Biology, Vol. 40, No. 2, p. 121-215, 1977. 1 fig, 6 tab, 6 ref. NG-33-73.

Descriptors: *Tidal effects, *Microorganisms, *South Carolina, Streams, *Biomass, Estuaries, Carbon, Bacteria, Regression analysis, *Distribution.

Ten physical-chemical factors were analyzed to assess the influence of ebb and flood tides on microbial biomass in salt marsh creeks, including changes in community characteristics. Two creeks near Georgetown, SC, were sampled over five separate tidal cycles. Variables were time, depth, temperature, velocity, salinity, dissolved oxygen (DO), pH, bacteria, adenosine triphosphate (ATP), and particulate organic carbon (POC). Although several significant correlations were noted between some of the variables, correlations coefficients were generally small. The highest value involving biological factors was 0.65, between POC and bacteria. Only when multiple regression analysis was used could more than 90% of the variability be accounted for. It was clearly demonstrated that water entering creeks during a flooding tide was characterized by a lack of relationships between variables; while significant relationships were found for ebb-tide water. This greater number of significant relationships, especially bacteria to carbon, is thought to reflect the influence of sediment properties. POC was important only during an ebb tide, and accounted for 55% and 63% of the variability in ATP and bacteria. (Lynch-Wisconsin)
W78-02197

KINETICS OF PHOSPHATE LIMITED ALGAL GROWTH,
Technical Univ. of Denmark, Lyngby. Dept. of Applied Biochemistry.
N. Nyholm.
Biotechnology and Bioengineering, Vol. 19, No. 4, p. 467-492, April 1977. 12 fig, 4 tab, 33 ref.

Descriptors: *Algae, *Chlorophyta, Phytoplankton, Laboratory equipment, Laboratory tests, *Chlorella pyrenoidosa, *Selenastrum capricornutum, *Michaelis-Menton kinetics, Kinetic models, Phosphate concentrations, Phosphorus deficiency.

Growth kinetics of two green algae, Chlorella pyrenoidosa and Selenastrum captricornutum, were investigated under phosphate limitation and with continuous light at saturation intensities. Nine kinetic models which express specific growth rate as a function of the intracellular phosphorus content were examined and one, the principles of which were described in earlier research, was found useful in predicting transient growth responses to smaller perturbations of the chemostat and can be utilized as a general growth model for phosphate limited phytoplankton. Kinetics of phosphate uptake were investigated by adding pulses of phosphate to chemostats. Uptake by phosphorus deficient cells could be described by Michaelis-Menten kinetics for phosphate concentrations below 500 mu g P/liter. Transition from limiting to nonlimiting conditions is described in the model as a discontinuous adjustment of the uptake rate. Because the uptake is rarely a rate-controlling step, this approximation has negligible influence on the model behavior in most cases. (Coyle-Wisconsin)
W78-02198

PRIMARY PRODUCTIVITY AND FISH YIELDS IN TROPHICAL LAKES,
Duke Univ., Durham, NC. Dept. of Zoology.
J. M. Melack.
Transactions of the American Fisheries Society, Vol. 105, No. 5, p. 575-580, September, 1976. 1 fig, 1 tab, 53 ref. NSF GB 8328X.

Descriptors: *Fish harvest, *Regression analysis, *Primary productivity, Statistics, Phytoplankton, Yield equation, Photosynthesis, Homogeneity, *African lakes, *Indian lakes, Gross photosynthesis, Morphoedaphic index.

Analysis of the relationship between fish yields and phytoplankton productivity in tropical African and Indian lakes shows that commercial fish yields increase logarithmically as primary productivity increases arithmetically. A regression equation is developed to describe the relation between fish yields (FY) and gross photosynthesis (PG). The equation for eight African lakes is log FY = 0.113 PB+ 0.91 (with a coefficient of determination of 0.57). The African relationship is corroborated by the regression equation developed for 15 trophical Indian lakes: FY = 0.122 PG + 0.95. However, data-based uncertainties are cited: (1) When estimates of primary productivity made at a few stations several times in one year are converted to an annual estimate, lakewide average errors are exaggerated; (2) Commercial catch records may indicate fishing effort and not potential yield; (3) Catch records may apply only to one part of the lake. While this type of analysis shows promise as a method for assessing a fishery potential, more lakes with better data should be included in the

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studies before management decisions are based on estimates to primary productivity measurements. (Spaeth-Wisconsin)
W78-02199

EFFECT OF SUSPENDED PARTICLES AND THEIR SIZES ON NITRICATION IN SURFACE WATER,
Pahlavi Univ., Shiraz (Iran).
For primary bibliographic entry see Field 5B.
W78-02200

5D. Waste Treatment Processes

AIR AND LIGHT IMPERVIOUS WATER PURIFICATION AND PRODUCT DISPENSING SYSTEM,
For primary bibliographic entry see Field 5F.
W78-01701

CONTROLLING INDUSTRIAL WATER POLLUTION--PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).
Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-01718

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.
For primary bibliographic entry see Field 5F.
W78-01833

METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTES.
Environmental Protection Agency, Cincinnati, OH. Office of Technology Transfer.
For primary bibliographic entry see Field 5A.
W78-01854

TECHNICAL MANUAL FOR PROCESS SAMPLING STRATEGIES FOR ORGANIC MATERIALS,
Monsanto Research Corp., Dayton, OH.
For primary bibliographic entry see Field 5A.
W78-01857

REMOVAL OF CADMIUM ION FROM AQUEOUS SOLUTION,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.
J. Chou, and Y. Okamota.
Journal Water Pollution Control, Vol. 48, No. 12, p. 2747-2753, December 1976. 5 fig, 3 tab, 23 ref. OWRT 14-30-3150.

Descriptors: *Cadmium, *Foam fractionation, *Surfactants, Foam separation, Human diseases, Human pathology, Ions, Chelation, Sulfonates, *Waste water treatment, Water treatment, Polyalkylenepolyamines, 4-dodecyl-diethylenetriamine, Dodecylbenzyl-triethylenetetramine, Sodium dodecyl benzene sulfonate.

Removal of cadmium ion from aqueous solution by foam separation using chelating surfactants was investigated under various conditions. Cadmium has been linked with several diseases in humans, including hypertension, emphysema, and chronic bronchitis. Foam fractionation is the partial separation of a dissolved or colloidal substance (colligend) from a liquid by adsorption on the surface of bubbles which, upon rising, form a foam. The method works even with very dilute solutions. The chelating surfactants used were 4-dodecyl-diethylenetriamine and dodecylbenzyl-triethylenetetramine, and for comparison, the commercial surfactant sodium dodecyl benzene sulfonate (ABS). With ABS cadmium ion could not be removed from a pure aqueous CdCl2 solution, but using an anionic surfactant, cadmium could not be removed from solutions containing a large excess of other metallic ions such as sodium, calcium, and magnesium which compete in electrical attraction. On the other hand, 4-dodecyl-diethylenetriamine removed cadmium ion from similar solutions. For both polyalkylenepolyamine surfactants, cadmium removal increased with pH increase up to an optimum of 7-10. In terms of ultimate removal, gas flow rates of 150 and 200 cu cm/min were more effective than 300 cu cm/min. The effects of surfactant and cadmium concentration were also analyzed. (Lynch-Wisconsin)
W78-01913

THE TREATMENT AND ANALYSIS OF CYANIDE WASTEWATER,
Thiokol Corp., Brigham City, UT. Wasatch Div.
D. P. Clark, L. W. Poulter, O. W. Wilson, and W. N. Christenson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-006 394, Price codes: A06 in paper copy, A01 in microfiche. Report No. AFCEC-TR-74-5, February 1975. 111 p, 25 fig, 31 tab, 1 append.

Descriptors: *Nitrogen compounds, *Chlorination, *Industrial wastes, *Electrochemistry, Hydrogen ion concentration, Chemical reactions, Electrolytes, Design data, *Waste water treatment, Pollutant identification, Cyanide, Chlorine generation, Electrolytic cells, Electroplating wastes.

A significant volume of cyanide-bearing waste water is generated at electroplating facilities used by the Air Force in its aircraft maintenance program. Problems associated with the alkaline chlorination process which has been used in the past to treat cyanide-bearing waste water include chlorine gas leaks, sensor probe failure, carbonate scaling, and the high cost of chemical raw materials. The Thiokol waste treatment process was developed in response to the need for a system to destroy cyanide materials at lower operating costs, without operational problems and in compliance with new federal regulations governing the levels of cyanide in effluents. The system includes an electrolytic cell to generate chlorine in the waste water. Since an equivalent number of hydroxyl ions are generated at the anode of the electrode, no pH adjustment is required during use of the system. Alternate methods for cyanide destruction are reviewed, including ion exchange, adsorption, reverse osmosis, integrated systems, and electrolytic decomposition. Design data for a prototype Thiokol system are presented for the process pump, salt feeder, chlorination tank, recycle pump, electrolytic cell, and settling tank. (Schulz-FIRL)
W78-02021

RECLAMATION OF METAL VALUES FROM METAL-FINISHING WASTE TREATMENT SLUDGES,
Battelle Columbus Labs., OH.
A. B. Tripler, Jr, R. H. Cherry, Jr, and G. R. Smithson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 018, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-018, April 1975. 87 p, 8 fig, 17 tab, 60 ref, 5 append.

Descriptors: *Metals, *Copper, *Nickel, *Chromium, *Electrochemistry, Leaching, Heavy metals, Sludge treatment, Costs, Reviews, Electrolysis, Sludge treatment, Sludge disposal, On-site data collections, Industrial wastes, *Waste water treatment, Metal-finishing sludges, Metals recovery.

The specific objectives of this project were acquiring data on the quantity and characteristics of metal sludges produced in the United States, evaluating existing treatment and recovery techniques used with metal sludges, developing new recovery techniques, and examining the effects of weathering on stored sludge. Results of a literature search, a plant survey, and field studies to augment information obtained from the previously mentioned sources and to collect sludge samples for laboratory studies are presented. Laboratory experiments were conducted to examine the leachability of metals from dried sludge samples from seven electroplating plants. Processes which were evaluated for the recovery of copper and nickel included electrowinning, cementation, and liquid ion exchange. Details of experiments with the electrolysis of ammonium carbonate leach solutions in a three-compartment cell are presented. Economic studies were conducted to estimate costs for small-scale processing of metal sludges to recover copper, nickel, and chromium. (Schulz-FIRL)
W78-02022

REMOVAL OF CHROMIUM FROM PLATING RINSE WATER USING ACTIVATED CARBON,
Battelle Columbus Labs., OH.
R. B. Landrigan, and J. B. Hallowell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 370, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-670/2-75-055, June 1975. 43 p, 10 fig, 6 tab, 4 append.

Descriptors: *Chromium, *Activated carbon, *Adsorption, *Chelation, *Separation techniques, Costs, Chemical reactions, Industrial wastes, Waste assimilative capacity, Pilot plants, Recycling, *Waste water treatment.

Pilot plant and laboratory studies were conducted to evaluate the use of an activated carbon system for removal of chromium from rinse waters in a plating plant and to compare acid and caustic stripping for removal of chromium from the activated carbon. The studies concluded that activated carbon treatment was applicable to rinse water solutions with chromium concentrations of up to 600 mg/liter, and perhaps higher. Chromium could then be desorbed from the activated carbon in a four-stage process. The desorption process includes wetting of the carbon with a 20% sodium hydroxide-500 ppm chelating agent solution, exposing the carbon to air for 18 hrs. washing with a 20% sodium hydroxide solution, rinsing with water, and washing with a sulfuric acid solution. More than 90% of the adsorbed chromium was removed during the caustic-aeration and water rinse steps of the desorption process. Studies on the adsorption capacity of activated carbon indicated that 22 lbs of chromium was adsorbed per 200 lbs of carbon in one cycle. Capital costs for a system designed to treat 20 gpm of rinse water containing 100 ppm of hexavalent chromium were estimated at $35,800 with an estimated daily total operating cost of $62.60. (Schulz-FIRL)
W78-02023

DESIGN AND EVALUATION OF AN OILY WASTES DISPOSAL SYSTEM FOR RED RIVER ARMY DEPOT,
DARCOM Intern Training Center, Texarkana, TX.
F. W. Crouse, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 729, Price codes: A05 in paper copy, A01 in microfiche. Report No. DARCOM-ITC-02-08-76-003, April 1976. 85 p, 11 fig, 15 tab.

Descriptors: *Oil wastes, *Oily water, *Water quality standards, *Waste disposal, Oxidation lagoons, Separation techniques, Sludge disposal, Industrial wastes, *Waste water treatment, Oil wastes disposal.

The EPA's requirement of a maximum concentration of 5 ppm of oil in effluent leaving the Red

River Army Depot (RRAD) in Texarkana, Texas, resulted in a project to design and evaluate an oily wastes disposal system for waste petroleum oils and lubricants (POL's). Current disposal practices for POL's include collection of some of the waste oils in 55-gal drums for sale to private contractors, with the remainder discharged to drainage ditches for collection in a large lagoon. The skimming system for removal of oil from the lagoon proved inadequate for EPA's requirements. A program was initiated to develop a system for RRAD which could be used as a general design for oil collection at military installations throughout the United States. The program included a sampling system to characterize wastes at RRAD, which indicated that the average oil content of effluent leaving the lagoon was 12 ppm. Various methods of primary, secondary, and tertiary treatment for oil wastes were considered. The treatment method chosen for separation of oil and water at RRAD included the construction of a 3.4-million-gal basin with an average storage level of 1.1 million gal to accomodate expected heavy yearly rainfalls in the area. Combustion in the depot's boilers was chosen as the means of oil disposal. (Schulz-FIRL)
W78-02024

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX),
Kappalaverket, Lidingo (Sweden).
For primary bibliographic entry see Field 5E.
W78-02025

THE USE OF HOLLOW-FIBER MEMBRANES IN REVERSE OSMOSIS (UTILISATION DES MEMBRANES EN FIBRES CREUSES DANS L'OSMOSE INVERSE),
R. B. Davis, M. J. Coplan, A. E. Allegrezza, Jr., and R. D. Bruchesky.
Informations Chimie, No. 163, p 171-174, January-February, 1977. 5 fig, 2 tab.

Descriptors: *Membrane processes, *Reverse osmosis, *Tertiary treatment, *Separation techniques, Permselective membranes, Filtration, Filters, Nitrogen compounds, Salts, Zinc, Industrial wastes, *Waste water treatment, Ultrafiltration.

The terms macroflotation, microflotation, ultrafiltration, and hyperfiltration (also called reverse osmosis) are defined. Reverse osmosis separates molecules or ions smaller than 20 Angstroms. The differences in mechanisms for ultrafiltration and reverse osmosis are described, the primary distinction being in the action of the solute on the osmotic pressure of the feed solution. In relation to this action different membrane materials are discussed. Membranes are available in flat, tubular, or hollow-fiber configurations. The manufacture of hollow fibers is described, stressing the importance of the furan resin component which acts as the rejecting barrier of the membrane, and which is chemically very stable. Tests with these membranes show that when used with a solution containing 2,000 ppm of zinc cyanide, the separation rate is 99+% of Z (+2) and 99+% of CN(-1). With a solution of 20,000 ppm of zinc chloride, 99.3% of Zn(+2) is recovered; with potassium chloride at 2,000 ppm the recovery if 99.2%. Reverse osmosis using hollow fiber membranes has several industrial uses. In addition to recovering precious metals from galvanic baths, it can purify dye bath wastes and prepare boiler feed waters. (Blits-FIRL)
W78-02026

WASTEWATER TREATMENT EXPERIENCE AT ORGANIC CHEMICAL PLANTS USING A PURE OXYGEN SYSTEM,
Union Carbide Corp., South Charleston, WV.
D. M. Hardisty, and H. E. Bishop, Jr.
AIChE Symposium Series, Vol. 73, No. 167, p 140-144, 1977. 5 fig, 4 tab, 1 ref.

Descriptors: *Activated sludge, *Oil wastes, *Chemical wastes, *Oxygenation, *Biological treatment, Industrial wastes, Biodegradation, Equipment, Treatment facilities, Organic wastes, *Waste water treatment, Oxygen activated sludge, Nutrient addition, Case histories.

Experiences with the use of Union Carbide's UNOX system, an oxygen activated sludge process, in the organic chemicals industry are described. Problems encountered in attempts to use biological treatment processes for the treatment of organic industrial wastes have often been related to variations in the biodegradability of industrial waste water components, unfavorable influent temperature or pH, the lack of nutrients, and the presence of toxic and/or inhibitory compounds in the waste water. Case histories on the use of the UNOX biological treatment system for two applications in the petrochemicals industry and in the coal conversion industry are presented. Treatment at the Union Carbide Corporation facilities in Sisterville, West Virginia, included neutralization, primary clarification, equalization, nutrient addition, UNOX secondary biological treatment, and final clarification for the treatment of wastes resulting from the manufacture of silicones. The second petrochemical complex produced over 250 chemical products and treatment comprised 24 hrs of equalization, primary clarification, nutrient addition, and the use of a two-stage UNOX test reactor. Wastes generated at the coal conversion facility had high concentrations of organics, including phenols, cresol, xylenols, and others. Studies are being conducted to determine the proper combination of stripping, equalization, pH and nutrient adjustment, UNOX, and nitrification for treatment. (Schulz-FIRL)
W78-02027

CONTROL OF AEROBIC GROWTH IN ACTIVATED CARBON WASTE WATER TREATMENT,
Exxon Research and Engineering Co., Linden, NJ.
R. V. Trense, A. Clamen, and J. M. Fernbacher.
United States Patent 4,053,396. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol. 963, No. 2, p 621, October, 1977. 1 fig.

Descriptors: *Activated carbon, *Aerobic treatment, *Suspended solids, *Organic wastes, *Hydrogen sulfide, Oxidation, Chemical oxygen demand, Oil wastes, Chemical wastes, *Waste water treatment, *Patents.

Improvements on an activated carbon treatment process designed to remove suspended solids and dissolved organic contaminants from waste waters, such as those resulting from petroleum refining or chemicals manufacturing, having a COD of 100-2000 mg/liter have been patented. The process includes pretreatment to remove suspended solids followed by contact with at least one bed of activated carbon to remove dissolved organic contaminants. The process was improved by the addition of dissolved oxygen to the waste water to suppress the evolution of hydrogen sulfide and to minimize the production of sludge in the bed. The oxygen is added to the waste water before it passes to the activated carbon beds to provide approximately 0.09-0.15 lb oxygen per lb of total COD in the waste water. (Schulz-FIRL)
W78-02028

SELECTED USES OF ACTIVATED CARBON FOR INDUSTRIAL WASTEWATER POLLUTION CONTROL,
Industrial Environmental Research Lab.-Cincinnati, Edison, NJ.
H. S. Skovronek, M. Dick, and P. E. Des Rosiers.
Industrial Water Engineering, Vol. 14, No. 3, p 6-13, May/June, 1977. 3 fig, 4 tab, 25 ref.

Descriptors: *Activated carbon, *Adsorption, *Chemical wastes, *Oil wastes, *Industrial wastes, Phenols, Tertiary treatment, Textiles, *Waste water treatment.

The EPA has sponsored several projects under its research and development program for industrial waste water pollution control in order to meet the water quality standards established by Public Law 92-500. Programs conducted by the state of Louisiana in conjunction with the Gulf South Research Institute have investigated water quality in the lower Mississippi River region and have examined advanced waste treatment methods for petrochemical plant wastes. Waste petroleum is being evaluated as a source of activated carbon. Tertiary treatment with oxygen-enriched carbon adsorption is being evaluated by the Union Carbide Corporation for a petrochemical complex in Puerto Rico. Dow Chemical has used a 100-gpm plant to appraise activated carbon adsorption as a means of removing and recovering phenol and acetic acid from an 18% NaCl brine. The Hercules Inc. chemical plant in Hattiesburg, Mississippi, has used a semi-continuous carbon treatment plant for 3.2 mgd of process waste water. Carbon adsorption has been used by the Reichhold Chemicals plant in Tuscaloosa, Alabama, to treat waste water containing phenols, formaldehyde, and urea-formaldehyde resins. An activated carbon treatment facility at a petroleum refinery in Los Angeles has been used to treat periodic storm flow. Other EPA-sponsored projects have evaluated activated carbon use for a Pennsylvania refinery, a textile yarn spinning plant, steel mill polishing effluents, and wastes generated during cleaning and reconditioning of drums and tank trucks. EPA-sponsored studies on the production and evaluation of refuse-derived activated carbon are described. (Schulz-FIRL)
W78-02029

THE APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO WASTE WATER ANALYSES USING THE DETERMINATION OF LOW VOLATILITY PETROLEUM-HYDROCARBON COMPOUNDS AS AN EXAMPLE (DIE ANWENDUNG DER DUENNSCHICHTCHROMATOGRAPHIE IN DER ABWASSERANALYTIK AM BEISPEIL DER BESTIMMUNG SCHWERFLUECHTIGER MINERALOEL-KOHLENWASSERSTOFFE),
Stadt Cologne (West Germany). Abwasserlaboratorium.
For primary bibliographic entry see Field 5A.
W78-02030

CLARIFIER CATCHES FINE PARTICULATES.
Chemical Engineering, Vol. 34, No. 25, p 133-134, November, 1977.

Descriptors: *Clarification, Equipment, *Suspended solids, *Centrifugation, *Industrial wastes, Pulp and paper industry, *Waste water treatment.

The Vortex Clarifier has been manufactured by Bird Machine Company of South Walpole, Massachusetts, for removal of suspended solids and fine particulates from industrial waste waters, for recovery of valuable solids from discharge water, and for polishing of process liquids. The centrifugal unit is designed to work on an operate-flush cycle and requires 1/200 of the space needed for a gravity settling tank. During operation, waste water is pumped into the bottom of the clarifier while the outer shell and inner vaned hub rotate simultaneously at a speed of 3,600 rpm. The particulates which accumulate on the outer wall are dislodged during the flush phase by two wiper vanes connected to the hub, and the unit is then backwashed. The operate-flush cycle can be set to a cycle time of 30 min to 12 hr. The Vortex Clarifier is reported to be more efficient that disc and bowl centrifuges, since high flowrates in centrifuges create strong eddy currents which remix the fine solids as fast as they are separated. The unit is currently manufactured in a 10 inch-dia size with a capacity of 40-140 gpm; a 24 inch-dia unit with a capacity of 300-1000 gpm should be available in early 1978. The system has been used to

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reduce solids in a paper mill white-water system by 84% from 1,400 to 224 ppm, and in talc slurry from a roofing mill coating operation by 97% from 450 to 12 ppm. (Schulz-FIRL)
W78-02032

R. O. SYSTEM FOR RINSE WATER.
Water and Waste Treatment, Vol. 20, No. 9, p 54, September, 1977.

Descriptors: *Reverse osmosis, *Membrane processes, *Water reuse, Separation techniques, *Chemical wastes, Costs, Industrial wastes, Filtration, Industrial water, *Waste water treatment, Electropainting wastes.

A reverse osmosis system is being used at the Mooka plant of Kobe Steel Ltd. in Japan to treat rinse water from an electropainting line. The acrylic paint recovery-water reuse system has reduced paint expenditure by 40% and overall costs by 30% for the plant, which uses an electropainting line to apply an acrylic finish to aluminum window frames. The unit is also a closed-loop system which separates the acrylic paint and associated solvents from the water so that both can be reused in the process, eliminating the need for waste water disposal to the municipal waste water treatment system. The reverse osmosis unit was designed by Shinko-Pfaudler Company Ltd. and includes 30 B-9 Du Pont Company 'Permasep' permeators. Costs to Kobe Steel Ltd. for acrylic paints used in the finishing process were reduced from $300,000/yr to 180,000/yr with the installation of paint recovery in the reverse osmosis system. Annual operating costs for the system were $6,700 for electricity and $23,000 for permeator and cartridge filter replacement, leaving a net savings of approximately $90,000. The system, which should pay for itself in two years with savings in raw materials, water, and waste disposal costs, produces water which contains less than 0.3% of the acrylic paint ingredients and has a conductivity of less than 80 microohms/cm. (Schulz-FIRL)
W78-02033

ABRASIVE EFFLUENT.
Water and Waste Treatment, Vol. 20, No. 9, p 54, September, 1977.

Descriptors: *Pumping, *Calcium carbonate, *Abrasion, *Filtration, *Dewatering, Equipment, Industrial wastes, Filters, *Waste water treatment, Effluents, Tile polishing wastes, Abrasive effluents.

A waste water treatment and disposal system which was designed by William Boulton Ltd. has been installed at the Saint James Tile Company in Cuffley, England. The highly abrasive effluent, which is actually a slurry of calcium carbonate particles from the tile polishing operations, is collected and flows into a sump. A Mono 'L' Range pump, manufactured by Mono Pumps Ltd., is used to transport the effluent to the top of a thickening tank. The Mono 'L' pump has a helical rotor/stator design to resist wear by abrasion and is equipped with a simplified Flexishaft drive to insure minimum maintenance. A Type 'K' Metripump, manufactured by Metering Pumps Ltd., is used to dose the effluent with polyelectrolyte. Particles which settle to the bottom of the thickening tank are pumped via a second Mono pump to a William Boulton filter press to a pressure of 50 lb/sq in. A ram pump completes the cycle to a maximum pressure of 150 lb/sq in, producing a press cake in the form of a clean, clay-textured filter cake which is discharged into trucks for later disposal. The relatively clean water which overflows a weir at the top of thickening tank is recycled to the tile polishing operations. (Schulz-FIRL)
W78-02034

STREAM ASSIMILATION CAPACITY: A FACTOR IN TRACE ORGANIC WASTEWATER TREATMENT POLICY,
Alabama Univ., University.
For primary bibliographic entry see Field 5B.
W78-02035

PHOSPHATE REMOVAL FROM AQUEOUS SOLUTION FROM ACTIVATED RED MUD,
Tokyo Univ. (Japan). Dept. of Metallurgy and Materials Science.
S. J. Shiao, and K. Akashi.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 280-285, February, 1977. 9 fig, 7 ref.

Descriptors: *Adsorption, *Nutrient removal, Phosphorus, *Mine wastes, *Mud, Filtration, Heat treatment, Industrial wastes, *Waste water treatment, Bauxite mining wastes, Red muds, *Phosphorus removal.

Solid adsorbents such as fly ash and activated alumina have been used as alternatives to conventional methods of phosphorus removal in waste water treatment. Results of studies on the use of an activated red mud, wasted from the Bayer process for extraction of alumina from bauxite, for phosphate removal are presented. Raw red mud was activated with 20% HCL and used in batch adsorption studies. Studies on the effect of contact time on phosphate removal efficiency indicated that more than 50% of the phosphate was removed during the first 10 min after contact and about 72% was removed within 120 min. The transition point between the initial rapid removal and the later phase of slower removal may represent a transitional point in the adsorption mechanism, after which pore diffusion rather than surface layer adsorption controls phosphate removal. Experiments on the effect of heat treatment and temperature indicated that heat treatment deceased the adsorption capacity of the red mud for phosphate, but the adsorption of phosphate from aqueous solutions by activated red mud was not affected by temperatures up to that of the liquid's boiling point. The phosphate adsorption capacity of activated red mud is reported to be similar to that of F1 alumina. (Schulz-FIRL)
W78-02036

ELECTROLYTIC DETOXIFICATION OF CYANIDES (ELEKTROLYTISK AVGIFTNING AV CYANIDER),
J. O. From.
Teknisk Ukeblad, Vol. 124, No. 16, p 39-40, April, 1977. 2 fig, 4 ref.

Descriptors: *Nitrogen compounds, *Electrochemistry, *Chemical wastes, *Electrodes, *Chemical reactions, Chemical precipitation, Oxidation, Industrial wastes, *Waste water treatment, *Cyanide.

A method for the electrolytic decomposition of cyanides in electroplating effluents and spent hardening salts is described. The cyanide electrolyte is oxidized to cyanate and further to carbon dioxide and nitrogen in an electrolyzer with graphite anodes and steel cathodes at a potential of 2.5-3 V and a current density of less than 4 A/d-sq m. This method is also suitable for the decomposition of nickel cyanide and iron cyanide complexes. The electrolyte is circulated during electrolysis. The metals precipitated on the cathode can be easily recovered. When adding sodium chloride to the electrolyte, sodium hypochlorite is generated continuously; this substance will react with cyanide, yielding sodium chloride, which is oxidized again to sodium hypochlorite. This reaction requires a pH value of 10-11 and a temperature of 40-50C. The energy consumption amounts to 6-12 kWh/kg of CN. (Takacs-FIRL)
W78-02038

SOME ION EXCHANGE APPLICATIONS TO RECOVER AND REUSE VALUABLE MATERIALS FROM POLLUTANTS,
G. S. Ranganathan.
Indian Chemical Journal, Annual Number, p 122-125, 1977. 1 fig.

Descriptors: *Recycling, *Separation techniques, *Ion exchange, *Cation exchange, *Anion exchange, Industrial wastes, Fertilizers, Ammonia, Mercury, Chromium, Acids, *Waste water treatment.

Applications of ion exchange in the recovery and recycling of industrial waste constituents are described. Zinc recovery and reuse is described for the process and regeneration/elution cycles of viscose rayon and tire cord manufacture. The recovery of ammonia from fertilizer manufacturing wastes can be accomplished by adsorption onto a strongly acidic cation exchanger. Mercury can be removed from chlor-alkali manufacturing wastes by adsorption onto a basic anion exchanger, which can be regenerated with acidified hydrogen sulfide. Ion exchange resins can also be applied to the removal of cyanide and chromium from plating shop effluents. In treatment of plating wastes, effluent first passes through an activated carbon filter for removal of organic matter and suspended solids. Cyanides can be destroyed with an oxidizing agent such as sodium hypochlorite, and chromates with a reducing agent such as sodium metabisulfite or sulfur dioxide. The use of a hydrogen-ion exchange treatment unit for the recovery and reconstitution of chromic acid in an anodizing bath is described. (Schulz-FIRL)
W78-02039

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS IN FERTILIZER INDUSTRY,
Fertilizer Corp. of India, Trombay.
Y. R. Pakkala.
Indian Chemical Journal, Annual Number, p 107-108, 1977.

Descriptors: *Fertilizers, *Acids, *Carbon, *Gypsum, *Recycling, *Chemical wastes, Filtration, Activated carbon, Phosphorus compounds, Air pollution, Waste treatment, *Waste water treatment.

Increasing demands on cropland in India have led to an increase in the number of fertilizer manufacturing operations. Since discharge of gaseous and liquid wastes from these fertilizer plants poses a hazard to the environment, efforts have been made by the Fertilizer Corporation of India Ltd. in Trombay to utilize some of the by-products or recover the waste products in order to minimize the pollution problem. Recovery of fine carbon particles in an ammonia plant where the Shell partial oxidation process is used is accomplished with a continuous disc filter. A filter cake which contains 15-20% carbon is produced while the filtrate is recycled through the plant. The carbon can then be reused in rubber, paint, printing ink, and activated carbon industries. Dimethyl ether produced during the synthesis of methanol is recovered by scrubbers at a rate of 300 tons/yr for use in solvent extraction and as a propellant for aerosols. Gypsum recovery at a phosphoric acid plant amounts to about 450 tons/yr. Hydrofluorosilicic acid is recovered in rubber-lined, carbon steel scrubbers for the production of aluminum fluoride and cryolite. Dilute nitric acid is concentrated for use in the manufacture of drugs, explosives, and dyes and is used along with dilute sulfuric acid for the acidulation of phosphate rock in the manufacture of phosphoric acid. A double absorption system for the removal of sulfur dioxide and acids from emissions is being installed. (Schulz-FIRL)
W78-02040

RE-USE OF WASTE WATERS,
M. L. Shah.
Indian Chemical Journal, Annual Number, p 137-139, 1977. 2 ref.

Descriptors: *Water reuse, *Effluents, *Tertiary treatment, *Industrial water, *Industrial wastes, Sewage treatment, Sewage disposal, Foreign countries, Pulp and paper industry, Textiles, Oil wastes, Fertilizers, *Waste water treatment, Waste water disposal, India.

Rapid industrialization and increased demands on water supplies for municipal and irrigation purposes have led to the consideration of reuse of domestic and industrial waste waters in India. Union Carbide India Ltd. in Chembur, India, has begun using a 4.540-mld tertiary treatment plant to treat domestic waste water for reuse in cooling, processing, air-conditioning, and other operations. Costs for the treated domestic waste water were 65 paise/1000 liters as compared with 100 rupees/1000 liters for water obtained from Bombay's municipal water supplies. Additional applications in which tertiary treatment was used to treat sewage water for use as make-up water for air-conditioning systems in high-rise buildings are described. General characteristics of industrial effluents which may influence their capacity for reuse are evaluated. Industries in India which currently reuse some portion of process waters include textile mills, pulp and paper industries, oil refineries, thermal power stations, and iron and steel plants. Additional treatment of blast furnace flue dust wash water and rolling mills effluent is normally required in the steel industry before these effluents can be recirculated. Recirculating of process waters is discussed for the fertilizer industry which manufactures urea, ammonia, acid, and granular fertilizer. (Schulz-FIRL)
W78-02041

TRC DEDICATES TREATMENT PLANT.
American Dyestuff Reporter, Vol. 66, No. 11, p 17, 58, November, 1977.

Descriptors: Chemical wastes, *Neutralization, *Activated sludge, *Oxidation lagoons, *Industrial wastes, Clarification, Sludge digestion, *Treatment facilities, *Waste water treatment, Toms River(NJ).

A new $15.5-million waste water treatment plant with an expected annual operating cost of $4.5 million has been dedicated at Toms River Chemical Corporation in Toms River, New Jersey. The 45-acre facility includes equalization basins, lime treatment facilities for neutralization, mechanical clarifiers for removal of suspended solids, and aerated lagoons for removal of soluble organics by biological oxidation. Construction of the new waste treatment facilities involved renovation and expansion of existing neutralization and equalization facilities, the installation of an additional clarifier, and the construction of an activated sludge system equipped for digestion and dewatering of sludge. A building which houses air compressors and pumps and another which houses sludge filters, control rooms, laboratories, offices, and personnel facilities were also erected. Toms River Chemical, jointly owned by Ciba-Geigy Corporation and an affiliate of Sandoz Ltd. of Basle, Switzerland, has modified production processes, eliminated some products, and conducted extensive research and development to assure compliance with regulations imposed by the EPA. (Schulz-FIRL)
W78-02042

DISPOSAL OF SWEET CHERRY PROCESSING BRINES,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
G. M. Sapers, O. Panasiuk, and L. R. Ross.
Journal of Food Science, Vol. 42, No. 6, p 1454-1456, 1977. 8 tab, 10 ref.

Descriptors: *Neutralization, *Brines, *Brine disposal, *Chemical precipitation, Sulfur compounds, Sulfite liquors, Sulfates, Oxidation, Canneries, Calcium, Industrial wastes, Food processing industry, Waste water treatment, Waste water disposal.
Identifiers: Cherry processing brines.

Various strategies for the disposal and treatment of cherry processing brines were investigated, including brine neutralization and calcium sulfite precipitation, the anaerobic degradation of neutralized brine, the oxidation of residual sulfur dioxide with hydrogen peroxide, deep well disposal, and brine reformulation with calcium dihydrogen phosphate. Studies with waste brines simulated from dry mix formulations used to process Windsor cherries indicated that in neutralization with calcium hydroxide, even when approximately 140% of the amount theoretically required for the neutralization of bisulfite was added, some SO2 remained in the brine. This was attributed to the presence of organic acids and bisulfite which interfered with calcium sulfite precipitation. Studies on the effect of organic acids on precipitation of calcium sulfite indicated that the presence of citric and malic acids resulted in higher residual SO2 concentrations than did fumaric acid. The studies also indicated that sulfite reductions could be enhanced by oxidation with hydrogen peroxide. The proposed treatment process involves separation of the precipitated calcium sulfite and sulfate from the neutralized brine by filtration, centrifugation, or sedimentation. Washing of the sludge to remove fermentable solids is recommended to alleviate possible objectionable odors arising during storage under anaerobic conditions. (Schulz-FIRL)
W78-02044

TREATING THE WATER FOR WATNEY'S.
For primary bibliographic entry see Field 5A.
W78-02046

CALIFORNIA'S FOOD INDUSTRY WASTEWATER MANAGEMENT CHALLENGE,
Montgomery (James M.), Walnut Creek, CA.
R. A. Tsugita, R. H. Ellis, and C. A. Kahr.
Civil Engineering-ASCE, Vol 47, No 7, p 62-68, September, 1977. 2 fig, 3 tab.

Descriptors: *Food processing industry, *Activated sludge, *Aeration, *Industrial wastes, *Canneries, Water quality standards, Water pollution control, Oxidation lagoons, Trickling filters, Return flow, *Waste water treatment.

Various aspects of food processing waste treatment practices in California are discussed. Since most food processing waste waters are free of toxic chemicals, biodegradable, and generally contain high concentrations of organic materials and suspended particles, biological treatment processes have been widely used. General characteristics of food processing wastes and regulations imposed upon food processing effluents by the 1972 Federal Water Pollution Control Amendments are discussed. Approximately 75% of California's fruit and vegetable canneries and meat and poultry packing plants discharge their waste directly to municipal treatment systems, as compared to a national average of 60%. The activated sludge process has been used by many municipal treatment plants to meet PL92-500 standards of 30 mg/liter for BOD and suspended solids. Particularly effective are the high-purity oxygen activated sludge process and the roughing filter/activated sludge system. Waste water treatment systems used by California food processing industries which do not discharge their wastes to a municipal system include ponding systems such as aerated lagoons, stabilization/evaporation ponds, facultative ponds, and percolation systems. Trickling filters, activated sludge units, and land disposal systems employing spray irrigation, surface irrigation, and overland flow have also been used. The use of in-plant controls to reduce water usage and/or waste generation at the source through improved operational procedures or the use of process modifications is discussed. Waste water management systems and combinations of systems available to the food processing industry are described. (Schulz-FIRL)
W78-02047

ARTICHOKE INDUSTRIES--CUTTING BOD BY 95%.
Civil Engineering-ASCE, Vol 47, No 7, p 63, September, 1977.

Descriptors: *Food processing industry, *Flotation, *Biochemical oxygen demand, *Water consumption, *Treatment facilities, Activated sludge, Canneries, Pilot plants, Industrial wastes, *Waste water treatment, Castroville(CA).

Artichoke Industries in Castroville, California, the sole processing plant for artichokes in the United States, processes over 14,000 tons of artichokes annually. Increasing production during the 1950's led to overloading of the local municipal treatment plant, and an industrial waste water ordinance limited Artichoke Industries' discharge in 1963 to 60,000 gpd and 240 lb BOD/day. Although in-plant modifications had already reduced water consumption, further process changes were necessary to reduce the BOD of 3,750 lbs/day to the required level. A physical-chemical treatment system which was instituted in 1967 to utilize ferric chloride and lime addition only reduced the BOD in discharge waste water to 700 lbs/day. Laboratory and pilot-scale tests led to the conversion of the chemical precipitation unit to an air flotation tank with skimming for solids removal. Additional studies indicated that segregation of the waste into three streams would be beneficial. Pilot studies with an air-activated sludge system which removed 97% of the BOD led to the conversion of an existing holding tank to a full-scale activated sludge system with nutrient addition in pretreatment. Current operations at the facility produce 20,000-40,000 gpd of waste water flow with an average BOD of 150 mg/liter. (Schulz-FIRL)
W78-02048

AT SUNKIST, LEMONS AND ORANGES DON'T MIX.
Civil Engineering-ASCE, Vol 47, No 7, p 64, September, 1977.

Descriptors: *Citrus fruits, *Canneries, Food processing industry, *Return flow, *Activated sludge, Biochemical oxygen demand, Treatment facilities, Lemons, Oranges, Effluents, Industrial wastes, *Waste water treatment.

Two citrus processing waste treatment facilities operated by Sunkist Growers in southern California for the treatment and disposal of high-strength wastes are described. The Orange Products Division in Ontario processes over 500 citrus by-products from oranges, grapefruit, and tangerines, generating approximately 1.7 mgd of high-strength waste water. Waste water is conveyed by gravity pipelines to a 230-acre farm for land application. A portion of the process waste with a high salt content is discharged to the Los Angeles County Sanitation District's system. The Lemon Products Division in Corona produces over 300 different lemon products, including juice concentrates, pectin, lemon oil, dried peel products, and beverage bases. Since discharge requirements established by the California Regional Water Quality Control Board did not allow the use of a land disposal system, a $6.5-million high-purity oxygen activated sludge system was selected for pretreatment of the 1.5 mgd of high-strength waste prior to disposal to the municipal sewer. (Schulz-FIRL)
W78-02049

UNIVERSITY OF ILLINOIS - CHAMPAIGN

TREATMENT PROCESS FOR COPPER PYROPHOSPHATE ELECTROPLATING RINSE WATERS,
Agricultural Research Service, Peoria, IL. Northern Regional Research Lab.
R. E. Wing, W. E. Rayford, and W. M. Doane.
Metal Finishing, Vol 75, No 5, p 101-104, May, 1977. 7 tab, 28 ref.

Descriptors: Chemical reactions, *Chemical precipitation, *Copper, *Phosphorus compounds, *Separation techniques, Hydrolysis, Metals, Lime, Calcium chloride, Calcium hydroxide, Hydrogen ion concentration, Phosphates, Industrial wastes, *Waste water treatment, Plating wastes, Pyrophosphates.

The treatment of copper pyrophosphate baths and rinses used in the plating of printed circuits is governed by EPA regulations on plating effluents. A treatment process designed to lower the copper and phosphorus concentrations was tested with synthetic and actual rinse waters. The treatment process involves the addition of calcium hydroxide or lime at pH values above 9 to remove copper and phosphorus from fresh baths which contain relatively little orthophosphate, and the substitution of calcium chloride for lime as the orthophosphate concentration builds up to more than 12 oz/gal. The optimum amounts of calcium as calcium hydroxide, lime, or calcium chloride required to reduce the concentration of copper to less than 0.02 mg/liter and total phosphorus concentration to less than 1 mg/liter were determined with synthetic solutions. The studies indicated that 2.7 moles Ca(++) removed 0.9 moles P207(-4) and 2.0 moles Ca(++) removed 1.0 moles HPO4(--). Results of the use of the treatment process for actual copper pyrophosphate baths and for diluted dragout rinses from these baths are presented. The use of carbonation with CO2 to remove the residual Ca(++) is recommended. An anionic polyelectrolyte can be added at a concentration of 3.5 mg/liter to facilitate settling of the phosphate sludge. Chemical costs for the treatment process with lime and a polymer were estimated at $0.16/1000 gal. (Schulz-FIRL)
W78-02050

PURIFICATION OF NICKEL AND COBALT ELECTROPLATING SOLUTIONS,
Metalux Corp., Paterson, NJ. (Assignee).
R. Merker, and S. Lucca.
United States Patent 4,053,400. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol 963, No 2, p 622, October, 1977.

Descriptors: *Electrochemistry, *Heavy metals, *Separation techniques, Chemical reactions, *Filtration, Industrial wastes, Acidic water, Zinc, Copper, Iron, Metals, Nickel, Cobalt, Chemical precipitation, *Waste water treatment, *Patents, Electroplating wastes.

A process has been patented which utilizes electrodeposition of nickel and cobalt from aqueous acidic solutions, such as electroplating solutions, which contain the metals in an ionic form. The solution, in which metals such as zinc, copper, and iron build up during use, is periodically filtered to remove the metallic impurities. The process has been improved by the addition of an organic compound having the general formula a-S-X to the solution during filtration to precipitate the metallic impurities. The compound has a radical group represented by 'a' which includes N, C, S, and either methyl, ethyl, or butyl. 'X' in the formula consists of H, Na, K, Li, a, or some combination of a, S, H, Na, K, Li, or Co. (Schulz-FIRL)
W78-02051

SLUDGE TREATING PROCESS,
Nichireki Chemical Industry Co. Ltd., Tokyo (Japan). Assignee.
F. Fukushima, T. Sugita, K. Kobayashi, H. Asada, and A. Onishi.
United States Patent 4,053,401. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol 963, No 2, p 622, October, 1977.

Descriptors: *Sludge treatment, *Separation techniques, *Mercury, *Cadmium, *Coagulation, Arsenic, Sulfur compounds, Chemical precipitation, Industrial wastes, *Patents, *Waste water treatment, Dodecyl mercaptan.

A process has been patented for the treatment of sludges which contain toxic pollutants such as mercury, cadmium, lead, or arsenic. A bituminous emulsion and dodecyl mercaptan are added to coagulate and solidify the sludge. For the treatment of sludges which contain mercury, the sludge is coagulated and solidified by the addition of a bituminous emulsion and colloidal sulfur. (Schulz-FIRL)
W78-02052

SX'S KEY ROLE: TREATING METAL WASTES.
Canadian Chemical Processing, Vol 61, No 10, p 27-28, October, 1977. 1 fig.

Descriptors: *Solvent extractions, *Separation techniques, *Organic compounds, *Metals, *Recycling, Industrial wastes, Uranium, Zirconium, Copper, Cobalt, *Waste water treatment.

Increases in chemical costs and stricter waste water disposal regulations have created incentives to use solvent extraction for recovery of valuable substances from industrial wastes. At the present time more than 40 agents are available for solvent extraction in metals recovery. Copper is currently being recovered from leach solutions at a rate of 200 Gg/yr by solvent extraction followed by electronwinning. Chromium and vanadium have been recovered from low-grade iron ores in Canadian mining operations by extraction with a strongly alkaline leach solution. Studies in Sweden have investigated the recovery of zinc from mill flue dust, neutralization sludge, and nickel-cadmium battery scrap. The International Nickel Corporation in Sudbury, Ontario, is currently investigating cobalt recovery. Eldorado Nuclear, a uranium refining operation, has used solvent extraction in pilot studies to purify zirconium and to recover uranium as uranium oxide and uranyl nitrate. The feasibility of solvent extraction in a particular industry is suggested to be a function of metal values, organic solvent costs, and the effects of organic solvents on aquatic life in receiving waters. (Schulz-FIRL)
W78-02053

MONITORING PLANT EFFLUENT WITH OPEN-CHANNEL FLOW METER,
Vulcan Mold and Iron Co., Trenton, MI.
For primary bibliographic entry see Field 5A.
W78-02054

TREATMENT OF ELECTROPLATING EFFLUENTS IN METAL-WORKING INDUSTRY (GALVAN SZENNYVIZEK TISZTITASA A FEMSZERELVENYGYARTAS FOLYAMAN),
F. Mosoni.
Gepgyartastechnologia, Vol. 17, No. 4, p 156-158, April, 1977.

Descriptors: *Chromium, *Metals, *Chemical precipitation, *Neutralization, Industrial wastes, Chemical reactions, Effluents, *Waste water treatment.

The treatment of electroplating effluents at a metal fixtures factory in Hungary is described. The cyanide-free effluents contain acids, bases, and hexavalent chromium. The acid and basic effluents are neutralized in a common reactor, while the hexavalent chromium is reduced to trivalent chromium by monobasic sodium sulfite at pH 2.5. The metals are precipitated with sodium hydroxide at pH 8.5-9.5, and then settled in a settling basin for 2 hr. The sludge is dewatered by means of a scroll centrifuge to a dry matter content of 25-30%. (Takacs-FIRL)
W78-02055

FILTERS AND CLARIFIERS.
Water and Waste Treatment, Vol. 20, No. 9, p 78, September, 1977.

Descriptors: Equipment, *Clarification, *Separation techniques, *Filters, Industrial wastes, Centrifugation, Filtration, *Waste water treatment.

Sala Ltd. of England produces a wide variety of filters, clarifiers, and thickeners for use in mineral processing. A Sala belt drum filter is being used in Nottingham to filter a fine froth-floated coal and has been used extensively in the sewage and pulp and paper industries. The unit is equipped with a belt tracking device and can be used with either roller discharge or an air knife discharge. The disc or drum filters can be arranged for 'snap blow' or belt discharge with normal or top feed. The Sala Lamella thickener/clarifier is available in sizes of 16-500 sq m. Since the gravity sedimentation units do not require as much ground area as conventional thickeners, they are suggested for use in pollution control where space is limited. Centrifugal pumps are available with rubber-covered or Ni-hard parts. Sala also produces a series of Krebs hydrocyclones for particles separation in a size range of 2-100 microns. (Schulz-FIRL)
W78-02057

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED,
S. J. Khambatta, and C. M. Ketkar.
Indian Chemical Journal, Annual Number, p 109-113, 1977. 4 tab, 3 ref.

Descriptors: *Pulp and paper industry, *Activated sludge, *Return flow, *Fertilizers, *Nutrient removal, Effluents, Industrial wastes, Aeration, Sludge treatment, Treatment facilities, *Waste water treatment, Waste water disposal.

The Pudumjee Pulp and Paper Mills Ltd. in India have begun using an advanced waste water treatment plant to treat activated sludge treatment plant effluents for use in irrigation. During treatment at the 1.6-mgd plant, effluents are pumped to a bar screen, a venturi flume for flow metering, a flash mixer for pH adjustment, and a primary clarifier which removes floating matter and suspended solids and reduces BOD by 20-25%. The effluent is then mixed with recycled activated sludge, and nutrients in the form of urea and phosphoric acid are added at a rate of 100 kg BOD:5 kg N:1 kg P. The mixture is aerated with fine bubble diffusers to produce a dissolved oxygen concentration of 2.0-3.5 mg/liter. A secondary clarifier is used to separate the treated effluent from the activated sludge. The treated effluent which satisfies standards set by the Indian government is distributed through a network of pipelines and canals to irrigate 300-500 acres of neighboring agricultural land. Sludge from the primary clarifiers is used as fuel and fertilizer by the local populaton. (Schulz-FIRL)
W78-02058

PREVENTION OF ENVIRONMENTAL POLLUTION IN THE MAN-MADE FIBER INDUSTRY DURING THE 10TH 5-YEAR-PLAN (OBEZVREZHIVANIE OKRUZHAYUSHCHEI SREDY PREDPRIVATII ISKUSSTVENNYKH VOLOKONA V DESYATOI PYATIPETKE),
V. P. Kim, I. I. Chicherin, and A. N. Selin.
Khimicheskie Volokna, No 2, p 29-31, 1977. 2 fig.

Descriptors: *Water pollution control, *Pulp and paper industry, *Textiles, *Water quality management(Applied), Water reuse, Water consumption,

*Waste water treatment, Foreign countries, USSR.

Measures to be implemented in the areas of clean air maintenance and water pollution prevention in the man-made fiber industry of the USSR during the tenth 5-yr-plan are discussed. The fiber production will have to be increased by 52-62% without increasing the water consumption. The specific water consumption and the effluent discharge will have to be reduced by the adoption of new technologies entailing lower water consumption, closed water cycle, and partial recirculation of slightly polluted water. The use of certain harmful chemicals such as carbon disulfide should be eliminated by the introduction of new technologies. Three-stage waste water treatment on plant premises is envisaged. (Takacs-FIRL)
W78-02059

TREATING WOOL SCOUR WASTE.
Australian Patent 478,434. Issued December 2, 1976. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 45, p 4406, December, 1976.

Descriptors: *Flocculation, *Surfactants, *Detergents, *Textiles, *Patents, Separation techniques, Industrial wastes, *Waste water treatment, Wool processing wastes, Polyacrylamide.

A process for treating spent or partially spent liquors used in the scouring of raw or slipe wool has been patented. After the aqueous soap or synthetic detergent solution is removed from the scour bowl, an effective non-ionic or cationic polyacrylamide is added in the form of an aqueous solution to give a flocculant concentration of 1-20 ppm by weight in the spent liquor. The liquid is held to allow sufficient separation of the solids and liquor. After the solids are removed, the clarified liquor can be discharged or recycled. (Schulz-FIRL)
W78-02060

DISPERSE DYE-CARRIER INTERACTIONS ON ACTIVATED CARBON,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, and A. S. Natter.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 235-244, February, 1977. 15 fig, 3 tab, 9 ref.

Descriptors: *Dyes, *Dye dispersion, *Activated carbon, *Adsorption, *Surfactants, Textiles, Color, Industrial wastes, Separation techniques, *Waste water treatment, Dyehouse waste, Disperse wastes, Dye carriers, Cationic surfactants, Dye removal.

Interactions between disperse dyes and other waste constituents, the removal of several different dye bath waste constituents in a carbon bed, and the effects of carrier and cationic surfactant concentrations on removal of disperse dyes were investigated with dye bath constituents obtained from Ware Knitters, Inc., in Ware, Massachusetts. The disperse dyes used in the study were Foron Yellow E-3GFL, Foron Rubine SE-GFL, and Foron Blue E-GFLN. Tanavol APP and Hostetex L-PEC were used as dye carriers and Katapol VP-532 as the cationic surfactant. Studies with two carbon columns indicated that although carrier concentrations as high as 4000 mg/liter were added to the dye bath waste, color removal was still inadequate and high carrier concentrations shortened the life of the carbon column. Lower dye removals with 50 mg/liter of Katapol VP-532 were attributed to adsorption by the cationic surfactant, which decreased the number of adsorption sites available to the dyes. Addition at 150 mg/liter resulted in decreased dye concentrations in the feed and enabled complete removal in the column. The use of a surfactant as a coagulant prior to contact with activated carbon is suggested to provide adequate means of treatment for textile dyes while extending the life of the carbon bed. (Schulz-FIRL)
W78-02061

MUNICIPAL SEWERS HELP SOLVE WATER DISPOSAL PROBLEMS,
Armco Steel Corp., Kansas City, MO.
J. K. Fuller.
Industrial Wastes, Vol. 23, No. 5, p 34-37, September/October, 1977. 1 fig, 1 tab.

Descriptors: *Neutralization, *Oxidation, *Aeration, *Treatment facilities, *Acidic water, Equalizing reservoirs, Sodium compounds, Steel, *Waste water treatment, Waste water disposal, *Sewers, Kansas City(MO).

The Armco Steel Corporation plant on the Big Blue River in Kansas City, Missouri, produces a variety of high carbon rod products in its rod cleaning and wire coating operations. The rod cleaning facilities include two 8,000-gal sulfuric acid pickling tubs. The wire coating facility uses hydrochloric acid in two copper coating lines and an aluminizing line, and acidized flux (zinc ammonium chloride) in the galvanizing lines. Since water quality standards imposed by the Missouri Clean Water Commission prohibit direct discharge of treated or untreated process water, the treatment and disposal plant for the acidic rinses was designed to allow discharge to the Kansas City sewer system. The rod cleaning and wire coating wastes are first pumped through a bar screen chamber to a 1200-ft circular concrete reinforced basin which is lined with acid brick. After retention for 30 min, three end-suction centrifugal pumps transport the water through a high density polyethylene underground pipeline to the treatment plant. The treatment facility includes chemical storage facilities, Leeds and Northrup pH control and flow measuring equipment, and the chemical metering pumps. The rinse water, which has a pH of 2.0, is neutralized with a 50% NaOH solution in a 10,000-gal partially buried mixing tank. The tank is equipped with a submerged turbine aerator for oxidation of the ferrous iron in the waste water. The pH control system is used to adjust and maintain the pH of the treated waste water at 8.5. (Schulz-FIRL)
W78-02062

SPENT SULPHURIC ACID WASTES CONVERTED TO USEFUL GYPSUM.
Chemical Processing, Vol. 40, No. 8, p 105, July, 1977.

Descriptors: *Gypsum, Calcium compounds, *Calcium sulfate, *Acidic water, *Neutralization, Metals, Titanium, Industrial wastes, *Waste water treatment, Sulfuric acid, Titanium dioxide.

American Cyanamid Corporation of Bound Brook, New Jersey, has begun using a process for the production of gypsum from spent sulfuric acid produced during the sulfate process of titanium dioxide manufacturing. The neutralization facilities at Cyanimid's titanium dioxide plant in Savannah, Georgia, treat 4 mgd of strong and weak acid which is combined with 20 mgd of non-process waste water prior to discharge. The gypsum conversion process to prevent water pollution by spent sulfuric acid wastes is recommended for titanium dioxide plants and for other industrial manufacturing operations where sulfuric acid streams of low and medium strength are generated. (Schulz-FIRL)
W78-02064

TURNING WASTE WATER AROUND.
Rohm and Haas Reporter, Vol. 35, No. 3, p 17-19, Fall, 1977.

Descriptors: *Acidic water, *Anion exchange, *Water reuse, *Filtration, *Ion exchange, Industrial water, Industrial wastes, Suspended solids, Neutralization, Chemical wastes, Waste water treatment.

The Western Electric plant at Lee's Summit, Missouri, produces a waste discharge of more than 1 mgd in the form of a dilute acid waste stream with a pH of 2-3. Approximately 400,000 gpd consist of high-quality water which has been treated by the plant's large deionization facility. Lime treatment of the dilute acid waste which had been used for neutralization resulted in increased total dissolved solids. Studies were conducted in 1973 to develop a method of treatment which would render the water pure enough for reuse but not result in increased dissolved solids. An evaluation of the use of Amberlite, a weak base anion exchange resin manufactures by Rohm and Haas, indicated that a pilot plant employing 6 cu ft of resin was capable of treating 2,000 gpd. A larger unit was constructed to handle 200,000 gpd with provisions for scaling up to 600,000 gpd of low-conductivity, low-acidity water for reuse. A stainless steel disc filter is used to remove solids over 200 microns and an anthracite filter removes additional solids and oil. An 85-cu-ft column of Amberlite IRA-94 ion exchange resin neutralizes wastes and removes organics from the water, producing an effluent with a total dissolved solids concentration of approximately 100 ppm and a pH of 7-10. (Schulz-FIRL)
W78-02065

INDUSTRIAL PRESSURE LEAF FILTERS.
Water and Waste Treatment, Vol. 20, No. 9, p 36, September, 1977.

Descriptors: *Filters, *Filtration, Equipment, *Separation techniques, *Industrial wastes, Chemical wastes, Food processing industry, *Waste water treatment, Filtration, Industrial pressure leaf filters.

Amafilter Ltd., a British subsidiary of the Dutch company Amafilter B. V. of Alkmaar, Holland, has begun producing the Ama-Niagara range of vertical leaf pressure filters. The units are available with vertical or horizontal tanks for filter areas of 2.2-300 sq m and can be equipped with a wide range of accessories, including heating or cooling jackets, a cake thickness detector, and pneumatically operated clean-out doors. An oscillating sluice pipe allows operation with automatic dry or slurry cake discharge. The filters are designed for solids separation in the chemical, petrochemical, pharmaceutical, food processing, and brewing industries. The units, which can constructed of mild steel, stainless steel, monel, and titanium, can also be equipped with hydraulically-operated bayonet ring closures and a retractable filter leaf cartridge. (Schulz-FIRL)
W78-02066

PHOTODECOMPOSITION OF ODOROUS CHLOROPHENOLS IN WATER,
National Inst. for Environmental Studies, Tsukuba (Japan). Dept. of Chemistry and Physics.
A. Yasuhara, A. Otsuki, and K. Fuwa.
Chemosphere, Vol. 6, No. 10, p 659-664, 1977. 3 fig, 18 ref.

Descriptors: *Phenols, *Odor, *Chemical analysis, Analytical techniques, *Ultraviolet radiation, Chemical wastes, Industrial wastes, *Chemical reactions, Chlorination, *Waste water treatment, *Chlorophenols, *Photodecomposition(Phenols).

Odorous chlorophenols can be produced by the reaction of organic compounds in waste water with chlorine during disinfection by chlorination. Deodorization of chlorophenols by photolysis was investigated with 10-ppm solutions of 2-, 3-, and 4-chlorophenols irradiated with a 400W high-pressure mercury lamp. Experiments indicated that 4-chlorophenol was decomposed very easily by photolysis, forming phenol which was identified by gas chromatography-mass spectrometry. The 2-

chlorophenol decomposed to some degree while 3-chlorophenol was hardly affected by photolysis. A straight line plot of residual chlorophenols against irradiation time indicated that the reactions were first-order with rate constants of 0.0002/sec for 2-chlorophenol, 0.000036 for 3-chlorophenol, and 0.0014 for 4-chlorophenol. Photolysis at an irradiation time of less than 1 hr was not considered effective in deodorization since 2-chlorophenol is the major odorous component in monochlorophenols. Studies were conducted on the decomposition of 2- and 4-chlorophenols by ultraviolet irradiation for 1 hr in the presence of hydrogen peroxide at 15C and 1 atm nitrogen. The phenol formed from the decomposition of 4-chlorophenol was photooxidized in the presence of hydrogen peroxide. At hydrogen peroxide concentrations over 1000 ppm the odorous 2-chlorophenol was also decomposed, suggesting feasibility of the treatment process for industrial waste waters. (Schulz-FIRL)
W78-02068

HEMICELLULOSE-B FROM COMMERCIAL PINEAPPLE JUICE UNDERFLOW,
Hawaii Univ., Honolulu. Dept. of Food Science and Technology.
J. K. C. Chan, and J. H. Moy.
Journal of Food Science, Vol. 42, No. 6, p 1451-1453, 1977. 4 fig, 1 tab, 8 ref.

Descriptors: *Canneries, *Solvent extractions, *Tropical fruits, *Cellulose, *Pulp wastes, Food processing, Recycling, Industrial wastes, Separation techniques, Hydrolysis, Waste disposal, *Waste water treatment, Pineapple processing wastes, Hemicellulose-B, Acid hydrolysis, Enzyme hydrolysis.

At least 7,200 gal/day of centrifuged pineapple juice underflow, the wet suspended solid removed from the centrifuge in the process of juice manufacturing, can be produced as waste at a large pineapple cannery. Previous studies have investigated the recovery of several by-products from commercial pineapple juice underflow, including pineapple oleoresin, pineapple syrup, hemicellulose-B, and alpha-cellulose. Results of studies on the characterization and hydrolysis of hemicellulose-B after its isolation from the centrifuged pineapple juice underflow are presented. The scheme for extraction and isolation of various fractions in centrifuged underflow obtained from Dole Pineapple Company in Honolulu, Hawaii, is described. Details of the acid hydrolysis, enzymatic hydrolysis, and hydrolysis deionization techniques used in the preparation of hemicellulose-B hydrolysis are presented. The hemicellulose-B was recovered at 9.8% dry weight by freeze drying from a juice underflow which had 80.6% moisture. Comparisons of chromatographs produced from acid and enzymatic hydrolysis indicated that the chemical compositions in terms of sugars were identical. Industrial application of the hemicellulose-B recovery method is recommended with recovery of the alcohol, acetone, and sodium acetate used in the process to eliminate the creation of new pollution sources. Treatment with 17.5% sodium hydroxide extraction and 85% phosphoric acid treatment to remove insect fragments would make possible the use of hemicellulose-B as a thickener in syrups, beverages, and other food products. (Schulz-FIRL)
W78-02069

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 698, Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-304, December 1976. 503 p, 131 fig, 156 tab, 175 ref.

Descriptors: *Food processing industry, *Canneries, *Poultry, *Fruit crops, *Vegetable crops, Effluents, *Waste water treatment, Waste treatment, Recycling, Shellfish, Proteins, Design data, Operation and maintenance, Industrial wastes, Waste disposal.

Texts are supplied for 26 of the 27 papers presented at the Seventh National Symposium on Food Processing Wastes. The symposium was held in Atlanta, Georgia, on April 7-9, 1976, and was co-sponsored by the National Canners Association, American Meat Institute, Southeastern Poultry and Egg Association, and the Pacific Egg and Poultry Association. The papers cover a wide range of treatment, disposal, and recycling techniques for industries such as fish, shellfish, meat, and poultry processing; fruit and vegetable canneries; and wineries. Studies on the toxicity of food processing effluents to fish and on techniques for reducing waste water production through process changes are presented. (See W78-02071 thru W78-02090) (Schulz-FIRL)
W78-02070

A WASTEWATER TREATMENT STUDY FOR SKOKOMISH SALMON PROCESSING PLANT,
Kramer, Chin, and Mayo, Inc., Seattle, WA.
S. S. Lin, P. B. Liao, and M. W. Cochrane.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. P 21-42, 4 fig, 13 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Canneries, *Fish handling facilities, *Salmon, *Aeration, *Activated sludge, Water pollution control, Biological treatment, Pilot plants, Food processing industry, Industrial wastes, Waste water treatment, Skokomish River(WA), Salmon processing wastes.

Regulations imposed in 1973 by the EPA and the State of Washington required the Skokomish Salmon Processing Plant in Shelton, Washington, to treat its waste water before discharge into the Skokomish River. The facility designed by Kramer, Chin, and Mayo, Inc., of Seattle included an extended aeration system and two identical aerobic polishing ponds. Treated effluent passes to a soil disposal field for distribution through a 6 inch perforated plastic pipe. In an effort to monitor operations at the treatment facility and to provide data on fish processing wastes, grab and composite samples were collected from eight stations at the plant. Samples were analyzed for pH, DO, temperature, BOD, COD, SS, VSS, TS, grease and oil, TKN, alkalinity, turbidity, ortho-P, total-P, MLSS, and MLVSS. Waste water characteristics were observed to fluctuate with processing period, including large salmon processing, small salmon processing, fish food addition, and no activity except repacking. Treatment efficiencies during each period are calculated with respect to each of the parameters analyzed. Data on oxygen uptake were collected. Sludge filterability at the Skokomish plant was comparable to that of conventional activated sludge plants. The study indicated that the processing of large salmon resulted in lower flow and pollutant concentrations per unit of fish than did small salmon processing. Longer retention times and overaeration resulted in poor clarifier performance and high effluent phosphorus concentrations produced by the release of phosphorus in the aeration tank. (See also W78-02070) (Schulz-FIRL)
W78-02071

RECLAMATION AND TREATMENT OF CLAM WASH WATER,
Cornell Univ., Ithaca, NY. Dept. of Food Science.
For primary bibliographic entry see Field 5E.
W78-02072

PILOT PLANT PRODUCTION OF A FUNCTIONAL PROTEIN FROM FISH WASTE BY ENZYMATIC DIGESTION,
Washington Univ., Seattle. Inst. for Food Science and Technology.
G. O. Bucove, and G. M. Pigott.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 67-82, 6 fig, 4 tab, 17 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Enzymes, *Proteins, *Waste disposal, *Food processing industry, *Fish handling facilities, Pilot plants, Recycling, Feeds, Industrial wastes, Waste water treatment, Protein recovery, Enzymatic digestion, Non-fat dry milk substitutes.

At most only 65% of the available protein in fish caught annually is processed for human consumption, while the remainder is used for low grade animal feed or disposed as wastes. A biological enzyme process to digest fish protein was evaluated for the production of a soluble, high-quality protein product to be used as a mild solids substitute in animal feed or as a human food additive. The whole fish or fish waste is deboned and homogenized before passing to an enzyme reactor where pepsin is added to the water-fish slurry. The mixture is centrifuged to remove sludge and oil. Sodium hydroxide is added to the mixture in an anion conversion reactor to remove salts and the mixture is again centrifuged. After neutralization, the mixture is concentrated and spray dried to produce a white, fluffy powder which contains about 85% protein. Costs for the process are estimated at $0.80/lb as compared with current prices of $0.60/lb for non-fat milk solids which contain only 35% protein. (See also W78-02070) (Schulz-FIRL)
W78-02073

AN IMMOBILIZED-ENZYME PILOT PLANT FOR THE TREATMENT OF ACID WHEY,
Lehigh Univ., Bethlehem, PA. Dept. of Chemical Engineering.
M. Charles, R. W. Coughlin, and K. Julkowski.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 83-99, 7 fig, 4 tab, 9 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Enzymes, *Catalysts, *Dairy industry, *Food processing industry, Equipment, Recycling, Adsorption, Porous media, Industrial wastes, Waste water treatment, Lactase, Lactose, Whey.

A fluidized-bed hydrolysis reactor with lactase immobilized on small alumina particles as a catalyst was used in studies at the Lehigh Valley Dairy in Allentown, Pennsylvania, on the hydrolysis of lactose in raw (unfiltered) cottage cheese whey. The smallest practical particle size (50-200 microns) was used with the immobilized-enzyme catalyst since the larger relative particle surface area minimized the reactor size required and increased productivity. The laboratory-scale reactors were 3 ft high, 1 in diameter, and charged with 40 g of the lactase-on-alumina catalyst. The laboratory-scale reactors functioned without mechanical failure and the catalyst was stable throughout the experiment. An initial decay in the apparent catalyst activity was attributed to partially reversible adsorption of whey protein. Pilot plant studies were conducted with two 6-ft high, 3 in diameter hydrolyzers which contained approximately 4 kg of catalyst. Optional prehydrolysis treatment with either ultrafiltration or demineralization was added to the treatment process. Pilot plant operations resulted in a minimum lactose conversion of 70%. Total capital and operating costs for the system were estimated at $0.15/lb whey solids. Based on the cost of waste treatment, whey protein, and sucrose, a return investment of 68% for a 300 day/yr operation or $5.85/lb whey solids is predicted. (See also W78-02070) (Schulz-FIRL)
W78-02074

IN-PLANT CONTROL TECHNOLOGY FOR THE FRUITS AND VEGETABLES PROCESSING INDUSTRY,
SCS Engineers, Long Beach, CA.
K. V. LaConde, and C. J. Schmidt.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 100-109, 2 fig, 1 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Surveys, *On-site data collections, *Fruit crops, *Vegetable crops, *Flow control, Design data, Operation and maintenance, Industrial wastes, Waste water treatment, Food processing industry, Carrot processing, Fruit and vegetable processing industry.

An EPA-sponsored project conducted by SCS Engineers of Long Beach, California, included a survey of approximately 500 fruit and vegetable processing plants to obtain information on basic manufacturing processes, unit operations, waste water volume and characteristics, current in-plant practices used to reduce waste water volume and pollutant loading, current treatment technologies, performance efficiencies, alternatives, and costs. Plants which exhibited significantly lower raw waste loads were identified. Various in-plant operations and their potential effect on pollutant loadings were examined. Processes which were identified as having a positive effect in raw waste load reductions included separation of low and high strength waste streams, installation of low-volume high pressure clean-up systems, dry in-plant transport of products, countercurrent reuse of wash/flume/cooling waters, dry handling of solid wastes, dry caustic peeling, changeover from water to steam blanching, air cooling after blanching, and an active and progressive waste management program. A case study on designs to reduce waste water flow at a frozen carrot processing plant is presented. (See also W78-02070) (Schulz-FIRL)
W78-02075

LAND DISPOSAL OF WINERY WASTEWATER,
Montgomery (James M.), Walnut Creek, CA.
L. L. Russell, J. N. De Boice, and W. W. Carey.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 110-117, 2 fig, 3 tab, 5 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Soil disposal fields, *Waste water treatment, *Waste water disposal, *Return flow, Groundwater, Waste water disposal, Artificial recharge, Food processing industry, Industrial wastes, Winery wastes.

Various alternatives were considered in the construction of a waste water treatment and disposal system to accomodate a large new winery at the Beringer Winery in St. Helena, California. The winery generates 50,000 gpd of waste water during the 45-day crushing season and 20,000-30,000 gpd during the non-crushing season. The treatment system chosen for the waste water which usually has a COD of more than 10,000 mg/liter included screening and neutralization prior to disposal in seven percolation beds. Hydrologic and soils studies used to evaluate the feasibility of percolation beds included soil percolation studies, permeability studies, a computer simulation of the biological and chemical reactions that occur in soil, dispersion analysis, and studies on the effects of the discharge on the Napa River. The studies indicated that land disposal was capable of providing a high level of treatment at low capital and operating costs. Problems associated with odors, gnats, and anaerobic conditions could be controlled al low applicaton rates. Studies to characterize the winery's waste waters included analyses of samples taken automatically every 1.5 hrs and 6-hrs composite samples for hardness, calcium, TDS, COD, TKN, alkalinity, pH, conductivity, and odor. To comply with stipulations of the discharge permit, a groundwater quality monitoring program was instituted. (See also W78-02070) (Schulz-FIRL)
W78-02076

LOW WASTEWATER POTATO STARCH/PROTEIN PRODUCTION PROCESS - CONCEPT, STATUS, AND OUTLOOK,
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
J. R. Rosenau, L. F. Whitney, and R. A. Elizondo.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 118-128, 5 fig, 12 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Protein, *Food processing industry, *Water consumption, *Potatoes, Recycling, Proteins, Separation techniques, Industrial wastes, Waste water disposal, Waste disposal, Potato starch.

A process for the production of starch, feed grade protein meal, and pulp from cull potatoes with minimum generation of waste water is described. In the process potatoes are ground and the slurry, wet-sieved with recycled juice, is pumped to a liquid cyclone to remove the starch from the pulp. The starch-rich underflow is dewatered and washed on a belt vacuum filter to remove the residual juice. The starch-free overflow is recycled back to the liquid cyclone and pumped into the tangential elutriation inlet. The recycled juice, which contains 4% solids and 50% protein, can be further treated with ultrafiltration or heat- and acid-induced precipitation. This treatment concentrates and fractionates juice solids to recover the available protein for use as an animal feed supplement. The process requires 25 lb of water per 100 lb of potatoes processed. At current prices and a cost of $0.75/cwt of cull potatoes, the total value of the recovered products is estimated at $1.86/cwt with $0.98/cwt left to cover profit, capital costs, and operational expenses. (See also W78-02070) (Schulz-FIRL)
W78-02077

TOMATO FLUME WATER RECYCLE WITH OFF-LINE MUD REMOVAL,
Eutek Process Development and Engineering, Sacramento, CA.
G. E. Wilson, W. R. Rose, and J. Y. C. Huang.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 157-188, 6 fig, 11 tab, 6 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Water consumption, *Water utilization, *Water reuse, *Operation and maintenance, Flocculation, Coagulation, Suspended solids, Food processing industry, Tomatoes, Costs, Water conservation, Industrial wastes, Canneries, Waste water treatment, Tomato processing.

The objective of the project which was jointly sponsored by the EPA and the National Canners Association was to demonstrate an in-plant water recycle system with off-line mud removal, which could result in approximately 50% savings in the total annual wastes water-related costs in the tomato processing industry. The system installed at a 35-ton/hr plant included a solids trapping false bottom, an ejector for solids transport, a screen with screenings discharge hopper, a soil solids separating swirl concentrator, a sludge thickener, and a chemical coagulation-flocculation system. The system was operated in four modes: conventional cleaning, conventional cleaning with water recycle, disc cleaner, and disc cleaner with recycle and chemical coagulation-flocculation. Use of the disc cleaner and water recycle system increased the daily average tonnage of tomatoes processed because solids did not accumulate in the dump tank and impair product flow. Measurements of water consumption and total solids balance revealed a 26% decrease in the average total daily water usage with use of the disc cleaner with water recycle and chemical flocculation. A breakdown of water consumption indicated that approximately 7% was used for filling, 55% for operational purposes, and 39% for clean-up. (See also W78-02070) (Schulz-FIRL)
W78-02078

PROTOTYPE APPLICATION OF SINGLE PARAMETER SLUDGE AGE CONTROL TECHNOLOGY - A CASE HISTORY - PERFORMANCE OPTIMIZATION BY APPLICATION OF SLUDGE AGE CONTROL TO EXTENDED AERATION TYPE TREATMENT PLANT FOR FOOD PROCESS WASTES,
Brown-Devlin Associates, West Seneca, NY.
C. G. Brown.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. p 189-236, 14 fig, 15 tab, 13 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Prototype tests, *Model studies, *Food processing, *Design data, *Sludge treatment, Monitoring, Operation and maintenance, Treatment facilities, Clarification, Aeration, Industrial wastes, Waste water treatment, Sludge age control, Frozen food processing.

The application of the single control parameter of sludge age to an existing conventional activated sludge plant was demonstrated at a frozen food processing plant in western New York. The program included monitoring of production, water use, and waste water flow and constituents. The existing treatment plant facilities and operating conditions are described. Operating conditions before and after the initiation of sludge control are compared. A 7-day test period was used to identify problems and establish operating parameters for a longer study of the system. After a 34-day testing period, a final design was developed which incorporated raw waste rough screening, a revised air flotation system, conversion of the existing final settling tank to an aeration tank, a larger and deeper clarifier, and a multi-media filter following the clarifier at an estimated total construction cost of $425,000. (See also W78-02070) (Schulz-FIRL)
W78-02079

CONTROL OF COLOR PROBLEMS DURING RECYCLING OF FOOD PROCESS WATERS,
Manitoba Univ., Winnipeg. Dept. of Food Science.
A. Hydamaka, P. Stephen, R. A. Gallop, and L. Carvalho.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 237-256, 11 fig, 16 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Color, *Food processing, *Potatoes, *Enzymes, *Analytical techniques, Chemical reactions, Activated carbon, Hydrogen ion concentration, Water reuse, Industrial wastes, Potato processing industry, Potato discoloration control.

Problems associated with on-site treatment of potato processing waste water or discharge of potato processing wastes to municipal sewer systems have given rise to a closed-loop recycle system for potato rinsing as well as to methods for treatment and recovery of rinse water constituents. Control of enzymatic browning of potato tissue as a result of phenol hydroxylase or crealase activity and polyphenol oxidase or catecholase activity is discussed with respect to closed-loop cyclic systems in potato processing. Activated carbon was evaluated as a means of controlling 'browning' with respect to the activity of polyphenol oxidase enzyme and the level of hydroxylated aromatic compounds (tannin) present in the rinse water before and after treatment. During the studies, rinse water from the processing of french fry slices was centrifuged, filtered, and treated with 0.10%, 0.30% or 0.50% dosages of powdered carbon. A carbon dosage of 0.10% was considered insufficient to control enzyme activity over several cycles but was capable

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of significantly lowering both tannin and enzyme activity. At 0.30% the enzyme and substrate accumulation rate was decreased, and at a dosage of 0.50% residual enzyme activity was not detected up to and including the fifth cycle. The use of citric acid to lower the pH of the rinse water to approximately 5.5 held the use of citric acid to lower the pH of the rinse water to approximately 5.5 held the enzyme activity at a constant level but did not affect the tannin concentration. (See also W78-02070) (Schulz-FIRL)
W78-02080

THE TOXICITY OF FOOD PROCESSING EFFLUENTS TO FISH,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5C.
W78-02081

CHARACTERIZATION AND POTENTIAL METHODS FOR REDUCING WASTEWATER,
Mayer (Oscar) and Co., Madison, WI.
D. L. Grothman, L. J. P. Scully, P. M. Berthouex, and D. O. Dencker.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 273-297, 6 fig, 8 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Water conservation, *Food processing industry, *Hogs, *Water utilization, Industrial water, Industrial wastes, Monitoring, Sampling, Water pollution control, Oily water, Biochemical oxygen demand, Waste water treatment, Meat processing wastes, Waste water reduction.

An Oscar Mayer and Company meat processing plant in Madison, Wisconsin, was the site of a study to determine the waste load from different hog slaughtering processes, to characterize waste stream, and to develop process changes which would reduce water use and waste water production and prevent product loss to sewers. Hog slaughtering processes for the 1000-head/hr plant are described. As part of the monitoring program, waste water grab samples were collected at various stages of the slaughtering process and analyzed for BOD, COD, organic carbon, grease, solids, and total Kjeldahl nitrogen. Flow monitoring and analyses indicated that approximately 33% of the water use and 5% of the BOD load originated during the clean-up phase, while 66% of the water use and 95% of the BOD loading occurred during the production shift. Process changes which were recommended to reduce waste water flow by 41% and reduce BOD and suspended solids by 63% are described. (See also W78-02070) (Schulz-FIRL)
W78-02082

POULTRY PROCESSING WASTEWATER-ADVANCED TREATMENT AND REUSE,
D. T. McGrail.
In. Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 298-307, 1 fig, 8 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Water reuse, *Recycling, *Tertiary treatment, *Poultry, *Food processing industry, Disinfection, Flocculation, Effluents, Industrial water, Waste water treatment, Poultry processing waste water.

Advanced treatment and recycling of poultry processing waste water were evaluated at the 6,000-bird/hr Sterling Processing Corporation in Oakland, Maryland. The project was initiated because limited water resources in the area could not meet processing requirements even after strict conservation measures has been taken. The project included a sampling program to characterize the 300,000 gpd of raw waste water with respect to BOD, TSS, and oil and grease. The lagoon system which received waste water before it passed to the advanced treatment plant included two aerated lagoons which removed 93% of the BOD, 96% of the grease, and 79% of the suspended solids in the raw waste water. The advanced waste water treatment process included microstraining, flocculation and sedimentation, and sand filtration. The microstrainer, designed to handle an average BOD of 15 ppm, suspended solids of 60 ppm, and grease of 8 ppm, was not efficient during extreme weather conditions. Laboratory tests conducted to determine the optimum dosages of alum, lime, and a polyelectrolytic coagulant for flocculation and sedimentation suggested dosages of 100 ppm alum, 35 ppm lime, and 1 ppm of HERCOFLOC, a slightly anionic coagulant. Flocculation and sedimentation resulted in BOD removals of 80% and suspended solids of 70%. The sand and gravel gravity filtration which followed flocculation was capable of producing an effluent of potable quality. Disinfection is accomplished by chlorination at a rate of 10 ppm, after the second lagoon and again after the sand filtration. (See also W78-02070) (Schulz-FIRL)
W78-02083

ALTERNATIVES FOR TREATING POULTRY PROCESSING WASTEWATER,
F. E. Woodard.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 308-330, 7 fig, 6 tab, 7 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Water reuse, *Tertiary treatment, *Poultry, *Food processing industry, *Industrial wastes, Industrial water, Filtration, Activated carbon, Biological treatment, Water conservation, Separation techniques, Waste water treatment, Costs, Poultry processing wastes.

Performance and feasibility of various alternatives for pollutant reduction available to the poultry processing industry are discussed. Typical poultry processing operations, waste water sources, and flow and pollutant loading are described. Proposed NPDES effluent guidelines for poultry processing wastes based on live weight killed (LWK) include a BOD of 0.46 lb/1000 lb LWK, suspended solids of 0.62 lb/1000 lb LWK, and grease of 0.20 lb/1000 lb LWK. Three alternatives for reducing the discharge of pollutants from poultry processing plants are presented. The first includes chemical coagulation and dissolved air flotation of the combined waste flows, followed by tertiary treatment with sand filtration and activated carbon to meet NPDES standards. The second alternative involves effluent flow reduction through process changes to replace water-using steps such as chilling and viscera removal with dry processes. The third alternative involves physico-chemical treatment with screening, chemical coagulation, dissolved air flotation, sand filtration, activated carbon adsorption, and disinfection to allow reuse of water for each individual process. Results of technical feasibility studies and cost analyses for the alternatives are presented. (See also W78-02070) (Schulz-FIRL)
W78-02084

PROCESSING EGG BREAKING PLANT WASTE,
Missouri Univ.-Columbia.
J. M. Vandepopuliere, H. V. Walton, W. Jaynes, and O. J. Cotterill.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 331-337, 4 fig, 2 tab, 2 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Poultry, *Waste disposal, *Salmonella, *Food processing industry, *Industrial wastes, Equipment, Costs, Disinfection, Microorganisms, Dewatering, Waste treatment, Waste disposal, Egg breaking plant waste, Egg shells.

Disposal by conventional means, in landfills or farm land pastures, of the 50,000 tons of waste produced at approximately 150 egg breaking plants has been considered as posing potential pollution problems. Results of a pilot program conducted at a commercial egg breaking plant by the EPA and the Missouri Agricultural Experiment Station are presented. Dehydrating and cooking of egg breaking wastes were investigated with a Heil SD 45-12 triple pass rotary drum dehydrator installed in-line at the plant. A shell spin and a liquid egg separator were installed to separate the liquid from inedible eggs. Wet egg shells and dried egg shell meal were combined in a dehydrator which was equipped with a cyclone collector and diverter to regulate the amount of dehydrated egg shell meal that would be returned to the blending operation. Salmonellae counts indicated that the wet egg shell waste contained approximately 1.79 million microorganisms per gram while the dehydrated samples were salmonella-negative. Installation costs for the dehydrator are estimated at $35,000 with combined ownership and operating expenses ranging from $13.40 to $16.79 per ton of dried egg shell meal. The estimated feed value of egg shell meal was projected at $35.00 per ton. (See also W78-02070) (Schulz-FIRL)
W78-02085

TREATMENT OF PACKINGHOUSE WASTEWATER BY SAND FILTRATION,
East Central Oklahoma State Univ., Ada. School of Environmental Science.
M. L. Rowe.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 356-366, 4 fig, 7 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Tertiary treatment, *Filtration, *Pilot plants, *Aeration, *Oxidation lagoons, Filters, Treatment facilities, Industrial wastes, Waste water treatment, Porous media, Food processing industry, Suspended solids, Design data, Sand filters, Packinghouse waste water.

Intermittent sand filter treatment for packing house waste water was evaluated in pilot studies at the W. E. Reeves Packing Company in Ada, Oklahoma. Two pilot-scale filter units were constructed adjacent to the existing extended aeration and secondary stage lagoons. The filter units received waste water from the lagoon system at a rate of equivalent to 0.5 million gal per acre per day. The units were filled with 18 inches of gravel ranging from 1.25 inches in diameter at the bottom of the filter to 0.25 inches at the top, and were covered with 36 inches of sand at a diameter of 0.2 mm. The units were constructed with clay embankments with a 2.5:1 slope on three sides and a common concrete wall separating the two units on the fourth side. Each filter was equipped with a underdrain network of 5 inches diameter perforated pipes. Construction costs for the unit were $12,850. Clogging after only 2 days of operation of the filter units was attributed to sludge accumulations produced by loading rates in excess of the filter capacity. After cleaning to remove the 16,000 gal of sludge accumulated in the bottom, the filters were again put into operation and clogged within 4 days. Further investigations revealed that aeration in the lagoon system during the 4-hr loading period increased the amount of sludge loaded onto the filters. After correction of problems caused by aerator timing, the settling time in the lagoon was increased and the filters performed properly with average BOD and suspended solids values in the effluents of 8 and 12 mg/liter, respectively. (See also W78-02070) (Schulz-FIRL)
W78-02086

WASTE TREATMENT FOR SMALL MEAT AND POULTRY PLANTS,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Food and Wood Products Branch.
J. L. Witherow.

In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 367-409, 10 fig, 7 tab, 35 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Food processing industry, *Design criteria, *Costs, *Oxidation lagoons, *Aeration, Treatment facilities, Poultry, Construction materials, Effluents, Water quality standards, Aerobic treatment, Operation and maintenance, Industrial wastes, Poultry processing waste water, Meat processing waste water, Extended aeration lagoons.

Various aspects related to waste water treatment for small meat and poultry processing plants are reviewed with respect to five steps in solving a waste water problem: preliminary design, funding, detailed design, construction, and operation. Preliminary design involves the selection of in-plant controls, treatment processes, and site in an effort to supply adequate treatment while minimizing costs. Discharge and monitoring regulations are discussed with respect to slaughterhouses, packinghouses, and chicken and fowl processors. In-plant methods for waste reduction are described as means of reducing flow volume and quantity of pollutants which contribute to waste water treatment costs. Methods of sampling and analysis to characterize waste water and define treatment requirements are presented. Considerations in site selections are evaluated. Various treatment processes are appraised for use in small meat and poultry processing plants, including anaerobic lagoons, aerobic lagoons, extended aeration lagoons, aerated lagoons, intermittent sand filtration, land application, and disinfection. Types of funding and methods for calculating relative costs are presented. Location, size and shape, dikes, inlets and outlets, and aeration equipment needs are discussed with respect to the development of detailed designs for lagoon systems. Guidelines for the various phases in construction of a lagoon system are presented. (See also W78-02070) (Schulz-FIRL)
W78-02087

EVALUATING AND TREATING POULTRY PROCESSING WASTEWATER,
Richard B. Russell Agricultural Research Center, Athens, GA.
W. K. Whitehead.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 410-431, 10 fig, 3 tab, 9 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Poultry, *Industrial wastes, *Activated sludge, *Oxidation lagoons, *Food processing industry, Sludge treatment, Pilot plants, Monitoring, Sampling, Waste water treatment, Poultry processing wastes.

Studies were conducted to define sources, quantities, and characteristics of waste water generated in a poultry processing plant; to evaluate an existing poultry waste lagoon treatment system; and to design and operate a conventional activated sludge system for poultry processing wastes. The first phase of the project included analyses of BOD, COD, TOC, fat, total and volatile solids, and total and volatile suspended solids in waste water collected at a plant processing 9600 broilers/hr. The second phase of the program involved monitoring of a 4-stage lagoon process, with aeration in the first two ponds, at a poultry processing plant which handled 90,000 broilers/day and discharged 3.5 million gal of waste water/wk. The laboratory-scale activated sludge system which was designed and operated in the study included a reactor and a solids-liquid separator. The system was operated at a feed rate of 28 liter/day, a hydraulic detention time of 6 hrs, and sludge ages of 1, 2, 3.5, 7, 10, and 14 days. The system was capable of removing 93% of the COD and more than 90% of the suspended solids and fat. (See also W78-02070) (Schulz-FIRL)
W78-02088

A MEAT PACKER'S SOLUTION TO MEETING 1983 EFFLUENT REQUIREMENTS,
Foth and Van Dyke and Associates, Inc., Green Bay, WI.
J. A. Homel, Jr, and J. McVaugh.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 432-449, 2 fig, 8 tab, 3 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Activated sludge, *Food processing industry, *Nutrient removal, *Phosphorus, *Treatment facilities, Coagulation, Flotation, Return flow, Soil-water-plant relationships, Costs, Industrial wastes, Waste water treatment, Meatpacking wastes.

Hillshire Farm Inc. in New London, Wisconsin, was required in 1972 by the state of Wisconsin to reduce BOD and SS to maximums of 35 mg/liter and reduce total phosphorus by 85% in waste water generated during the slaughter and processing of 1500 hogs/day. Costs for connection to the municipal waste treatment system were projected at $680,000-750,000 with yearly sewage surcharge fees of $25,000. A program for flow monitoring and waste water sampling was initiated to examine possible methods of on-site waste water treatment for stream discharge. Waste water treatment facilities chosen for Hillshire Farm included a rotary screen for kill flow wastes, a lift station, dissolved air flotation, completely-mixed activated sludge, chlorine contact, and final detention in a pond filled with marsh vegetation. A sampling program conducted to evaluate process performance indicated that overall removal efficiencies were 99% for BOD, 98% for SS, 70% for phosphorus, and 98% for oil and grease with actual marsh effluent concentrations of 7, 8, 7, and 6 mg/liter, respectively. Studies conducted to examine methods to increase phosphorus removal from 70% to 85% revealed that ferric chloride was more effective than lime or alum for enhancing phosphorus removal. Captial costs for the system, which was installed in 1973, were $350,000. Annual operating costs have averaged at $25,000. (See also W78-02070) (Schulz-FIRL)
W78-02089

TREATMENT OF MEATPACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at El Paso. Dept. of Civil Engineering.
A. J. Tarquin.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 470-484, 5 fig, 4 tab, 5 ref. Technical Report EPA-600/2-76-304.

Descriptors: *Return flow, *Application methods, *Infiltration, *Nutrient removal, *Waste assimilative capacity, Waste water disposal, Waste water treatment, Food processing industry, Phosphorus, Oily water, Industrial wastes, Infiltration-percolation, Overland flow.

Land application has been used to remove residual carbon, phosphorus, and nitrogen from a wide variety of municipal and industrial wastes. Major types of land application systems include irrigation, overland flow, and infiltration-percolation. Results of pilot scale studies on land application for meatpacking wastes conducted at the Peyton Meatpacking Plant in El Paso, Texas, are presented. Effluent concentrations from the catch basin of the Peyton Packing Plant are presented. Site characteristics which may influence the feasibility of land application include climate, soil, topography, groundwater, and vegetation. Design considerations such as loading rates, operating pressure, and monitoring are discussed. Treatment efficiencies for the infiltration system at the Peyton Packing Plant were 100% for grease, 99% for COD, 72% for nitrogen, and 100% for SS at an application rate of 2.5 in/wk and 100%, 98%, 58%, and 100%, respectively, for 4 in/wk. Removal efficiencies with overland flow treatment were 84% for COD, 44% for Kjeldahl nitrogen, 54% for total solids, 76% for volatile total solids, 87% for suspended solids, and 89% for volatile suspended solids. (See also W78-02070) (Schulz-FIRL)
W78-02090

ZINC SLUDGE RECYCLING AFTER KASTONE TREATMENT OF CYANIDE-BEARING RINSE WATER,
Metal Plating Corp., Connersville, IN.
J. G. Moser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 929, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-038, February 1977. 38 p, 4 fig, 2 tab, 6 append.

Descriptors: *Zinc, *Nitrogen compounds, *Sludge digestion, *Metals, Recycling, Sludge treatment, Chemical precipitation, Industrial wastes, *Waste water treatment, Cyanide, Plating wastes.

The DuPont Company's Kastone process for recycling of zinc sludge from rinse waters in metal finishing processes was evaluated in pilot studies at the Metal Plating Corporation in Connersville, Indiana. In the process the cyanide-zinc rinse with 500-5000 mg/liter NaCN is treated with formalin and a patented Kastone peroxygen compound which contains about 41% hydrogen peroxide, speical stabilizers, and flocculants. The free cyanide produces a combination of ammonia, sodium cyanate, and glycolic acid amide and the zinc is precipitated as zinc oxide. After the zinc oxide sludge is removed, it is dissolved in a quantity of plating solution, filtered to remove any insolubles, and fed to the original zinc plating bath. The study concluded that recycling of zinc oxide sludge extracted from cyanide-zinc rinse water was feasible if equipment was scaled and designed to minimize labor, sludge was handled on a daily basis, bag filtration was used, dragout was minimized, and the water was treated to eliminate insolubles. Daily recycling costs were $27.96 for treatment, $15.00 for recycling, and $18.45 for storage and transport of zinc sludge with a daily saving in zinc costs of $11.90. (Schulz-FIRL)
W78-02091

ANALYTICAL VARIABILITY OF FIVE WASTEWATER PARAMETERS - PETROLEUM REFINING INDUSTRY,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5A.
W78-02092

FRUIT CANNERY WASTE ACTIVATED SLUDGE AS A CATTLE FEED INGREDIENT,
Bovay Engineers, Inc., Spokane, WA.
For primary bibliographic entry see Field 5E.
W78-02093

DEMONSTRATION OF AERATION SYSTEMS FOR POULTRY WASTES,
Cornell Univ., Ithaca, NY.
J. H. Martin, and R. C. Loehr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 351, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-186, October 1976. 164 p, 38 fig, 38 tab, 67 ref, 1 append.

Descriptors: *Farm wastes, *Poultry, *Aeration, *Oxidation lagoons, *Farm lagoons, Pilot plants, Odor, Costs, Chemical oxygen demand, Nitrification, Sludge treatment, Industrial wastes, Waste water treatment, Poultry wastes, Odor control.

Full-scale studies at Manorcrest Farms in Camillus, New York, were used to evaluate the use of aerobic biological treatment systems for air and water pollution control for poultry wastes under commercial conditions. Design and operating

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guidelines for commercial applications were also developed. For study purposes, four existing manure collection pits in the bird house at Manorcrest Farms were converted to two oxidation ditches, each serving 4,000 birds. A steady state process with a constant SRT and low mixed liquor total solids concentrations was chosen as the operating mode for the oxidation ditches. Liquid solids separation via gravity settling for solids removal was chosen over the creation of a continuous flow system by water addition. Raw waste samples were analyzed for total manure production per bird-day, total solids, volatile solids, COD, and TKN. Mixed liquor and settling tank supernatant were analyzed for total solids, volatile solids, COD, TKN, ammonia-N, nitrite-N, nitrate-N, pH, temperature, and DO. Oxygen transfer studies conducted to establish baseline oxygen transfer data and to evaluate the brush aerator-propeller combination as an alternative aeration approach indicated that oxygen transfer in the first ditch was 527 g 02/hr or 132 g 02/1000 bird-hrs, and 3360 g 02/hr or 840 g 02/1000 bird-hrs in the second ditch. Problem areas in the design and operation of aeration systems were associated with sediment accumulation, foaming, feathers, and excess water. (Schulz-FIRL)
W78-02094

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY,
Black and Veatch, Kansas City, MO.
For primary bibliographic entry see Field 5G.
W78-02096

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPLE WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-02104

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 024, Price codes: A07 in paper copy, A01 in microfiche. EPA 904/9-76-018. June 18, 1976. 544 p. C370344.

Descriptors: *North Carolina, *Interceptor sewers, *Streams, *Environmental effects, *Sewage disposal, Septic tanks, Odor, Grants, Project planning, Alternate planning, Erosion, Sedimentation, Floods, Environmental control, Vegetation effects, Environmental sanitation, Waste water treatment, Water supply, Flood control, Storm runoff, *Environmental impact statement, Environmental Protection Agency.

The Environmental Protection Agency has prepared a Final Environmental Impact Statement on the awarding of grant funds to Wake County, North Carolina for the preparation of plans and specifications for the construction of an interceptor line to service the upper drainage basin of Crabtree Creek. The project area is a patchwork of agricultural lands, forest, bottom land vegetation and suburban and urban development. The main beneficical impacts are the establishment of a regional waste water collection system, the elimination of future waste water discharges into natural creeks and the discontinuance of septic tanks use. The primary adverse impacts of the project are construction erosion and sedimentation, alteration and destruction of vegetative ecosystems, possbile destruction of archeological historical sights and odor emanations. The secondary adverse impacts include the possibility of flooding, developmental erosion and sedimentation, and an increased demand for community services. The proposed project will cause irreversible and irretrievable expenditures of certain labor, material, land and community resources. Project alternatives include no action, alternative routing of interceptors, and a reduction in the scope of the project. The 'no action' alternative would result in inadequate regional wastewater treatment. (Curran-Florida)
W78-02107

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION (4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972).
Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-02108

VORTEX COAGULATION MEANS AND METHOD FOR WASTEWATER CLARIFICATION,
Swift and Co. Ltd., Chicago, IL. (Assignee).
E. R. Ramirez, and D. L. Johnson.
U.S. Patent No. 4,031,006, 14 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1228, June 21, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Sewage wastes, *Water pollution treatment, *Water quality control, Separation techniques, Coagulation, Vortices, Rotational flow, Bubbles, Packing plant wastes.

Raw wastewater to be clarified is routed in an apparatus which directs the wastewater in an upward directed vortex path that is above and open to a source of dense microbubbles. Impurities within the wastewater are urged toward the periphery of the vortex and coagulate, while the bubbles tend to pass up through a central core of the vortex. The coagulated impurities and the bubbles approach the outlet of the vortex apparatus, whereupon a venturi-like effect is developed to accomplish an improved contacting of the coagulated impurities and the bubbles to form buoyant agglomerates. The wastewater and buoyant agglomerates flow together through the vortex outlet, after which the buoyant agglomerates may be permitted to float to the surface of the wastewater in a seaprate chamber. (Sinha-OEIS)
W78-02129

SLOP OIL TREATING SYSTEM,
Cities Service Oil Co., Tulsa, OK. (Assignee).
A. V. Sierra, Jr.
U.S. Patent No. 4,031,007, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1228, June 21, 1977.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, Oil wastes, Oily water, Industrial wastes, Separation techniques, Water quality control, Water pollution treatment, Oil-water interface, Equipment, Slop-oil treatment.

Slop oil treatment is most typically found in a petroleum refinery, but this invention can also be applied in the treatment of used railroad oil or in the recovery of cutting oils used in a steel plant. One procedure is to add the slop oil-water mixture to the coalescer, along with emulsion-breaking chemicals. Under the influence of the direct current electric field in the coalescer, the emulsion breaks, giving an oily top layer and an aqueous bottom layer. This invention comprises employing a probe that produces a signal when the interface betwen the oil and water layers approaches a predetermined level in the coalescer, and employing vertically-placed extensions on the bottoms of at least two of the coalescer plates. The probe is used to detect and warn of the troublesome interface emulsion. The plate extensions are used as additional warning devices, so that operating conditions in the coalescer can be altered to move the level of the troublesome interface emulsion away from the coalescer plates. The combinations of these two devices allows continuous operation of the slop oil treatment system. (Sinha-OEIS)
W78-02130

REMOVAL OF GREASE AND OIL FROM PARTICULATE BED GRANULES BY BACKWASHING WITH A DETERGENT,
Sterling Drug Inc., New York. (Assignee).
D. S. Ross.
U.S. Patent No. 4,032,443, 10 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1706, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Oil wastes, Slime, Filtration, Suspended solids, Detergents, Cleaning, Backwash.

Waste treatment plant effluent containing significant amounts of colloidal or coalesced grease add a new and difficult dimension to the waste water filtration process. This tenacious grease film will cause the very fine media to adhere together forming clumps that block passage of air or water. This grease film will also cause media grains to attract and hold suspended solids to the grain surface, the film acting as a binder with other grains to block flows of air and water in all directions. This invention is directed toward a waste effluent filter of the type utilizing a particulate filter bed and an underdrain structure. The improvement comprises means to force chemical cleaning solution into the underdrain cavity to force water into the underdrain cavity mixing the cleaning solution with water and forcing the admixture of cleaning solution and water upward into the particulate media following the complete evacuation of air previously trapped in uniformly spaced compartments. The flow of cleaning solution into the media can be stopped to permit the media to soak in cleaning solution. Jet augers are created for short periods followed by additional soaking to completely emulsify the grease film on each media grain. The emulsified grease is then backwasted from the particulate media. (Sinha-OEIS)
W78-02135

SEALED SEWAGE EJECTOR ASSEMBLY,
Marten's (D) Mfg. Co. Ltd., Winnipeg (Manitoba). (Assignee).
U.S. Patent No. 4,032,448, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1708, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Septic tanks, Soil disposal fields, Domestic wastes, Waste disposal, Water pollution sources, Equipment.

Conventional sewage discharge systems from septic tanks and the like often drain into the sub-surface soil, particularly when the cycle stops as the discharge pipe drains at this point in order to prevent freeze-up occurring cold weather. In areas of high water tables and pervious soils, there is always the possibility of pollution occurring to the water supply. This invention incorporates a totally enclosed ejector assembly having an outer riser pipe with a cone-shaped base. The cone-shaped base is connected to the plastic discharge pipe from the sewage pump. A venturi assembly forming part of the discharge pipe, sits into the seat of the cone-shaped base and a small diameter pipe extends upward forming the remainder of the discharge pipe. When the pump stops, the small diameter discharge pipe drains back into the sealed outer riser pipe or standpipe and on the next pumping cycle, the venturi assembly drains the outer riser pipe or standpipe thus providing frost-

free surface discharge of all effluent with any subsurface seepage. (Sinha-OEIS)
W78-02136

EFFLUENT TREATMENT PROCESS,
British Petroleum Co., Ltd., London (England). (Assignee).
G. F. Oldham.
U.S. Patent No. 4,032,439, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1704, June 28, 1977.

Descriptors: *Patents, *Waste water treatment, *Oil pollution, *Oily water, *Water pollution treatment, *Filtration, Filters, Biological treatment, Sands, Refinery effluent, Percolating biological filters.

This invention relates to a method for treating effluent water contaminated with petroleum and petroleum products, particularly from oil refineries. A method has been devised for treating refiney effluent which enables an oil content of below 5 mg/litre to be achieved without a flocculation stage, which avoids the need for an incinerator and which can be used on almost all refinery and similar effluents. The method comprises passing the effluent water first through a sand filter and subsequently through a biological percolating filter. Reversal of the order of the stages is not a satisfactory or effective method. Biological percolating treatment after sand filtration can be adequate ro achieve the required oil and BOD levels and is superior in some respects to an activated sludge treatment. Biological percolating filters have been found to have advantages over activated sludge plants such as a greater resistance to shock load especially alkali because of the neutralising action of the high CO2 concentrations towards the top of the filter bed, good oxidation of ammonia in the lower levels and temperature reduction of warm effluents. The term biological percolating filter includes submerged and partly submerged biological percolating filters. (Sinha - OEIS)
W78-02142

PROCESS FOR RECOVERY OF SELECTED METAL VALUES FROM WASTE WATERS,
World Resources Co., McLean, VA. (Assignee).
M. Markels, Jr.
U.S. Patent No. 4,033,763, 10 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 275, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, Water pollution treatment, Metals, Separation techniques, Sludge, Sewage bacteria, Incineration, Precious metal recovery.

A process is described for recovering selected metal values from waste waters using sewage type bacteria to imbibe and capture and concentrate the metal values in a sludge, followed by de-watering and burning off the sludge to eliminate organic matter and to to further concentrate the metal values, and then treating by pyrometallurgical or hydrometallurgical steps to recover the desired metals in a sludge, with the step of burning off the sludge to eliminate organic matter and to further concentrate the metal values, and then treating by pyrometallurgical of hydrometallurgical steps to recover the desired metals. The invention couples the step of capturing and immobilizing the trace metals in a sludge, with the step of burning off the organic component and with the steps of a conventional metal-winning process to purify and recover captured selected metals, particularly precious metals. The efficiency of the combined process is such as to permit the economic recovery of precious metal values from waste waters which also contain a very wide variety of organic and inorganic matter, including undesired metal values appearing as contaminants in the water. (Sinha - OEIS)
W78-02147

CHROMATE REDUCTION IN AQUEOUS MEDIUM,
Betz Labs., Inc., Trevose, PA. (Assignee).
D. F. Jacques, and K. R. Lange.
U.S. Patent No. 4,033,867, 4 p, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water quality control, Cooling water, Chromium, Separation techniques, Chemical precipitation, Cation exchange.

Chromate treatments have been used for some years in the control of corrosion, deposition, scaling and general fouling in industrial cooling water systems. This invention is concerned with reducing or removing chromates from the effluent waters. Water containing an undesirably high level of chromate ion is lowered to a ph level of from near zero to 2.8, then is passed through a catalytic reduction column where it is contacted with hydrogen in the presence of a hydrogenation catalyst, such as palladium or platinum, to reduce the chromate ion to the trivalent chromic ion, then is raised to a pH of from about 3.5 to 4.0, then is either passed through a calcium-form cation exchange resin column to remove the chromic ion, or is sent to a precipitation area where the pH is raised to a high level to settle out the chromium as chromium as chromium hydroxide. Residual chromium levels as Cr+3 of 0.5 to 1 ppm are obtained with ion exchange. If essentially zero discharge is desired, a limestone polishing step may be added. (Sinha - OEIS)
W78-02148

METHOD AND APPARATUS FOR PROCESSING CONTAMINATED WASH WATER,
Licentia Patent-Verwaltungs-G.m.b.H., Frankfurt-am-Main (West Germany). (Assignee).
O. Meichsner, and H. Queiser.
U.S. Patent No. 4,033,868, 12 p, 2 fig, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water purification, Industrial wastes, Radioactive wastes, Separation techniques, Ion exchange, Filtration, Resins, Nuclear powerplants.

It is a primary object of this invention to provide a method for processing contaminated wash water from nuclear powerplants. This is accomplished by mixing the contaminated wash waters with ion exchange resins in a mixing vessel to form a suspension and then feeding the resulting suspension into a filter. The method thus is a combination of ion exchange and filtration. The usually predominant portion of ionic, radioactive substances is removed from the wash water in the mixing vessle by the ion exchange resin. The solid matter in the wash water is removed from the wash water by being retained on the filter. The wash water leaving the filter is thus freed of both ionically dissolved radioactive contaminants as well as radioactive solids suspended in the wash water. The mixing of the wash water with the ion exchange resins is distinguished from typical ion exchange processes where waste water usually is processed in a straight-through operation. In this invention, the water and ion exchange resin are mixed to form a batch suspension and this suspension is left for a period of time so that the ion exchange resin and water contact each other for a substantial time and a thorough ion exchange is effected. (Sinha-OEIS)
W78-02149

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS,
Universal Oil Products Co., Des Plaines, IL. (Assignee).
For primary bibliographic entry see Field 5F.
W78-02154

PROCESS FOR THE GALVANIC PURIFICATION OF THE WASTE WATERS,
Snam Progetti, S.p.A., Milan (Italy). (Assignee).
N. Mastrorilli.
U.S. Patent No. 4,035,269, 7 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 773, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial waste, *Water pollution treatment, Metals, Chemical reactions, Electrochemistry, Oxidation-reduction potential.

This invention refers to a redox process which can be particularly applied to the purification of waste waters. The method removes metals from waste liquids without the use of an externally supplied source of current. The method consists in: (1) immersing in the waste liquid at a pH of less than 3.5, two materials which are different from each other and the metal to be removed, one of the immersed materials being electropositive, the other being carbon or electronegative; (2) connecting the two immersed materials to each other, thus giving rise to an electric current; (3) precipitating the metal or metals to be removed; and (4) recovering the purified waste liquid. (Sinha-OEIS)
W78-02161

PURIFYING TREATMENT FOR EFFLUENTS OF MINERAL OIL DRILLINGS,
Societe Nationale Elf Aquitaine (Production), Courbevoie (France). (Assignee).
M. Guillerme, J. Gratacos, A. Sirvins, and B. Tramier.
U.S. Patent No. 4,035,289, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 777, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Water purification, Drilling fluids, Microorganisms, Microbial degradation, Aerobic conditions, Mineral oil drilling effluents.

An improvement in the anti-pollution treatment of the effluents from mineral oil drillings is provided. It makes possible the suppression of the major part of the BOD of the effluents, which cannot be sufficiently purified by the known physicochemical treatments. The invention consists of subjecting the effluent to the action of microorganisms obtained by the seeding of a portion of this effluent with a strain taken from a microbiological cleansing medium for sewage waters. This preparation of the strains consists in seeding the effluent with microorganisms taken from conventional treatment basins, and breeding generations of these microorganisms in aerated medium, to which are added the nutritive elements lacking in the effluent, particularly compounds of nitrogen and phosphorus. After the time which is necessary for the development of the useful microorganisms the medium which includes the strains thus formed is added to the total volume of the effluent to be treated. The drilling effluents contain clays which it is preferable to eliminate prior to the biological treatment. This flocculation of clays can be carried out at a pH of the order of 5. After separation of the clays, the effluent is subjected to the seeding and culture of the microorganisms. The strain is left to develop while air is continuously dispersed in the liquid. When the BOD has fallen to the required value, the aeration is stopped and decantation is allowed to take place, and the supernatant, purified water is sent into a physicochemical treatment basin. (Sinha-OEIS)
W78-02162

PROCESS FOR TREATING AN ACIDIC WASTE WATER STREAM,
Societe Anonyme Texaco Belgium N.V., Brussels. (Assignee).
A. Benoit, S. A. R. Dewaele, and A. Verhelst.

U.S. Patent No. 4,035,293, 4 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 779, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Acidic water, *Water pollution treatment, Acid streams, Chemical precipitation, Separation techniques, Neutralization.

A process for converting highly acidic waste water streams to a reusable clarified water effluent and an easily removable precipitate is described. The invention is directed to the treatment of phosphonic acid/phosphoric acid emulsions in water which results from methanol distillations. Such acids can be precipitated by the addition of CaO or Ca(OH)2 in an amount ranging from 55-93 per cent by weight basis acids at a temperature of 35 to 100C to a pH of 8 to 12. After removing the precipitated material, the effluent can be neutralized with CO2 gas. The precipitate can be calcined to tri calcium phosphate. (Sinha-OEIS)
W78-02164

SYSTEM FOR POLLUTION SUPPRESSION,
TII Corp., Lindenhurst, NY. (Assignee).
E. T. Armstrong.
U.S. Patent No. 4,035,296, 47 p, 41 fig, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 780, July 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Water purification, Disinfection, Oxidation, Chemical reactions, Ammonia, Ammonium compounds, Nitrification.

A two stage oxidative system is described for the disinfection of material which may contain nitrogen commonly in the form of ammonia or ammonium as in the treatment of waste or sewage plant effluent. A primary oxidizing agent is added to the effluent to disinfect as well as to lower the pH of the effluent and a secondary oxidizing agent is added to produce a synergistic disinfection system in which the distribution of ammonium and ammonia is shifted to nearly all ammonium. A desirable pH level is 7 or less with desirable primary oxidizing agenst including aluminum chloride or ferric chloride with desirable secondary oxidizing agents including chlorine, chlorine dioxide, ozone as in oxygen or air, or sodium hypochlorite. Another aspect of the invention relates to the nitrification of ammonia in the form of secondary effluent from a waste treatment system wherein the ammonia is converted to nitrates in a tertiary unit operation so that the effluent has low ammonia content. (Sinha-OEIS)
W78-02165

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.
Reading, PA. USAC Project.
For primary bibliographic entry see Field 3E.
W78-02181

5E. Ultimate Disposal Of Wastes

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
For primary bibliographic entry see Field 5G.
W78-01728

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-01783

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
For primary bibliographic entry see Field 5G.
W78-01795

GARBAGE - HOW DOES IT AFFECT YOU.
Public Health, Vol. 71, No. 1, p 29-32, January 1977.

Descriptors: *Solid wastes, *Domestic wastes, Organic wastes, *Waste disposal, *New Zealand(Auckland), *Garbage.

A disposal bag collection system for domestic garbage was introduced in Auckland, New Zealand. Public reaction, both positive and negative, were noted. Solutions to the problems that were encountered are offered. Paper and polythene bags are compared. (So African Water Info Center)
W78-01824

POLLUTION ESTIMATION FACTORS,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 5A.
W78-01850

GROUND-WATER HYDROLOGY AND SUBSURFACE MIGRATION OF RADIOISOTOPES AT A LOW-LEVEL SOLID RADIOACTIVE-WASTE DISPOSAL SITE, WEST VALLEY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-01869

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS,
Bureau of Mines, Spokane, WA Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W78-01884

TRANSPORT OF DIGESTED SLUDGE SLURRIES FOR ECONOMIC DISPOSAL, MASS TRANSPORT BY PIPELINE TO DISPOSAL OR TO USE FOR STRIP MINE RECLAMATION.
Rand Development Corp., Cleveland, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 675, Price codes: A06 in paper copy, A01 in microfiche. Report prepared for Federal Water Pollution Control Admin., Wash., D.C. November 1966. 94 p, 12 fig, 5 tab, 74 ref, 6 append. PH 86-65-21.

Descriptors: *Project benefits, Sludge disposal, *Slurries, *Water pollution control, *Land reclamation, Transportation, Pipelines, Mining, Strip mines, Sewage treatment, Ohio, Costs, Economics.

Pipeline transport of digested sludge slurries, with disposal and use of the slurry in the restoration of barren areas (e.g., strip mines) provides substantial savings over conventional sewage treatment. Pipeline transport reduces surface water contamination at sewage treatment plant outfalls, and topsoil is generated in stripped areas, which in turn reduces surface water contamination at sewage treatment plant outfalls, and topsoil is generated in stripped areas, which in turn reduces surface water contamination in those areas. Costs per mile are low and essentially do not increase with distance; for example, a city of just over two million producing 590,000 gal of 5% digested sludge slurry per day would incur costs of $35/ton to vacuum dry and incinerate sludge solids. Pumping 160 mi for disposal without beneficial use would cost $6/ton of dry solids, compared with $7.25/ton for transportation and use for land restoration. The optimum pipeline diameter would be 8 in., with a pumping velocity of 2.6 ft/sec. For a city of 2000,000, producing 33,000 gal of 8% digested sludge slurry per day, the cost of vacuum drying and incineration is about $60/ton; pumping 40 mi without restoration use would be $7/ton, and with beneficial use $10.50/ton. This pipeline should be 2.5 in. diameter, with a velocity of 3 ft/sec for slurry diluted to 4%. Field demonstrations near Canton, Ohio, were conducted to assess disposal of digested sludge slurries in acidic strip mine areas. (Lynch-Wisconsin)
W78-01890

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMALS WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
For primary bibliographic entry see Field 5G.
W78-01948

GROUND-WATER POLLUTION ASPECTS OF LAND DISPOSAL OF SEWAGE FROM REMOTE RECREATION AREAS,
Forest Service (USDA), Escanaba, MI. Hiawatha National Forest.
For primary bibliographic entry see Field 5B.
W78-01949

CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION, CLAIRTON WORKS, PITTSBURGH, PENNSYLVANIA, JANUARY 28-31, 1976.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-02020

DESIGN AND EVALUATION OF AN OILY WASTES DISPOSAL SYSTEM FOR RED RIVER ARMY DEPOT,
DARCOM Intern Training Center, Texarkana, TX.
For primary bibliographic entry see Field 5D.
W78-02024

ELIMINATION OF PHOSPHATES BY FERROUS SULFATE (ELIMINATION DES PHOSPHATES PAR LE SULFATE FERREUX),
Kappalaverket, Lidingo (Sweden).
K. I. Dahlquist, L. Hall, and L. Bergman.
Techniques et Sciences Municipales-L'Eau, Vol. 72, No. 4, p 159-167, April, 1977. 6 fig, 2 tab, 8 ref.

Descriptors: *Titanium, *Sulfur compounds, *Iron compounds, *Nutrient removal, *Sludge treatment, Phosphates, Chemical precipitation, Waste water disposal, Waste water treatment, Ferrous sulfate.

Ferrous sulfate, a waste product of titanium oxide manufacturing and metal cleaning operations, presents disposal problems. It can, however, be used economically as a precipitation agent. Experiences in the United States, Finland, and Sweden are summarized regarding the use of ferrous sulfate to eliminate phosphates. A better sedimentation is achieved with ferric phosphate than with ferrous phosphate, probably because ferric ions are more strongly hydrolized. The Kappala purification plant in Sweden is described. Experiments to eliminate phosphates using ferrous sulfate are detailed, along with a discussion of sludge properties and digestion. The iron contained in the activated sludge does not seem to have a negative effect on BOD degradation. Compared to treatment with aluminum sulfate, this method produces a more easily handled sludge which does not require post-precipitation of phosphates. Optimum application methods are outlined for using ferrous sulfate. (Blits-FIRL)
W78-02025

PHOSPHATE REMOVAL FROM AQUEOUS SOLUTION FROM ACTIVATED RED MUD,
Tokyo Univ. (Japan). Dept. of Metallurgy and Materials Science.
For primary bibliographic entry see Field 5D.
W78-02036

PERMISSIBLE CONCENTRATIONS OF ALCOHOLS AND FURFURAL IN WASTE WATER USED FOR IRRIGATION (O DOPUSTIMOM SODERZHANII SPIRTOV I FURFUROLA V STOCHNYKH VODAKH, ISPOL'ZUEMYKH DLYA OROSHENIYA),
V. T. Dodlina, B. F. Zhirnov, and L. E. Kutepov.
Gidrotekhnika i Melioratsiia, No. 4, p 101-104, 1977. 5 tab.

Descriptors: *Soil-water-plant relationships, *Absorption, *Chemical wastes, *Environmental effects, *Return flow, Alcohols, Irrigation practices, Organic compounds, Analytical techniques, Waste water disposal, Furfural.

The persistence of methanol, butanol, and furfural in soil and plants and their physiological effects on plants were studied to establish the maximum permissible concentration of these compounds in waste water used for flooding or spray irrigation. Methanol, added to water in concentrations of 100-400 mg/liter, completely disappeared from the upper 20-cm soil layer in 9 days. Butanol, added in 50-500 mg/liter concentrations to water, was decomposed in the soil in 3-5 days. The specific water consumption was 2,000-4,000 liters/ha for methanol-containing water, and 500-1,000 liters/ha for butanol-containing water. After irrigation, both compounds were degraded in a few days in the aerial parts of plants, and in 6-7 days in roots. In most cases, butanol stimulated the growth of cereal plants. Water containing 50-500 mg of furfural per liter was used for irrigation at rates of 800-2,400 liters/ha. Very rapid degradation was observed in the soil; traces were found on the fifth day in the 20-40-cm soil layer only after application of water with 300 mg/liter furfural or higher. Furfural was detectable in plants for 25-28 hrs only. When applied in a concentration of 500 mg/liter, furfural reduced the green mass of plants. The findings indicate that the maximum permissible methanol, butanol, and furfural concentration in wastewater intended for irrigation of farmlands should be set at 300 mg/liter. (Takacs-FIRL)
W78-02037

INDUSTRIAL DUMPS THREATEN GROUNDWATER.
For primary bibliographic entry see Field 5B.
W78-02043

DISPOSAL OF SWEET CHERRY PROCESSING BRINES,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-02044

AT SUNKIST, LEMONS AND ORANGES DON'T MIX.
For primary bibliographic entry see Field 5D.
W78-02049

INVESTIGATION OF THE SOIL POLLUTING PROPERTIES OF SLUDGES GENERATED IN THE MACHINE INDUSTRY (GEPIPARI ISZAPOK TALAJSZENNYEZO HATASANAK VIZSGALATA),
For primary bibliographic entry see Field 5B.
W78-02056

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS AT PUDUMJEE PULP AND PAPER MILLS LIMITED,
For primary bibliographic entry see Field 5D.
W78-02058

MUNICIPAL SEWERS HELP SOLVE WATER DISPOSAL PROBLEMS,
Armco Steel Corp., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-02062

HEMICELLULOSE-B FROM COMMERCIAL PINEAPPLE JUICE UNDERFLOW,
Hawaii Univ., Honolulu. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5D.
W78-02069

PROCEEDINGS SEVENTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.
Industrial Environmental Research Lab.-Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-02070

RECLAMATION AND TREATMENT OF CLAM WASH WATER,
Cornell Univ., Ithaca, NY. Dept. of Food Science.
R. R. Zall, L. F. Hood, W. J. Jewell, R. L. Conway, and M. S. Switzenbaum.
In: Proceedings Seventh National Symposium on Food Processing Wastes, April 7-9, 1976. 1976, p 42-66, 1 fig, 20 tab. Technical Report EPA-600/2-76-304.

Descriptors: *Canneries, *Commercial shellfish, *Pilot plants, *Water utilization, *Biological treatment, Recycling, Proteins, Water conservation, Food processing industry, Waste water disposal, Industrial wastes, Water utilization, Clam processing wastes.

Laboratory and pilot plant investigations and onsite studies at a Long Island clam processing plant were used in a study to characterize clam wash waters, develop methods to reduce water consumption and BOD landing in clam processing, examine methods of waste water treatment, and evaluate reclamation of proteins and flavor materials from clam wash water. Parameters monitored in waste water at the plant's clam washing stations included flow rate, water consumption, BOD, COD, protein, total solids, calcium, phosphorus, and chloride. Bacteriological data obtained for clams and wash water included yeast, mold, coliform, and total plate counts. In studies on the conversion of wash water to a canned juice product, ultrafiltration, open boiling, and vacuum filtration were used to concentrate wash water to a total solids concentration similar to that of market clam juice. Waste treatment studies on coagulation to reduce turbidity with trivalent solids, alum and ferric chloride, and chitosan as coagulants indicated that clam wash water was not particularly amenable to coagulation. Biological treatment of clam processing waste was investigated with four laboratory-scale aerobic lagoons operated at retention times of 2.5, 5, 10 and 15 days. The studies indicated that 90% COD reductions were possible with a hydraulic retention time of 2.5 days and total nitrification was possible after 5 days. (See also W78-02070) (Schulz-FIRL)
W78-02072

PILOT PLANT PRODUCTION OF A FUNCTIONAL PROTEIN FROM FISH WASTE BY ENZYMATIC DIGESTION,
Washington Univ., Seattle. Inst. for Food Science and Technology.
For primary bibliographic entry see Field 5D.
W78-02073

AN IMMOBILIZED-ENZYME PILOT PLANT FOR THE TREATMENT OF ACID WHEY,
Lehigh Univ., Bethlehem, PA. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-02074

IN-PLANT CONTROL TECHNOLOGY FOR THE FRUITS AND VEGETABLES PROCESSING INDUSTRY,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-02075

LAND DISPOSAL OF WINERY WASTEWATER,
Montgomery (James M.), Walnut Creek, CA.
For primary bibliographic entry see Field 5D.
W78-02076

LOW WASTEWATER POTATO STARCH/PROTEIN PRODUCTION PROCESS - CONCEPT, STATUS, AND OUTLOOK,
Massachusetts Univ., Amherst. Dept. of Food and Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-02077

TREATMENT OF MEATPACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at El Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-02090

ZINC SLUDGE RECYCLING AFTER KASTONE TREATMENT OF CYANIDE-BEARING RINSE WATER,
Metal Plating Corp., Connersville, IN.
For primary bibliographic entry see Field 5D.
W78-02091

FRUIT CANNERY WASTE ACTIVATED SLUDGE AS A CATTLE FEED INGREDIENT,
Bovay Engineers, Inc., Spokane, WA.
L. A. Esvelt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 357, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-253, September 1976. 16 fig, 23 tab, 12 ref, 1 append.

Descriptors: *Feeds, *Livestock, *Canneries, *Food processing, *Centrifugation, Sludge disposal, Bioassay, Activated sludge, Recycling, Food chain, Cattle, Sludge treatment, Industrial wastes, Waste water treatment, Ultimate disposal, Fruit processing wastes.

A sludge disposal project conducted by Snokist Growers in Yakima, Washington, demonstrated the use of dewatered sludge from fruit processing wastes as a supplementary cattle feed, determined the actual food value of the biological solids in the sludge, and evaluated the effects on cattle of a diet containing fruit processing sludge. Pilot-scale and prototype-scale basket centrifuges were used to dewater the biological sludge to a dry solids content of 7.5-9%. Feed mixtures which contained 2.3% or 4.5% fruit processing sludge were reported as being comparable to the control feed in terms of the animal's ability to digest and metabolize the feed, while feed containing 9.2% sludge solids was reported as having a lower quality. Studies in which four lots of six uniform yearling steers were fed diets containing 0.0, 2.3, 4.6, and 8.9% sludge solids on a dry matter basis indicated that the incorporation of a relatively small amount of sludge into the feed did not have adverse effects. Feeds containing 2.3% sludge actually improved weight gain and carcass quality. Dewatering of fruit processing sludge for use in cattle feed is suggested as economically feasible where the biological solids can be sold at a calculated value of $0.9-0.15 per kg dry solids. (Schulz-FIRL)
W78-02093

5F. Water Treatment and Quality Alteration

AIR AND LIGHT IMPERVIOUS WATER PURIFICATION AND PRODUCT DISPENSING SYSTEM,
C. W. Gossett, and W. J. Dauenhauer.
U.S. Patent No. 4,014,792, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1796-1797, March 29, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Reverse osmosis, Separation techniques, Water quality control, Equipment.

The object of the invention is to provide a water purification and distribution system where a reverse osmosis module product is protected from contamination by reducing its exposure to air and light. The system comprises, in combination with a conventional water service valve-controlled line, a reverse osmosis module connected for recurrently receiving a supply of raw water and purifying it to emanate a nearly pure product water from its outlet. It contains an electrical circuit, a solenoid for opening and closing the line, a switch for opening and closing the circuit, together with a water storage sealed collapsible gab. (Sinha-OEIS)
W78-01701

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.
Municipal Engineer, Vol 7, No 6, p 21-31, November 1976. 4 fig.

Descriptors: Water resources, Management, *Pumping stations, Distribution systems, *Water treatment, Pipelines, Rand Water Board, Barrage, Vaal Dam, Zuikerbosch Purification Plant, *South Africa.

The Rand Water Board's job to supply water is not an easy one. To give an indication of the extent: the area to be supplied covers about 17 075 km2 with approximately 4 300 000 inhabitants, while 60% of the Republic's manufacturing production takes place in this area. In addition the water has to be lifted 305 m from the Vaal River to the reservoirs in Johannesburg. There is an increasing demand for potable water and the Board constantly has to plan and construct new pipelines, reservoirs, pumping stations, etc., to meet the growing demand. For instance, presently a R45 million project for the construction of a new pipeline from Zuikerbosch via Mapleton and Rynfield to Vlakfontein is being carried out. And this is only one of the many projects under construction. (So. African Water Info Center)
W78-01833

REMOVAL OF CADMIUM ION FROM AQUEOUS SOLUTION,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-01913

APPARATUS FOR DESALTING SALINE WATER,
Societa Italiana Resine S.p.A., Milan (Italy). (Assignee).
For primary bibliographic entry see Field 3A.
W78-02128

ELECTRICALLY REGENERATED ION EXCHANGE SYSTEM,
Sybron Corp., Rochester, N.J. (Assignee).
T. A. Davis.
U.S. Patent No 4,032,452, 9 p, 3 fig, 2 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1709, June 28, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, Demineralization, Desalination, Separation techniques, *Ion exchange, Water softening, Anodes, Cathodes, Regeneration.

A more efficient electrically regenerated ion exchange system is accomplished by using elongated ion exchange members having a continuous ion exchange phase that is more conductive in the exhausted form than in the regenerated form. The continuous ion exchange phase reduces electrical power requirements by providing a low resistance path for the transport of ions from a demineralization compartment to electrode or waste compartments. Since the ion exchange materials are more conductive in the exhausted form, the electrical current tends to bypass the regenerated portions of the ion exchange bed, which means that the current is used more efficiently. A first demineralization compartment is provided adjacent to the anode compartment and a second demineralization compartment is provided adjacent to the cathode compartment. These demineralization compartments are separated by a waste compartment or by alternating waste and additional demineralization compartments. (Sinha-OEIS)
W78-02138

SPIRAL WOUND MEMBRANE MODULE FOR DIRECT OSMOSIS SEPARATIONS,
Universal Oil Products Co., Des Plaines, IL. (Assignee).
G. E. Foreman, and P. K. Worsley.
U.S. Patent No. 4,033,878, 7 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 308-309, July 5, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Waste water treatment, Membranes, Membrane processes, *Osmosis, *Separation techniques, Direct osmosis.

A membrane module is made from at least one pair of spaced membrane sheets that are interposed between spaced porous material sheets and all of the layers of sheets are in turn spirally wound around an axially positioned hollow mandrel that has at least one internal flow blocking means and side-wall openings connected to an internal portions of one of the porous sheets so that a first fluid flow can pass outward from a portion of the mandrel into a portion of the connecting porous layer and into the envelope resulting from the encompassing membranes and then back into another portion of the mandrel so that at least one out-to-in flow will be made through the membrane envelope, while a second fluid stream is passed through the next adjacent porous material layers to carry the fluid which has permeated through the membranes. One or more modules can be maintained in a pressure tight, elongated housing to provide an operation where one fluid is passed through the mandrel portions and through the layers of a first porous material and the membrane envelopes while a second fluid can pass longitudinally through the container and through the spaced layers of the other porous material t result in a operation whereby one fluid stream will be concentrated and the other fluid diluted from osmotic fluid flow passing through the membrane layers. (Sinha-OEIS)
W78-02154

WATER PURIFICATION SYSTEM,
P. J. McLean.
U.S. Patent No. 4,035,240, 4 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 960, no 2, p 766, July 12, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Domestic water, Distillation, Condensation, Equipment.

The water purification apparatus of this invention is used in combination with a domestic hot water heating tank and comprises a water container through a passage controlled by a float-actuated needle valve. Water in the container receives additional heat from a heat-radiating pipe which extends from the tank through the container and back to the tank to maintain a continuous circulation. Water vapor formed in the container is carried away through a duct and condenses. A receptacle is provided for receiving condensate from the discharge outlet of the duct. (Sinha-OEIS)
W78-02159

METHOD AND APPARATUS FOR PURIFYING A LIQUID BY PRESSURE DISTILLATION,
V. E. Carman.
U.S. Patent No. 4,035,241, 7 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 766, July 12, 1977.

Descriptors: *Patents, *Water treatment, *Desalination, *Demineralization, *Vapor compression distillation, Condensation, Separation techniques, Sea water, Waves(Water), Ocean waves, Equipment.

An apparatus and method for purifying a liquid by pressure-induced vaporization and condensation is described. The method comprises subjecting a liquid contained within a first enclosure to a negative pressure sufficient to convert a portion of the liquid to a vapor, transferring the vapor to a second enclosure, and then subjecting the vapor within the second enclosure to a positive pressure sufficient to condense the vapor back into a liquid. In this manner, any nonvolatile material contained within the impure liquid will remain in the first enclosure and only the volatile or pure components of the liquid will be transferred to the second enclosure. Where the liquid purifying process is to be carried out near an open body of wave-activated water, for example to desalinate sea water, the undulating motion of the body of water is used to provide the necessary pressure variation within the two enclosures. When such naturally occuring wave action is either inadequate or absent, the necessary pressure variations are produced by mechanical means. (Sinha-OEIS)
W78-02160

5G. Water Quality Control

OIL BOOM FOR COLLECTING AND SKIMMING OIL ON A WATER SURFACE,
National Marine Service, Inc., St. Louis, MO. (Assignee).
C. in't Veld.
U.S. Patent No. 4,014,795, 8 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 956, No 5, p 1797, March 29, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Skimming, *Water pollution treatment, Water quality control, Water pollution control, Equipment, Flow control.

An oil boom for sweeping and collecting oil from the surface of a body of water is constructed of a framework of structural members arranged in the form of a box beam. The framework supports two parallel rows of floating barrier screen panels and is connected to end floats. Flow diverter vanes beneath the barrier screen panels caused a surface transport current to flow between the two rows of the panels towards a surface skimmer located adjacent one end of the boom when the boom is towed in a direction transversely of its length across the body of water. The forwardmost row of the barrier screen panels sweeps floating oil on the water surface towards the skimmer, and the transport current carries oil that is caught in the underflow beneath the forwardmost row of panels towards the skimmer. Extension arms including floating vertical barrier screen panels are pivotally attached to the boom to extend the sweep area. The arms can be folded inward against the central

boom structure for stowage of the boom. (Sinha-OEIS)
W78-01702

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 381, Price codes: A17 in paper copy, A01 in microfiche. EPA-600/7-77-004, January, 1977.

Descriptors: *Research and development, *Grants, *Planning, *Projects, Administrative agencies, Allotments, Analytical techniques, Economics, Laboratories, Model studies, Research equipment, Research facilities, Technology, Testing, Research priorities, Federal government, Institutions, Management, Instrumentation, Environmental Protection Agency.

The Environmental Protection Agency (EPA) program report contains project-level descriptions of many research and development projects funded by the EPA--Coordinated Interagency Energy/Environment Research and Development Programs for 1976. The projects are classified into one of five research, development, and demonstration categories which include: pollutant characterization, measurement, and monitoring; environmental transport processes; health effects; ecological effects; and integrated assessment. Within each category, the programs are grouped by agency. Project descriptions are culled from research notice forms prepared by the appropriate laboratories and agencies using the Smithsonian Science Information Exchange format. Tables included in the report delineate total funding by each research and development category and agency. Other tables show the funding by each of the five research categories, by the energy source for each agency, and by each energy cycle component, i.e. extraction, processing, transportation and conversion, and utilization. (Moorhouse-Florida)
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 791, Price codes: A14 in paper copy, A01 in microfiche. EPA-600/7-77-003, January, 1977.

Descriptors: *Laboratories, *Project purposes, *Project planning, *Research and development, *Grants, Administrative agencies, Benefits, Fuels, Nuclear energy, Thermal power, Cost allocation, Cost-benefit analysis, Economics, Engineers estimates, Comprehensive planning, Materials testing, Model studies, Planning, Projects, Research equipment, Research facilities, Technology, Coals, Gases.
Identifiers: *Environmental Protection Agency.

This report contains project-level descriptions of many research and development projects funded by the Environmental Protection Agency--Coordinated Interagency Energy/Environment research and development program for fiscal year 1976. Each project description is grouped in accordance with one of nine research, development, and demonstration categories which include: energy resource extraction; physical and chemical coal cleaning; flue gas cleaning; direct combustion; synthetic fuels; nuclear; thermal; improved efficiency; and, advanced systems. Within each of the above listed categories, project descriptions are grouped by agency. The project descriptions are culled from 'Notice of Research Project' forms prepared by the appropriate laboratories and agencies using the Smithsonian Science Information Exchange format. Various tables attached to the report show budgetary breakdowns by agency, research and development category, and various stages in the energy cycle. (Moorhouse-Florida)
W78-01717

CONTROLLING INDUSTRIAL WATER POLLUTION--PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).
Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 329, Price codes: A05 in paper copy, A01 in microfiche. December 1970. 76 p.

Descriptors: *Federal Water Pollution Control Act, *Water Quality Act, *Industrial wastes, *Governmental interrelations, *Administrative agencies, Industrial plants, Effluents, Abatement, Pollution abatement, Water quality, Federal government, Water pollution, Legal aspects, State governments, Water quality standards, Water pollution control, Water pollution effects, Water pollution sources, Waste water(Pollution), Waste water treatment, Federal Water Quality Administration, Secondary treatment, Effluent limitations.

Prior to the establishment of the Environmental Protection Agency, the establishment and enforcement of water quality standards was a function of the Federal Water Quality Administration of the Department of the Interior in accordance with the provisions of the Federal Water Pollution Control Act of 1956 and the Water Quality Act of 1965. This 1970 report to Congress by the Comptroller General examined the abatement of industrial water pollution under the Federal Water Quality Administration. The primary responsibility for dealing with the problem rested with the individual states, and the effects and results of abatement programs varied widely from state to state. The report recommends that the Secretary of Interior encourage states to strengthen the staffs of the appropriate agencies; develop an inventory of sources of industrial pollution; and obtain data on progress being made by industry in meeting target dates for constructing abatement facilities. The report also recommends that Congress provide federal authority to establish and enforce specific effluent restrictions, expand federal jurisdiction to all navigable waters, bring enforcement action against industries failing to meet implementation schedules, and provide additional grant funds to states for administering water pollution control programs. (Sloan-Florida)
W78-01718

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES,
Public Administration Service, Chicago, IL.
T. Jacobi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 375, Price codes: A03 in paper copy, A01 in microfiche. October, 1964.

Descriptors: *Budgeting, *Personnel management, *Manpower, *Water pollution control, State jurisdiction, Employment, Management, Planning, Administrative decisions, Human resources, Personnel, Salaries, Wages, Cost allocation, Estimated costs, Financing, Water pollution, Water quality, Water quality control, Programs, Decision making, Project planning, *State policy.

The success of a state water pollution control program is affected by its staffing and its budgetary limitations. To determine personnel and financial needs, this 1964 study selected criteria that would measure need, be reflective of change, and were based on authoritative data. Total state population, population density, urbanization, recreational use, industrialization, and wet industries were among the factors used. Recommended general and facility service staff requirements are presented, divided by state, population size, and aspect of the pollution control program. Total proposed staffing needs constituted a principal basis for dtermination of budgetary requirements. Survey findings indicated that 75% of the average state water pollution control budget consisted of personal service costs. Supplies, materials, and services were estimated at an additional 33% of the budgeted amount for personal services. Study results are outlined in table format. The report concludes that in addition to staff and budgetary support, factors such as the legal basis of the pollution program, training of personnel, planning and balance within the program, and compliance measures used are conditions for successful programs. Consideration of these factors is more difficult, however, since they are not numerically definable. (Mulligan-Florida)
W78-01720

LAWS AND REGULATIONS AFFECTING COAL WITH SUMMARIES OF FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS PERTAINING TO AIR AND WATER POLLUTION CONTROL, RECLAMATION, DILIGENCE AND HEALTH AND SAFETY.
Department of the Interior, Washington, DC. Office of Minerals Policy and Research Analysis.
Available from the National Technical Information Service, Springfield, VA as PB-255 927, Price codes: A24 in paper copy, A01 in microfiche. Part 1 of 2-part study June 1976.

Descriptors: *Cost-benefit analysis, *Water pollution control, *Coal mines, *Reclamation, Federal reclamation law, Clean Air Act, Economics, Coals, Safety, Public health, Benefits, Costs, Industrial production, Cost-benefit ratio, Strip mines, Coal mines wastes, Permits, Legislation, Regulation, Administrative agencies, Mining, Water pollution, Air pollution, Governments, *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972, *National Pollutant Discharge Elimination System, Effluent guideline, Effluent limitations, Sulfur dioxides, Explosives, Administrative regulations.

All of the federal, state and local laws and regulations affecting the production and use of coal are summarized as one part of a two-part study of the benefit-cost ratio of such laws and regulations. This handbook is designed for use as a reference manual for the average citizen without specialized knowledge. A glossary of technical terms is included. The laws and regulations are catalogued under five general headings: air pollution control, water pollution control, reclamation, diligent development, and health and safety. Each section describes the pertinent federal regulations and discusses applicable state laws when such state laws are supplementary to the federal law. Local laws are discussed only as they relate to air pollution. The major federal laws providing for nationwide regulatory authority are the 1970 Federal Clean Air Act Amendments, the 1972 Federal Water Pollution Control Act Amendments, and the 1969 Federal Coal Mine Health and Safety Act. (Sloan-Florida)
W78-01721

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT).
Energy Research and Development Administration, Washington, DC.
May, 1977 (2 vols.).

Descriptors: *Environmental effects, *Thermal pollution, *Electric power plants, *Uranium radioisotopes, Environmental control, Water pollution, Chemical wastes, Evaporation, Fish management, Effluents, Heat pollution, Benefits, Economic impact, Social aspects, Rivers, Cooling

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water, Intakes structures, Groundwater resources, Water supply, Intakes structures, Groundwater resources, Water supply, Ohio, Ohio River, *Environmental impact statement, *Environmental groundwater management, *Uranium enrichment, National Environmental Policy Act, Environmental policy, Non-point sources(Pollution), Point sources(Pollution), Gaseous diffusion, Gaseous diffusion plants.

The Portsmouth, Ohio Gaseous Diffusion Plant has been enriching uranium since 1954. The impact of its continued operation with increased capacity considered in combination with two power plants which supply its electricity is detrimental to the Ohio River and the Scioto River which joins the Ohio at Portsmouth. There is a heat increase in these rivers caused by the generating plants. Impingment of fish on cooling water intake screens and the discharge of chemicals into the rivers are considered adverse impacts. Infiltration through ash disposal ponds may contaminate the ground water supply, a water source for nearby communities. Plant modification, which would produce only minor improvement in environmental quality, is too costly to justify, although improved water treatment could benefit the discharge from ash pits. If the Portsmouth plant continues to operate, the use of the rivers for disposal of heat and wastes is an irreversible commitment of resources. The study's Environmental Trade-Off Analysis concludes that the socio-economic benefits of enriching uranium outweigh the socio-economic disadvantages and the continuing loss of ecological habitat. (Jones-Florida)
W78-01722

POLLUTION OF NAVIGABLE WATERS OF THE DETROIT RIVER, LAKE ERIE AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN.
Public Health Service, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA as PB-253 697, Price codes: A10 in paper copy, A01 in microfiche. Proceedings of the Joint Federal-State of Michigan Conference, March 27, 1962, Detroit, Michigan. 177 p.

Descriptors: *Great Lakes, *Federal Water Pollution Control Act, *Michigan, *Water Pollution Control Act, *Michigan, *Water pollution, *Conferences, Lake Erie, Coliforms, Municipal wastes, Recreation, Navigable waters, Bodies of water, Tributaries, Bacteria, Water pollution sources, Water quality, Sewage, Waste disposal, Water pollution control, Industrial wastes, Sewage bacteria, Sewage disposal, Waste water, Pollution abatement, Rivers.

A federal-state conference on water pollution was convened in Michigan at the request of the governor in accordance with the provisions of Section 8 of the Federal Water Pollution Control Act. The conferees, representing various agencies of federal, state, and local governments, agreed that the Michigan waters of Lake St. Clair, the Detroit River, Lake Erie and their tributaries were undergoing pollution subject to abatement under the Act, and that the discharges causing the pollution came from various industrial and municipal sources. In the course of a two-day conference, reports were presented on such causes of pollution as sewage treatment plants, commercial shipping, power plants, automobile factory wastes, dredging operations, and other industrial waste discharges. Water pollution was found to interfere with legitimate water uses including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating and other forms of recreation. The conferees recommended that a cooperative investigation be undertaken by the Department of Health, Education, and Welfare in cooperation with the proper Michigan state agencies to determine effects and appropriate methods of abatement of pollution. (Sloan-Florida)
W78-01725

PROCEEDINGS OF JOINT MEETING OF FEDERAL AND STATE GOVERNMENTS ON MISSISSIPPI RIVER TEMPERATURE STANDARDS (2ND SESSION) HELD AT ST. LOUIS, MISSOURI ON MARCH 3, 1971.
Environmental Protection Agency, Office of Water Quality. Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 867, Price codes: A13 in paper copy, A01 in microfiche. March 1971. 296 p.

Descriptors: *Mississippi River, *Standards, *Thermal pollution, *Fish conservation, *Water temperature, Fish types, Fish physiology, Fish reproduction, Biology, Water pollution, Water pollution control, Water pollution sources, Temperature control, Cooling towers, Low flow, Cooling, Electric powerplants, Powerplants, Missouri River, Rivers, Federal government, State governments, Aquatic life, *Environmental Protection Agency.

The discharge of heated effluent into the Mississippi River by nuclear and fossil fuel plants can raise river temperatures above natural levels thereby harming biota. Therefore, water temperature standards have been proposed for the river. The Mississippi River is divided into five zones, each demanding different standards. Included are data and charts showing: (1) natural water temperatures recorded monthly in each zone; and (2) temperatures conducive to the survival, growth, and reproduction of species of fish populating the Mississippi River. Maximum safe water temperatures for each month and zone are listed. The report recommends that the maximum artificial rise in water temperature in any given zone and month not exceed either five degrees fahrenheit above the recorded natural temperatures or the maximum safe temperature, whichever is lower. Changes in temperature caused by natural conditions and normal daily and seasonal temperature fluctuations should be maintained. Low flow data is provided and locations and generating capacities of power plants abutting the river are given. Plants can easily comply with the standards with closed cycle cooling being the most economically feasible means. These proceedings include numerous reports and general discussions. (Smith-Florida)
W78-01726

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
R. G. Berger.
Land and Water Law Review, Vol. 12, No. 2, p. 431-56, 1977.

Descriptors: *Pollution abatement, *Return flow, *Waste water disposal, *Economic justification, *Prior appropriation, Beneficial use, Appropriation, Colorado, Discharge(Water), Effluents, Water pollution, Evaporation, Municipal water, Waste water(Pollution), Legal aspects, Wyoming, Water policy, Water transfer, Water storage, Water reuse, Preference(Water rights), *Total containment systems.

In the western states, aridity makes the efficient use of water especially important. Therefore, questions of legality and policy arise with respect to the use of total containment water quality control systems, a pollution control method by which water polluted by riparian users is contained and evaporated after use rather than treated and discharged back to the stream. To be legally viable, such consumption must be a 'beneficial use' of water, a doctrine the author defines, discusses, and criticizes with the aid of relevant statutes and cases. Legal viability also depends upon the system's ability to withstand challenges from junior water appropriators whose vested water rights protect them from a change of use - reuse dichotomy reveals that total containment systems involve neither. Such systems will probably be favored by the courts; however, decisions made on semantic, legal grounds should be rejected in favor of reliance on social and economic policy which dictates that inequitable and inefficient allocation of resources will result if the implementation of total containment systems is permitted as a matter of right. (Smith-Florida)
W78-01728

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-01729

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT),
Spessard L. Holland Law Center, Gainesville, FL.
For primary bibliographic entry see Field 6E.
W78-01730

A RECALL FOR GREENWAYS,
For primary bibliographic entry see Field 6E.
W78-01732

LEGAL ASPECTS OF THERMAL DISCHARGES,
New York Power Authority, NY.
For primary bibliographic entry see Field 6E.
W78-01733

HOW SHOULD CONGRESS AMEND PL 92-500,
Los Angeles County Sanitation Districts, CA.
For primary bibliographic entry see Field 6E.
W78-01736

INTERNATIONAL ENVIRONMENTAL LAW, INTERNATIONAL CONVENTIONS CONCERNING OIL POLLUTION AT SEA,
Inter-Governmental Maritime Consultative Organization, London (England). Legal Div.
For primary bibliographic entry see Field 6E.
W78-01745

IMCO: AN ENVIRONMENTALIST'S PERSPECTIVE,
Center for Law and Social Policy, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-01746

LAW OF THE SEA (NEW YORK SESSION OF THE THIRD U.N. LAW OF THE SEA CONFERENCE).
For primary bibliographic entry see Field 6E.
W78-01749

PROTECTION OF LAKE TAHOE AND ITS WATERSHED.
For primary bibliographic entry see Field 6E.
W78-01753

STATE OF ALABAMA EX REL. BAXLEY V. ENVIRONMENTAL PROTECTION AGENCY (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
For primary bibliographic entry see Field 6E.
W78-01758

SHELL OIL COMPANY V. TRAIN (ADMINISTRATIVE RULINGS ON EFFLUENT LIMITATIONS CHALLENGEABLE ONLY IN FEDERAL CIRCUIT COURTS).
For primary bibliographic entry see Field 6E.

W78-01763

RESOURCE MANAGEMENT AND ESTUARINE FUNCTION WITH APPLICATION TO THE APALACHICOLA DRAINAGE SYSTEM,
Florida State Univ., Tallahassee.
R. J. Livingston.
Available from National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 3-17, 9 fig, 2 tab, 25 ref.

Descriptors: *Estuaries, *Baseline studies, *Florida, Water pollution effects, Resources development, Drainage systems, *Apalochicola drainage system(Fla).

Problems encountered in the management of an estuarine system in north Florida are discussed with respect to existing programs and laws in Florida. The often difficult decisions concerning resource development depend on the availability of baseline scientific and socio-economic data. Information is needed concerning the basic energy relationships of estuaries and the long-term effects of pollution on such systems. Realistic estuarine management practices involve an interdisciplinary approach at both the local and regional levels. Federal programs should be aimed at the translation of scientific information into the planned development of the entire drainage area of a given estuary. Based on unsuccessful attempts of resource management in the Apalachicola drainage system, a generalized plan for estuarine development is given. (Sinha-OEIS)
W78-01764

THE RHODE RIVER PROGRAM,
Smithsonian Institution, Edgewater, MD.
D. L. Correll.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 19-27, 4 tab, 5 ref.

Descriptors: *Chesapeake Bay, *Nutrients, *Estuaries, *Baseline studies, *Environmental effects, Land use, Water pollution, Maryland, Rhode River(Md).

An intensive study of the interactions of the Rhode River, a subestuary of Chesapeake Bay, with its watershed and airshed is being conducted at the Chesapeake Bay Center for Environmental Studies. Rainfall is a major source of nitrogen nutrients for the watershed and estuary. Very little of the nitrogen in the rain falling on the watershed or that applied to cultivated croplands reaches the estuary. Almost all of the phosphorus loading of the estuary is from watershed runoff. Using land use analysis and watershed runoff studies, seasonal area yield loading rates have been calculated from land use categories. Freshwater wet areas are effective traps for nitrogen, phosphorus and mineral suspended matter, while residential areas and cultivated croplands are major non-point sources of these parameters. Neither the upland soils, nor the tidal marsh sediments can be considered long term sinks for phosphorus. Most of the organic matter which fuels the food chains of the estuary is produced by the phytoplankton, rather than upland forests, tidal marshes, or mud flat benthic plants. The phytoplankton productivity peaks in an area of the estuary in which the ratio of nitrogen to phosphorus is between 5 and 20. Net productivity also peaks in this zone. Thus this estuary, which has no point sources of pollution, is maintained in a eutrophic situation by nitrogen loading from rainfall and distant sources of water pollution in the bay, and from phosphorus loading from residential and agricultural diffuse sources. Where the ratio of these nutrients is maintained within a biologically useful range intensive phytoplankton blooms develop. (Sinha-OEIS)
W78-01765

CHARACTERIZATION OF THE NATURAL ESTUARY IN TERMS OF ENERGY FLOW AND POLLUTION IMPACT,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.
W78-01766

PROBLEMS, ADVANCEMENTS, AND FACTORS CONTROLLING ESTUARINE WILDLIFE MANAGEMENT PROGRAMS,
Texas A and M Univ., Jasper.
For primary bibliographic entry see Field 2L.
W78-01767

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,
Cornell Univ., Ithaca, NY.
R. J. Kalter.
Available from the National Technical Information Service, Springfield, VA, 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13 1975. Environmental Protection Agency Report No. 400/1-77-007A, March 1977. Vol 1, p 83-94, 2 fig, 4 tab, 14 ref.

Descriptors: *Estuaries, *Recreation, Resources development, Environmental effects, Water quality control.

Determinants of recreation activity are discussed and justification for the provision of recreation services by the public sector outlined. After reviewing the availability of data and other studies pertaining to recreational use, projections of recreation demand are made for selected activities. Economic models based upon a 1972 national recreation survey serve as the basis for this effort. The implication of these forecasts for the nation's estuarine areas is evaluated and policy recommendations, based on this analysis, are provided. (Sinha-OEIS)
W78-01770

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,
Development and Resources Corp., Sacramento, CA.
For primary bibliographic entry see Field 6G.
W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,
East Carolina Univ., Greenville, NC.
S. R. Riggs.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 121-136, 3 tab, 27 ref.

Descriptors: *Estuaries, *Resource development, *United States, *Economics, *Mineral deposits, Pollutants, Water pollution effects, *Extractive industries, Coastal zone.

A basic knowledge of the mineral reserves and the general economic value to man is essential prior to the development of any land and water use management plans involving the continued development of our coastal zone. Economics of a given mineral resource may change dramatically in response to new technological advances, discoveries of new ore deposits, or as industrial and social demands change with time. Such changes can have drastic effects upon the same management programs which define land and water uses. The resulting dilemma becomes of paramount importance: the need to protect a delicately balanced estuarine system, upon which man is dependent, and at the same time dramatically increase its use and modification for materials which man is also dependent upon. (Sinha-OEIS)
W78-01772

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,
State Univ. of New York at Stony Brook.
J. L. McHugh.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 149-168, 1 fig, 5 tab, 31 ref.

Descriptors: *Estuaries, *Water pollution effects, *Pollution abatement, *Water quality control, *Estuarine fisheries, Resources development, Shellfish, DDT, New York, *New York Bight, Commercial fisheries, Middle Atlantic Ocean, Landings.

Landings of fish and shellfish by domestic commercial fisherman in the Middle Atlantic Estuarine Area (Rhode Island-Virginia inclusive) nearly doubled in weight from 1969 to 1973, from about 586 million to more than 1,074 million pounds. The increase was not accompanied by a similar increase in fishing effort, but by distinct increases in abundance of certain coastal fishes like menhaden, weakfish, summer flounder, and bluefish. In the area north of Chesapeake Bay blue crab was more abundant than it has been for more than a decade and scup also was more plentiful. It is tempting to attribute these increases to pollution abatement, but no direct proof is available. For example, the return of blue crab to the New York Bight area may have been made possible by the decline in use of DDT. All these species are known to vary widely in abundance from natural variations in environmental factors and it is difficult to separate natural from manmade causes. The only certainly adverse effects of water pollution abundance or catches of living marine resources are those which produce obvious and measurable effects, usually catastrophic, or which result in closure of shellfish beds. Because so many important living resources use the estuaries as spawning, nursery, or feeding grounds it is prudent to avoid additional deterioration of water quality and, where possible, to reduce dumping of wastes. (Sinha-OEIS)
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,
Living Marine Resources, Inc., San Diego, CA.
For primary bibliographic entry see Field 2L.
W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,
Texas A and M Univ., College Station.
S. H. Hopkins, and S. R. Petrocelli.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained

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in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 177-190, 73 ref.

Descriptors: *Water pollution effects, *Estuarine fisheries, *Gulf of Mexico, *Environmental effects, Resources development, Baseline studies, Commercial fisheries.

The gulf coast, with 13% of the U.S. coastline producing one-third of the Nation's fisheries catch, is enriched by the Mississippi and many smaller rivers. The same river water that brings in food and fertility also brings pollutants from cities, industries and agricultural areas. So far, this pollution has not provably affected the commercial fisheries, except that closure of some bay areas by health authorities has hurt the oyster fishery. But over 95% of gulf fisheries production is based on species that depend on estuarine nursery areas and are therefore vulnerable to pollution and other man-made changes in estuaries. Fish kills and decreased reproduction in some areas warn of what could happen if conditions get worse. Research is needed on the costs as well as the benefits of man's activities, including pollution and pollution control, as population increases. (Sinha-OEIS)
W78-01776

SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN DREDGED SEDIMENT ON ESTUARINE WATER QUALITY,
Texas Univ. at Dallas, Richardson.
G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 211-216, 3 ref.

Descriptors: *Estuaries, *Sediments, *Dredging, *Water quality, Water pollution effects, Chemical wastes, Pollutants.

A review of the information available today on the relationship between the presence of chemical contaminants in dredged sediments and water quality shows no technical justification for the general adoption of alternate methods of disposal at this time. Further, it is shown that some of the alternate methods of disposal may be more ecologically damaging than those previously used. The U.S. Army Corps of Engineers initiated in 1973 the 5-year, $30 million Dredged Material Research Program, designed to provide a technical base of information for the determination of the most ecologically sound, technically, and economically feasible methods of disposal. This program shows great promise in providing needed information. (Sinha-OEIS)
W78-01778

LIMITING FACTORS THAT CONTROL DREDGING ACTIVITIES IN THE ESTUARINE ZONE,
Miami Univ., FL.
J. H. Carpenter.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 217-216, 3 ref.

Descriptors: *Estuaries, *Dredging, *Environmental effects, *Sediments, *Erosion, Pollutants, Resources development, Water pollution.

The current level of dredging activity for navigation channels (250,000,000 cubic yards annually) is producing substantial effects in the United States estuaries. These effects derive from (1) physical changes at the dredge site and release of substances from the sediment during the dredging; and (2) physical changes at the disposal area--filling of deeper areas and smothering of bottom dwelling organisms--and release of substances to the waters of the disposal area. The recent increased use of diked disposal areas, along the shorelines at increased costs, does not eliminate all of the environmenta effects. Since soil erosion throughout the watershed is the primary source of the sediments, the obvious management strategy is control at the source. In addition to the recognized desirability of soil conservation, erosion control should be identified as essential to prevent continuing damages to estuaries. (Sinha-OEIS)
W78-01779

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING,
Espey, Huston and Associates, Inc., Austin, TX.
W. H. Espey, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 225-234, 4 fig, 4 tab, 32 ref.

Descriptors: *Estuaries, *Dredging, *Gulf of Mexico, *Environmental effects, Water quality, Water pollution effects.

The coastal zone is a rich national asset closely tied to our economy. Man's activity in the coastal zone has caused this rich national asset to be placed in jeopardy. 'The National Estuarine Study' (1970) estimated that approximately 85% of the estuaries located on the gulf coast have been modified because of man's activities. Shell dredging activities in the gulf coast region indicate a slight downward trend and are expected to decline as a whole in the future. The reasons for the reduction in shell dredging activity reflect both alternative raw materials and environmental concern. However, the overall USCE dredging activities as well as private dredging are expected to increase in the near future. Insufficient data are available on the extent of dredging and filing in the gulf coast, where it is a major environmental problem. Many of the environmental aspects of dredging are not well understood. The federal permit system that deals with dredging activities in the coastal zone needs to be centralized and streamlined to expedite the efficient processing of permits. Environmental criteria used in evaluating USCE dredging permit applications should be clarified and quantified to the extent possible. (Sinha-OEIS)
W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES,
American Univ., Washington, DC.
M. A. Champ.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 237-255, 9 fig, 5 tab, 45 ref.

Descriptors: *Estuaries, *Nutrients, *Ecosystems, Waste disposal, Water pollution effects, Resources development, Eutrophication.

An evaluation is made of the current status of nutrient loading in the nation's estuaries. Special consideration is given to sources and transport of nutrients and their impact on estuarine ecosystems. Critical problems and trends in nutrient loading are reviewed at the national level and for six major estuaries: Cook Inlet, Columbia River Estuary, San Francisco Bay, Galveston Bay, Pamlico Sound and Chesapeake Bay. (Sinha-OEIS)
W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ. at Raleigh.
J. E. Hobbie, and B. J. Copeland.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 257-274, 41 ref.

Descriptors: *Estuaries, *Nutrients, *Ecosystems, *Water pollution effects, Ecology, Resources development, Environmental effects, Algae, Algal blooms.

Almost all nutrients entering estuaries come via streams, with smaller amounts from precipitation and the ocean. Oversupplies of nutrients are transported to estuaries from land-use activities, sewage disposal, industry, agricultural wastes, urban runoff and mining. Increased nutrients cause algal blooms, which lead to more subtle estuarine ecological problems. Many processes affect nutrient concentrations during transportation and after they reach the estuary. Absorption, dilution, coagulation, and sedimentation decrease nutrient concentrations in estuarine waters. Since an equilibrium is established between water and sediment, nutrients are also released to the water from sediment storages. Biological activities influence nutrient cycling and concentration. Several control mechanisms are discussed. The potentially most successful and least harmful means of controlling nutrient inputs to estuaries is to control them at their source. After nutrients reach estuaries, there is little possibility for effective reduction in nutrient concentrations. Suggestions for research to develop new and more effective means to control nutrient inputs to estuaries are made. These include denitrification, land-use practices, natural filters, treatment innovations, and new ways to assess ecosystem response. Finally, management mechanisms are suggested to influence nutrient inputs and to minimize effects. (Sinha-OEIS)
W78-01782

ESTUARINE WASTEWATER MANAGEMENT: DESIGN CONCEPTS AND CONSIDERATIONS,
California Univ., Berkeley.
E. A. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 275-284, 1 fig, 4 tab, 6 ref.

Descriptors: *Estuaries, *Waste disposal, *Waste water pollution, Outfall sewers, Water pollution, *Outer Continental Shelf, Ocean dumping.

The design of estuarine wastewater management systems should consider the cost and effective-

ness of specific pollutant removal (treatment) and the cost and efficacy of wastewater transport to and dispersion in areas of high dilution capacity, and of minimal ecological significance. A representative example cost analyses for a city of one million persons indicates that the incremental cost of upgrading treatment from secondary to advanced (tertiary) level is adequate to build and operate a land interceptor-transport system about 124 kilometers in length. Similarly, for a coastal city (Pacific Coast conditions) the same incremental cost for upgrading treatment would build and operate (break-even basis) a deep water outfall-diffuser system about 28.6 kilometers in length. If long-term protection of estuarine resources is to be achieved, all technical and economically feasible steps should be taken to transport adequately treated wastewaters out of estuarine systems, to the open coast in well engineered transport and high-dilution capacity outfall dispersion systems. (Sinha-OEIS)
W78-01783

POLLUTION PROBLEMS IN THE ESTUARIES OF ALASKA,
Alaska Univ., College.
D. W. Hood, and J. J. Goering.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 285-296, 2 fig, 2 tab, 18 ref.

Descriptors: *Estuaries, *Alaska, *Oil pollution, Resources development, Environmental effects, Pollution abatement, *Outer Continental Shelf.

The Alaskan marine coastal systems are classified into 13 categories which represent nearly all systems found in the 48 contiguous states with the exception of tropical systems and those heavily stressed by petrochemical and other complex industrial pollutants. Alaska is the only state that has ice-stressed coastal systems. It also has 54% of the United States coastline and 53% of its tidal shoreline. The scope of Alaskan coastal pollution problems at present and in the future are examined. Minor problems associated with wastes from municipalities and activities of the petroleum, timber, pulp and paper, and the fishing industries are presently evident. Increased petroleum production and the associated transport of oil products through Alaskan coastal systems poses a future large scale pollution risk. An evaluation of previous Alaskan coastal pollution abatement programs and trends is given. Because Alaska has such unique coastal systems it is concluded that any future coastal pollution control program will succeed only if based on sound environmental data rather than on adaptations of standards uniformly administered throughout the 48 contiguous states. Emphasized through the paper is the need for better environmental understanding of Alaska's coastal systems upon whih decisions can be wisely made that will protect them, and at the same time utilize them for waste disposal and extraction of the resources needed to benefit man. (Sinha-OEIS)
W78-01784

ENVIRONMENTAL STATUS OF HAWAIIAN ESTUARIES,
Hawaii Inst. of Marine Biology, Honolulu.
S. V. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 297-306, 6 fig, 6 tab, 26 ref.

Descriptors: *Estuaries, *Hawaii, *Water quality, *Environmental effects, Resources development, Baseline studies, *Outer Continental Shelf.

Hawaiian estuaries are small but numerous, and they are of importance to the State of Hawaii. With a few exceptions, detailed environmental information about these estuaries is lacking. Circulation in the estuaries is sluggish. Many of the estuaries fail to meet water quality standards set by state law; this failure represents the combined effects of unrealistic standards governing excessive discharges. The major human stresses imposed on the estuaries are the introduction of nutrients, freshwater, and sediments. More research directed at the estuaries as total systems is needed. (Sinha-OEIS)
W78-01785

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY,
Delaware Univ., Newark.
R. B. Biggs.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 309-318, 28 ref.

Descriptors: *Estuaries, *Industrial wastes, *Waste disposal, *Water pollution effects, Resources development, Hazards, Ecosystems, Industrialization.

When dealing with the effects of industrialization on the estuary, this paper addresses those problems unique to estuarine areas which have arisen through increasing industrial activities in the estuarine environment, and delineates individual industrial-estuarine pollution problems and discusses possible solutions. More specifically, the report examines pollution problems in estuaries, identifies factors that actually pollute, investigates the effect of control on the estuarine environment as a whole including human activities , and describes the procedures, if possible, for gaining control of such factors. The period from 1970 to the present is emphasized. (Sinha-OEIS)
W78-01786

INDUSTRIAL WASTE POLLUTION AND GULF COAST ESTUARIES,
Texas A and M Univ., College Station.
R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 319-329, 4 fig, 6 tab, 11 ref.

Descriptors: *Estuaries, *Texas, *Gulf of Mexico, *Industrial wastes, Water quality, Waste disposal, Industrialization, Houston ship channel.

The status of gulf coast estuaries is explored with regard to degradation of water quality from a variety of sources and mechanisms, emphasizing industrial waste effluents. The typical features of gulf coast estuaries, particularly the limited tidal action, the presence of bays behind barrier islands, and in many cases, limited flushing, are outlined. Environmental modification as differentiated from environmental pollution is presented and examples of the impact of each on Texas gulf coast estuaries is discussed. A hierarchy of water quality problems is presented and used to document the principal water quality problems in seven selected Texas estuaries. The causes of the degradation which lowers water quality in these seven estuaries are listed with emphasis on waste-generating industries. The Houston ship channel is used as a case study to outline the potential solutions to each of the individual water quality problems. A plea is voiced for the consideration of novel or innovative solutions to water quality problems such as the concept of supplemental aeration which is proposed for the Houston ship channel. (Sinha-OEIS)
W78-01787

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING,
United Engineers and Constructors, Inc., Philadelphia, PA.
J. W. Blake.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 333-339, 4 fig, 2 tab, 1 ref.

Descriptors: *Estuaries, *Powerplants, *Thermal pollution, *Sites, Baseline studies, Data storage and retrieval, Environmental effects, Environmental impact, Power plant siting.

With present experience certain efficiencies can be brought to bear on evaluation of proposed power plant sites. These concern (1) ways and means of determining what data are really needed for thermal discharge impact evaluation, and (2) optimization of efforts to obtain such data. Data relevance cannot be determined through comparison with a list of parameters which must always be studied at every site, but rather through a list of topics to be considered for possible study, i.e., questions to be asked (the answers to which determine the parameters which need study at the specific site under consideration). Optimization of data acquisition could be greatly improved through addition of geographic indicators to all environmental data purlications and indexing/storage systsms, following the examples set by EPA STORET AND NODC listings for water quality parameters. Such complete data availability will make possible better predictions of significanc of impact, and therefore more realistic and consistent decisions on utilization of our environment. (Sinha-OEIS)
W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS,
Maryland Univ., Solomons.
J. A. Mihursky.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 341-357, 40 ref.

Descriptors: *Estuaries, *Thermal pollution, *Environmental effects, Electric powerplants, Ecosystems, Water pollution effects.

Interactions between steam electric station operations and estuarine aquatic systems are described. Environmental problem areas are discussed under two broad categories: (1) the predator role of a power plant in terms of larger organisms impinging upon water intake structures, or of effects on smaller organisms upon passage through cooling water condenser systems; and (2) the discharge water or plume impact on resident and migratory organisms in the receiving water. Biological damaging effects are described from many factors other than excess heat alone, e.g., mechanical,

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biocides, et cetera. A number of siting and operating design options to achieve better compatibility are described. Integration of field and laboratory programs is urged at both national and regional levels. Present trends are reviewed. Four recommendations are made with regard to national and regional policies. Eleven recommendations are made with regard to research activities. (Sinha-OEIS)
W78-01789

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS,
Pacific Gas and Electric Co., San Francisco, CA.
R. H. Brooks, M. L. Brehmer, A. S. Autry, and F. N. Moseley.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007A, March 1977. Vol 1, p 373-381, 1 fig, 15 ref.

Descriptors: *Estuaries, *Thermal pollution, *Environmental effects, *Powerplants, *Cooling water, Aquatic life, Baseline studies, Environmental impact.

Results of investigations into the effects of power plant cooling water discharges into selected, representative estuaries are presented. These studies performed at mid-Atlantic, mid-Pacific, and Gulf of Mexico locations indicate that, at these stations, the cooling water discharges have not adversely affected the surrounding, estuarine receiving water environment. The conclusion is reached that power plants can be operated on estuaries without adverse effects with the result that each potential or existing estuarine site should be evaluated on a 'case-by-case' basis. (Sinha-OEIS)
W78-01791

OIL POLLUTION IN THE COASTAL ENVIRONMENT,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-01792

CONSEQUENCES OF OIL POLLUTION IN THE ESTUARINE ENVIRONMENT OF THE GULF OF MEXICO,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 5C.
W78-01793

SOLID WASTE DISPOSAL AND ITS RELATIONSHIP TO ESTUARINE POLLUTION,
Environmental Impact Planning Corp., San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-01794

IMPACT OF CHLORINATION PROCESSES ON MARINE ECOSYSTEMS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.
W. P. Davis, and D. P. Middaugh.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007B, Mar 1977. Vol 2, p 415-423, 1 fig, 5 tab, 48 ref.

Descriptors: *Estuaries, *Chlorination, *Sewage effluents, *Cooling water, Ecosystems, Aquatic life, Antifouling materials, *Outer Continental Shelf, Disinfectants.

The use of chlorine as a disinfectant and antifouling agent is reviewed. Chemical reactions of chlorine in aquatic environments are discussed, with particular emphasis on the formation of halogenated organic constituents in freshwater and marine systems. Studies of the effect of chlorinated sewage effluents and cooling water from generating stations on marine organisms and ecosystems are summarized. (Sinha-OEIS)
W78-01795

THE IMPACT OF SYNTHETIC ORGANIC COMPOUNDS ON ESTUARINE ECOSYSTEMS,
Mote Marine Lab., Sarasota, FL.; and Eco-Analysts, Inc., Sarasota, FL.
For primary bibliographic entry see Field 5C.
W78-01796

NATIONAL ESTUARINE MONITORING PROGRAM,
Environmental Protection Agency, Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-01803

FACTORS BEARING ON POLLUTION CONTROL IN U.S. PORTS LOCATED IN ESTUARINE AREAS,
Portland Harbor Pollution Abatement Committee, ME.
E. Langlois.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 529-544, 8 fig, 17 ref.

Descriptors: *Estuarine environment, *Water pollution, *Harbors, *Resources development, *Water quality control, United States, Ecology, Education, Legal aspects, *Outer Continental Shelf, *Ports, Ballast water, Oily wastes, Coastal zone management, Deepwater ports.

Ports must meet environmental demands during a period when they are faced with abrupt changes in terminal design and operations. Attention must be given to increased costs, due to delays and confusions that will affect the economic productivity of our ports. Additional and equal attention must be placed on the effect port development will have on the existing and future ecology of our estuarine areas. (Sinha-OEIS)
W78-01805

FACTORS BEARING ON POLLUTION CONTROL IN WEST COAST ESTUARINE PORTS,
San Francisco Dredging Committee, CA.
F. Boerger.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 545-551, 15 ref, append.

Descriptors: *Water pollution control, *Estuarine environment, *Economics, Harbors, Regulation, U.S. West Coast, Ports.

The value of west coast estuarine ports is established; port operational problems attributable to pollution control are defined and analyzed. Major problem areas, including regulations and procedures, are explained with examples. It is concluded that water pollution control regulations cause the most problems and that they are characterized by unjustifiable delay, risk, uncertainty, and confusion. Remedial recommendations are given. (Sinha-OEIS)
W78-01806

SEA GRANT ESTUARINE STUDIES,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 2L.
W78-01807

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION,
University of West Florida, Pensacola.
For primary bibliographic entry see Field 2L.
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARY PROTECTION,
Public Relations Consultant, Corpus Christi, TX.
V. Smylie.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 581-591, 4 illust, 8 ref.

Descriptors: *Estuarine environment, *Texas, *Water quality control, Public lands, Water pollution, Pollution abatement, *Public interest, Public participation, Superports, Deepwater ports.

The projected superport inside the South Texas bay system at Harbor Island, near Corpus Christi, stirred public indignation to a high level. Here is the way the people of South Texas reacted--and the methods they used to make their voices heard. (Sinha-OEIS)
W78-01809

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA,
Horan, Lloyd, Dennis, and Farr, Carmel, CA.
For primary bibliographic entry see Field 2L.
W78-01810

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE,
Washington Univ., Seattle.
M. J. Hershman.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 607-616, 51 footnotes.

Descriptors: *Estuarine environment, *Land use, *Water quality control, *Legal aspects, Planning, Management, Water pollution control, Coastal Zone Management Act.

A complex institutional problem has arisen in the management of estuarine resources due to overlapping and contradictory regulatory programs at the federal, state, and local levels. A contributing factor to this problem is the spilt between regional and community-focused resource management involving state and local land use planning, and specific resource management programs involving federal controls over air and water, and federal review of major construction projects affecting the environment. Noting that state and local government initiatives in control of lands adjacent to estuaries are increasing, and that the federal Coastal Zone Management Act of 1972 was

designed to bridge the fields of regional and community-focused management and federal resource management both technically and institutionally, the paper concludes that state-level coastal zone management efforts should be upgraded. Further, coordination requirements included in many federal laws should be given more study and financial support to make them effective. (Sinha-OEIS)
W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES,
Natural Resources Defense Council, New York.
A. Macbeth.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 617-627, 62 footnotes.

Descriptors: *Estuarine environment, *Legal aspects, Water pollution control, Water quality control, Regulation.

Estuaries are large scale, highly productive physical systems. Regulation and management of estuarine resources is divided among a multitude of agencies at all levels of government. Federal regulation has operated through expanding the mandate of federal agencies to include review of most estuarine resources and consultation with agencies responsible for them. The weakness of this system lies in (1) the unwillingness of the agencies to accept the expanded mandate; (2) the lack of agency expertise to comply with the expanded mandate; (3) the failure to fully staff and fund the consultation mechanism; (4) unequal distribution of resources between the public, private, and governmental bodies. This can be remedied by funding public groups which contribute to agency proceedings; establishing national estuarine laboratories with mixed research and regulatory responsibilities; and full funding and staffing of the consultation mechanism. (Sinha-OEIS)
W78-01812

ESTUARINE MANAGEMENT--THE INTERGOVERNMENTAL DIMENSION,
For primary bibliographic entry see Field 6E.
W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES,
Georgia Univ., Athens.
J. C. Belcher.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 637-656, 2 fig, 5 tab, 16 ref.

Descriptors: *Estuarine environment, Water resources, *Legal aspects, Land use, Waste disposal, Water quality control, Human population, Distribution patterns, Population pressure.

The number of people is not the critical factor in water pollution, but the way the population is distributed and the life patterns that are followed. This report describes the changing distribution of the population of the estuarine counties of the eastern seaboard including the development of new urban structures such as the megalopolis and the creation of new lifestyles brought about by increased leisure time, retirement, second homes, commuting, female participation in the labor force, and changing residential arrangements. (Sinha-OEIS)
W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES,
Maryland Univ., College Park.
J. H. Cumberland.
Available from National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 659-670, 1 fig, 15 ref.

Descriptors: *Estuarine environment, *Economics, *Management, *Water quality control, Maryland, Water pollution, Coastal zone management, Environmental assessment, National policy.

An economic-environmental systems model for analyzing estuaries which has been used in Maryland to forecast the quantities and types of waste and residuals which will be generated through the year 1985 for the Chesapeake Bay and each of its major tributaries is described. The model indicates that the amount of residuals will be a function of the rate and composition of economic development. Consequently, economic development and growth in the region can be expected to generate water quality problems of increasing magnitude for all estuaries in the U.S. Various corrective policy measures are evaluated for dealing with the environmental threat to the quality of estuarine waters. One of the most serious environmental impacts is aesthetic damage and methods are suggested for applying charges for various levels of aesthetic damage in order to encourage improved qualities of economic development. (Sinha-OEIS)
W78-01815

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 2L.
W78-01816

EVALUATION OF WATER QUALITY IN ESTUARIES AND COASTAL WATERS,
Virginia Inst. of Marine Science, Gloucester Point.
W. J. Hargis, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No 440/1-77-007B, Mar 1977. Vol 2, p 701-721, 4 fig, 1 tab, 32 ref.

Descriptors: *Estuarine environment, *Water quality control, *Coasts, *Management, Estuarine fisheries, Water pollution control, Legal aspects, Monitoring, *Outer Continental Shelf.

Estuaries and coastal waters, comprising less than 5% of the earth's surface, are under ever-increasing pressures from growing populations and demands. Yet these complex and dynamic waters are the key to preserving the viability and productivity of the oceans. Maintenance of their quality is vital to man and his future, causing much concern, especially in the United States. Consequently, considerable research, legislation, and other efforts oriented at improving management of estuarine and coastal waters have gone forward in the last 10 to 15 years. Despite all these efforts, the condition of estuarine environments and resources continues to decline. Several factors appear to be causal. The 'state of the art' for control of quality in estuarine and coastal waters must be rapidly improved to reverse the downward trend. Recommendations are made. (Sinha-OEIS)
W78-01818

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
J. W. Hedgpeth.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Procedings of a Conference held at Pensacola, Florida, on February 11-13, 1975. Environmental Protection Agency Report No. 440/1-77-007B, March 1977. Vol 2, p 723-737, 23 ref.

Descriptors: *Estuaries, *Estuarine environment, *Water pollution effects, *Water quality, *Environmental effects, Ecosystems, Aquatic life, Waste disposal, Ecology, Pollutants, Wetlands, *Coastal zone, Environmental quality control.

The most significant factor contributing to the degradation of our estuaries is our failure to treat an estuary as a natural system, rather than as a convenience serving man's many and conflicting purposes. This attitude is exacerbated by lack of competence on the part of consultants called upon to predict the results of interfering with natural processes they do not understand in the first place. When this is combined with notions of cost-benefit analysis and trade-offs that justify to ourselves the addition of deleterious substances and chemicals, alteration of temperature and sediment regimes, and spillage of oil, the synergistic action may accelerate the demise of an estuary. (Sinha-OEIS)
W78-01819

VARIATION OF 'GILL' SIZE IN LARVAE OF THE AFRICAN MIDGE CHIRONOMUS TRANSVAALENSIS KIEFFER,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W78-01827

ASSESSMENT OF ENVIRONMENTAL ASPECTS OF URANIUM MINING AND MILLING,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5B.
W78-01851

MODEL STATE WATER MONITORING PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
For primary bibliographic entry see Field 5A.
W78-01855

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Arthur D. Little, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5A.
W78-01887

RECREATIONAL BOATING IN DADE COUNTY 1975-76,
Miami Univ., Coral Gables, FL.
For primary bibliographic entry see Field 6B.
W78-01889

TRANSPORT OF DIGESTED SLUDGE SLURRIES FOR ECONOMIC DISPOSAL, MASS TRANSPORT BY PIPELINE TO DISPOSAL OR TO USE FOR STRIP MINE RECLAMATION.
Rand Development Corp., Cleveland, OH.
For primary bibliographic entry see Field 5E.
W78-01890

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ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAAL SUMMARY.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 977, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034a, December 1976. 60 p, 5 tab. EPA-68-03-2198.

Descriptors: *Industrial production, *Energy, *Conservation, *Environmental effects, *Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Cost, Evaluation.

Volume I summarizes the other parts of a 15-volume study evaluating the environmental impact of energy conservation measures in 13 energy-intensive industries. Vol. II describes methodology of the overall study, including procedures used in selecting and ranking the industries. Vols. III-XV analyze these industries in detail; alumina and aluminum, ammonia, cement, chlor-alkali, copper, fertilizers, glass, iron and steel, olefins, petroleum, phosphorus, pulp and paper, and textiles. The study concentrates only on major changes likely to be implemented in the next 10-15 years. All such changes would require important process modifications such as improved housekeeping and thermal efficiencies. Conservation is considered possible by either direct thermal savings, or savings achieved by converting from natural gas and light petroleum to heavier petroleum and coal. Some 55 new process options are analyzed in detail, and compared with 25 'baseline' or current processes representing conventional manufacturing techniques. Processes are evaluated according to pollutants emitted, energy requirements, and investment and operating costs for pollution control and basic production. This volume presents the general findings for each industry and also identifies generic or cross-industry technology and further research areas. (See W78-01893 thru W78-01905) (Lynch-Wisconsin)
W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II. INDUSTRY PRIORITY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 268, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034b, December 1976. 124 p, 4 fig, 41 tab, 49 ref, 3 append. EPA 68-03-2198.

Descriptors: *Industrial production, *Energy, *Conservation, *Analytical techniques, *Environmental effects, Methodology, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluation.

Vol. II of a 15-volume analysis of the environmental impact of energy conservation measures in 13 industries describes the study methodology and gives a preliminary overview of the industries. The initial task was to identify industries for detailed analysis, and then to rank them by priority. Criteria for industry selection included: (1) significance of environmental problems in the industry; (2) the likelihood of implementing the process changes identified; and (3) total energy use in the industry. Within each industry chosen, processes subject to change were identified, and those thought to have both significant energy and environmental consequences were selected for in-depth study. A currently practiced 'baseline' technology was then established in each industry for comparison with the new process changes. Energy data gathered are presented in tables. Preliminary conclusions on several industries are also given in this report, prepared early in the course of the overall study. Industries discussed include: iron and steel (blast furnaces), pulp and paper, industrial organic chemicals (olefins), cement, primary aluminum and alumina, petroleum refining, textiles, glass manufacturing, copper, ammonia, iron and steel foundaries, alkalies and chlorine, industrial organic chemicals N.E.C., food, and lime. (See also W78-01892) (Lynch-Wisconsin)
W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III. IRON AND STEEL INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 269, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/76-034c, December 1976. 90 p, 17 fig, 45 tab, 32 ref. EPA 68-03-2198.

Descriptors: *Steel, *Iron, *Energy, *Conservation, *Environmental effects, Technology, Industrial production, Pollution abatement, Costs, Industrial wastes, Baseline studies, Industries, Metallurgy, Sulfur, Evaluations.
Identifiers: Coke, Blast furnaces, Carbon monoxide.

Environmental impacts of four manufacturing process changes which could possibly conserve energy are assessed for the iron and steel industry, as part of a broader study of 13 energy-intensive industries. Process options analyzed are: (1) recovery of carbon monoxide from basic oxygen process (BOP) vessels in steelmaking; (2) external desulfurization of blast furnace hot metal; (3) conversion from wet to dry process for quenching of coke; and (4) direct reduction of iron ore. Recovery of carbon monoxide from BOP vessels would provide a supplementary fuel source as well as better gas cleaning efficiency. It probably will be widely adopted in new facilities. External desulfurization allows for utilization of higher sulfur coke in the blast furnace, or reduction of the coke rate and limestone consumption. Fugitive air and water pollution streams would all little to overall pollution. This option probably will also be adopted. Dry quenching of coke, essentially an energy-saving measure, may pollute less than wet quenching but would require prohibitively-high capital investment and is not likely to be considered by any but large integrated plants. Direct reduction of iron ore through the rotary kiln-electric furnace method eliminates a major pollution source, the coke oven, and uses lower-valued coals but is more energy-consuming. As it is not yet perfected technically, it is not likely to be adopted in the next 15 years. (See also W78-01892) (Lynch-Wisconsin)
W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV. PETROLEUM REFINING INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 270, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034d, December 1976. 171 p, 18 fig, 86 tab, 6 append. EPA68-03-2198.

Descriptors: *Oil, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Asphalt, Industries, Technology, Industrial wastes, Effluents, Baseline studies, Alternative planning, Costs, Evaluation.
Identifiers: *Refining, Hydrocracking, Flexicoking, Desulfurization.

Five potential energy-saving processes in petroleum refining are evaluated for environmental impact as part of broader study of 13 energy-intensive industries; (1) direct combustion of asphalt in process heaters and boilers; (2) hydrocracking of vacuum bottoms (H-oil); (3) flexicoking of vacuum bottoms; (4) internal electric power generation; and (5) hydrogen generation by partial oxidation. All five alternatives generally are net consumers of energy in a thermodynamic sense, especially considering pollution control energy consumption. Reduction in refinery efficiency is slight, except for flexicoking of vacuum bottoms, which results in 2% lower efficiency. Energy form value upgrading is the principal conservation benefit, accomplished through utilization or conversion of refinery residue streams with a corresponding net increase in the availability of higher-valued fuels (such as refinery gas and distillate range products). Implementation of these five options would have little impact on wastewater-control costs, as they do not change treated effluent characteristics. Options (1) and (4) significantly increase total operating costs; in the case of (1) flue gas desulfurization accounts for over half of the total operating cost. Improving reliability and reducing the cost of flue gas desulfurization is the most important area for further research. (See also W78-01892) (Lynch-Wisconsin)
W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V. PULP AND PAPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 271, Price codes: A10 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034e, December 1976. 186 p, 15 fig, 80 tab, 3 append. EPA 68-03-2198.

Descriptors: *Pulp and paper industry, *Energy, *Conservation, *Environmental effects, Recycling, Pulp wastes, Industrial production, Pollution abatement, Effluents, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.

Environmental impacts of technological modifications which offer energy-conserving potential to the pulp and paper industry are evaluated as part of a broader study of 13 energy-intensive industries. A preliminary assessment is included of some 60 process changes and their stages of development, together with a detailed analysis of four alternatives likely to have significant energy and environmental impact in the near future: (1) alkaline-oxygen (A-O) pulping; (2) Rapson effluent-free kraft process; (3) thermo-mechanical pulping (TMP); and (4) de-inking of old newsprint for reuse. The A-O process would eliminate sulfur and odor associated with the kraft recovery process, and improve the color problem of the caustic/chlorine bleach system; air emissions and solid waste would not be reduced. The Rapson process is designed to eliminate BOD, suspended solids, and color from chlorine/caustic bleach system effluents, but would not affect solid waste or air emissions. The Rapson process is considered the most important as energy use and costs would be greatly reduced. TMP causes no net change in energy use or pollution, but produces a stronger pulp. De-inking of old newsprint conserves energy and virgin fiber, creates no odor, and reduces household waste. Alternative paper-drying methods and displacement washing have significant energy-saving potential. (See also W78-01892) (Lynch-Wisconsin)
W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI. OLEFINS INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 272, Price codes: A08 in paper copy, A01 in microfiche.

Report No EPA-600/7-76-034f, December 1976. 134 p, 29 fig, 65 tab, 6 append. EPA 68-03-2198.

Descriptors: *Chemical industry, *Energy, *Conservation, *Environmental effects, Coals, Natural gas, Technology, Pollution abatement, Industrial production, Industrial wastes, Baseline studies, Costs, Alternative planning, Propane, Evaluations.
Identifiers: *Olefins, *Ethylene, Feedstocks, Naphtha, Ethane, Organic chemicals, Gas oils.

The olefins industry, the largest subgroup among industrial organic chemicals, is analyzed for environmental impact of an expected change in energy form values from lighter to heavier feedstocks, as part of a broader study of 13 energy-intensive industries. Most ethylene (80%) in the U.S. is produced from the pyrolysis of ethane and propane, derived mainly from natural gas. Projected natural gas shortages will mean conversion to heavier feedstocks such as naptha and atmospheric gas oil. These contain more impurities (especially sulfur) and therefore would have a greater adverse effect on the environment. Environmentally acceptable control technology exists for operating heavy liquid olefin crackers; but the estimated aggregate cost of these controls (0.5-1.75% of total production costs) is high, considering the large amount of ethylene produced--23 billion lbs in 1975. Heavier feedstock cracking is also expected to cost 30% more than cracking of lighter feedstocks. The report concentrates on new technology for producing olefins from heavier, more available, and less costly feedstocks than ethane-propane, naphtha, and atmospheric gas oil, including vacuum gas oil, vacuum residues, crude oil, and coal. New processes reviewed were: coil cracking, fluid bed cracking, autothermic cracking of heavy petroleum-based feedstocks, plasma cracking and byproduct production from coal. Gross energy demand for producing ethylene increases as feedstock quality decreases, and form value displacement is the only energy conservation achieved. (See also W78-01892) (Lynch-Wisconsin)
W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII. AMMONIA INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 273, Price codes: A06 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034g, December 1976. 88 p, 16 fig, 45 tab. EPA 68-03-2198.

Descriptors: *Ammonia, *Energy, *Conservation, *Environmental effects, Natural gas, Coals, Industrial production, Pollution abatement, Technology, Industries, Industrial wastes, Sulfur, Baseline studies, Alternative planning, Costs, Evaluations.
Identifiers: Coal gasification, Fuel oils.

Shortages of natural gas, the basic feedstock for virtually all ammonia production in the United States, is forcing the ammonia industry to look to alternate sources such as coal and heavy fuel oil. This report, part of a broader study of 13 energy-intensive industries, evaluates environmental and economic impacts of converting ammonia production to gasification of coal or heavy oil. These alternatives are not economically attractive; estimated incremental capital investment above the current $186 per annual ton of ammonia based on natural gas is $111 per annual ton for coal gasification and $21 per annual ton for heavy fuel oil. Estimated incremental production costs are $17 per ton for coal, including $8.65 per ton for pollution control, and $45 per ton for heavy fuel oil with $3.46 for pollution control. Needed pollution control measures will require an energy expenditure of 165,000 Btu per ton of ammonia for coal, a 0.5% increase in total energy consumption in ammonia production, and 125,000 Btu per ton for heavy fuel oil, a 0.2% increase in total energy consumption. Therefore, the relative incremental fuel use would be negligible, but fuel form savings would be significant. The most important potential environmental problem for both alternatives is byproduct sulfur, but a sulfur recovery system could handle this in an acceptable manner. (See also W78-01892) (Lynch-Wisconsin)
W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII. ALUMINA/ALUMINUM INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 274, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034h, December 1976. 139 p, 8 fig, 38 tab, 3 append. EPA 68-03-2198.

Descriptors: *Aluminum, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.
Identifiers: *Alumina, Bayer process, Hall-Heroult process, Alcoa chloride process, Clay chlorination.

Environmental impacts of energy-saving production alternatives are examined for the alumina/aluminum industry as part of a larger study of 13 energy-intensive industries. Two basic independent operations at separate facilities comprise the aluminum industry: production of alumina (Al_2O_3) from bauxite by the Bayer process, and reduction of alumina to aluminum metal by the Hall-Heroult electolytic reduction process. Bauxite is now in short supply. Accordingly, alternatives to the Bayer process are based on clay as a raw material instead of bauxite. Alternatives include treatment of clays by: (1) hydrochloric acid leaching; (2) nitric acid leaching; and (3) high temperature chlorination (Toth process). Alternatives to the energy-consuming Hall process include: (1) Alcoa chloride process; and (2) use of titanium diboride cathodes. A combination of clay chlorination and Alcoa chloride processes would result in considerable cost savings along with a decrease in both air pollution and energy consumption. All the new alumina processes would produce more solid waste and involve higher pollution control costs than the Bayer process, but with proper plant location, wastes could be returned to the mined-out areas. Lowest energy consumption and operating costs are associated with the clay chlorination method. The Alcoa chloride process could realize energy savings of 10% without increasing operating costs. (See also W78-01892) (Lynch-Wisconsin)
W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 275, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034i, December 1976. 76 p, 11 fig, 27 tab, 2 append. EPA 68-03-2198.

Descriptors: *Textiles, *Energy, *Conservation, *Environmental effects, Cotton, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Fabrics, Evaluations.
Identifiers: Polyester, Weaving, Knitting.

Alternative energy-saving textile processing operations are assessed for environmental impacts as part of a broader study of 13 energy-intensive industries. In 1971 total energy use by the industry was about 0.54 quads. About 60% of energy consumption is in wet operations, such as fabric preparation, dyeing, and finishing; a major fraction is spent in heating and evaporating water, so water conservation or elimination of its use is a critical variable. Three energy-conserving process alternatives were analyzed: (1) integrated knit fabric mills using advanced processing (minimizing water use) of polyester; (2) integrated knit fabric mills using solvent processing of polyester; and (3) integrated woven fabric mills using advanced processing of a 50-50 polyester-cotton mixture. These alternatives were compared with current manufacturing practices. Advanced processing offers lower energy and pollution control costs in return for a somewhat higher capital investment and could be adopted beneficially for replacement capacity and capacity expansion. Advanced processing of knit fabrics results in a 50% reduction in energy use. Advanced processing of woven fabrics results in a 57% reduction in energy consumption as well as lower costs for energy and pollution control. All-solvent processing of knit fabrics offers 70% energy savings and practically eliminates water pollution problems but potential solvent losses and technical development limitations inhibit widespread application. (See also W78-01892) (Lynch-Wisconsin)
W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 276, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034j, December 1976. 116 p, 19 fig, 38 tab, 4 append. EPA 68-03-2198.

Descriptors: *Concretes, *Cements, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Fuels, Coals, Evaluations.
Identifiers: Suspension preheaters, Flash calciners, Fluidized-bed cement process, Clinker production, Rotary kilns.

Three energy-saving manufacturing changes in the cement industry were evaluated for economic and environmental impacts as part of a larger study of 13 energy-intensive industries. The unit process of clinker production, which consumes in the form of fuel 80% of total cement industry energy requirements, is the focus of this report. Alternatives analyzed were: (1) suspension preheaters, (2) flash calciners; and (3) the fluidized-bed cement process. All the alternatives investigated require a lower fixed capital investment, use less total energy, and would probably have lower pollution control costs than the conventional long rotary kiln now in use. Effluent quantities and composition would be essentially the same as with the long rotary kiln. Suspension preheater-equipped rotary kilns, which fell into total disfavor in the U.S. due to technical problems which have since been overcome, largely eliminates process water discharge and waste kiln dust problems. The flash calciner, a variation of the suspension preheater rotary kiln, is likewise a dry process. The fluidized-bed cement process replaces the rotary kiln entirely. Conversion from oil and natural gas to coal fuel was also considered. Coal, which was progressively displaced by oil and natural gas, is now again becoming a major fuel in the industry; could replace all of the oil and natural gas now being used. Conversion to coal would require additional storage and handling expense, and fugitive emissions and runoff would be likely to increase pollution control costs. (See also W78-01892) (Lynch-Wisconsin)
W78-01901

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI. GLASS INDUSTRY.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 277, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034k, December 1976. 111 p, 9 fig, 40 tab, 42 ref, 4 append. EPA 68-03-2198.

Descriptors: *Energy, *Conservation, *Environmental effects, *Fuels, Natural gas, Electric power, Industrial production, Pollution abatement, Air pollution, Technology, Industries, Industrial wastes, Baseline studies, Alternative planning, Costs, Coals, Evaluations.
Identifiers: *Glass industry.

Five glass-manufacturing process alternatives-based on coal or electric power rather than natural gas- are evaluated in terms of economic and environmental effects, as part of a broader study of 13 energy-intensive industries. These alternative energy forms are based on the unit process of melting, which consumes 60-80% of total glass industry energy requirements: (1) coal gasification, (2) direct coal firing, (3) coal hot gas generation, (4) electric melting, and (5) batch preheating. The alternatives were compared to a conventional process using natural gas in a 200 tpd side-port fired regenerative furnace, melting soda-lime-silica glass. All except (5) require higher energy input per ton of glass produced, but involve less-critical energy sources. Emissions from the glass tank--primarily sulfur oxides and particulates--are increased, indicating higher pollution control costs. Coal gasification and coal hot gas generation may be economically unfeasible because of high facility conversion and pollution control costs. Direct coal firing involves higher capital and operating costs, as well as serious technical problems. Electric melting results in the lowest air emission loads. The form is less critical in spite of a 12% increase in energy consumption, making this option economically and technically feasible. Batch preheating reduces melting energy use by 20%, and can be used with any of the alternative energy forms. (See also W78-01892) (Lynch-Wisconsin)
W78-01902

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII. PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 279, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034m, December 1976. 80 p, 12 fig, 26 tab, 26 ref. EPA 68-03-2198.

Descriptors: *Phosphorus, *Energy, *Conservation, *Environmental effects, Fertilizers, Electric power, Phosphates, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.
Identifiers: *Phosphoris acid.

Energy-saving alternatives in the phosphorus/phosphoric acid industry are analyzed for economic and environmental effects, as part of a broader study of 13 energy-intensive industries. Phosphate rock is converted to phosphoric acid with sulfuric acid (wet process), or reduced to elemental phosphorus in an electric furnace and subsequently converted to phosphoric acid. Unpurified wet-process acid is suitable only for fertilizer manufacture, while furnace acid is pure and is used in detergents, food, and fine chemicals. The furnace process consumes five times more energy than the wet process; alternatives were therefore geared to wet-process improvements: (1) chemical cleanup of phosphoric acid, (2) solvent extraction for wet-process acid, (3) byproduct sulfuric acid use, and (4) the strong acid system. Chemical cleanup seems economically feasible, pollution problems would not be increased, and energy savings over the furnace method would be substantial. Solvent extraction is not a well-established system, but seems economically feasible and would result in significant energy savings. Use of byproduct sulfuric acid instead of sulfur in the wet process would produce phosphoric acid competitive with normal wet-process acid. The strong acid method which uses phosphoric acid concentrations of 50% P2O5 in the wet process, may be competitive with the standard process; as evaporation of the product acid is not necessary, energy savings are realized. (See also W78-01892) (Lynch-Wisconsin)
W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 280, Price codes: A07 in paper copy, A01 in microfiche. Report No EPA-600/7-76-034n, December 1976. 124 p, 26 fig, 47 tab, 39 ref, 2 append. EPA 68-03-2198.

Descriptors: *Copper, *Metallurgy, *Energy, *Conservation, *Environmental effects, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Evaluations.
Identifiers: Outokumpu process, Noranda process, Mitsubishi process, Arbiter process.

Six manufacturing alternatives for primary copper industry smelting and refining are evaluated in terms of economic and environmental effects, as part of a larger study of 13 energy-intensive industries: (1) Outokumpu flash smelting, (2) Noranda process, (3) Mitsubishi process, (4) oxygen use in smelting, (5) metal recovery from slag (flotation or electric furnace), and (6) Arbiter process. The first three are all pyrometallurgical processes using exothermal reactions which occur during smelting to reduce net energy requirements about 30% (or 50% when oxygen enrichment is used). These methods produce only a concentrated SO2 stream, which can be treated efficiently for SO2 recovery by conversion to sulfuric acid. A 90% sulfur capture is possible, compared with 50-70% for conventional smelting. However, applicability of these processes to impure concentrates is unproven. Oxygen use in smelting results in net energy savings, as increased energy demand for oxygen separation is more than offset by the decrease in smelting fuel requirements. Disadvantages include higher operating temperatures and therefore increased maintenance. The two slag metal recovery processes eliminate the need to maintain a low matte grade in the primary smelting unit. The Arbiter process is less polluting and can operate on a small scale, but uses more energy than conventional technology. (See also W78-01892) (Lynch-Wisconsin)
W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT,
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 281, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-0340, December 1976. 60 p, 10 fig, 26 tab. EPA 68-03-2198.

Descriptors: *Fertilizers, *Energy, *Conservation, *Environmental effects, *Air pollution, Industrial production, Pollution abatement, Industries, Technology, Industrial wastes, Baseline studies, Alternative planning, Costs, Agricultural chemicals, Evaluations.

A report on possible energy-saving alternatives to current production methods in the fertilizer industry concludes that no feasible options are available, and identifies two cases where environmental regulations and energy conservation are in conflict. This investigation is part of a larger study of 13 energy-intensive industries. Most of the industry's energy consumption and costs are in raw materials, not in the subsequent processes. No process changes are foreseen solely for reasons of energy conservation. Two areas were analyzed in which environmental regulations and energy conservation conflict: (1) reduction of nitrogen oxide emissions from nitric acid plants, and (2) conversion from natural gas to fuel oil for firing fertilizer dryers, where bag filters are used for emission control. Catalytic decomposition of nitrogen oxides, the most widely used emission control method in nitric acid plants, is capital and energy intensive, and depends on natural gas. Most plants are limited in their purchase of natural gas and production of ammonia is thereby curtailed. All other abatement systems suffer from various technical problems. The shift from natural gas to fuel oil in the 10-20% of ammoniation granulation fertilizer plants using bag filters instead of wet scrubbers has caused operational problems due to filter clogging. (See also W78-01892) (Lynch-Wisconsin)
W78-01905

AQUATIC WEED PROBLEMS IN PUERTO RICO,
Office of the Chief of Engineers (Army), Washington, DC.
E. O. Gangstad.
Journal of Aquatic Plant Management, Vol. 15, p 3-5, June 1977. 11 ref.

Descriptors: *Puerto Rico, *Aquatic weed control, *Water hyacinth, Aquatic weeds, Rivers, Reservoirs, Watersheds(Basins), Alligatorweed, Biocontrol, Insects, Herbicides, 2,4-D, Dalapon, Water quality.
Identifiers: *Eichhornia crassipes, Alternanthera philoxeroides, Alligatorweed flea beetle, Agasicles hygrophila.

Water hyacinth (Eichhornia crassipes) is the primary aquatic weed problem in Puerto Rico, but when it is brought under control alligatorweed (Alternathera philoxeroids) is likely to become a problem. Major aquatic weed problem areas are along the north coast of the island from Rio Grande to Arecibo. Lesser infestations are found in the river systems of the south from Naguabo to Ponce and from Mayaguez through Valle de Lajas to Yauco. There are few problems in the streams and lakes of the mountainous interior. Major infested reservoirs include Lago de Cidra, Lago de Loiza, Lago de la Plata, Lago dos Bocas, Lago Coamo, and Laguan Cartagena. Introduction of the alligatorweed flea beetle (Agasicles hygrophila) for control of alligatorweed was recommended in 1968 by the U.S. Army Corps of Engineers. Drainage canals of the Lajas Valley are infested with paragrass (Panicum purpurascens), water smartweed (Polygonum natans), and cattails (Typha spp.). The use of dalapon and 2,4-D was recommended by the U.S. Department of Agriculture for control of these weeds. Water hyacinth infestations in the following watersheds are assessed: Rio Grande de Loiza, Rio de Bayamon, Rio de la Plata, Rio Grande de Manati, and Rio Grande de Arecibo. (Lynch-Wisconsin)
W78-01921

WATER HYACINTH CONTROL ON THE LOWER FITZROY RIVER,
Queensland Dept. of Primary Industries, Rockhampton (Australia).
G. I. Jamieson, C. Kershaw, and R. J. Ciesiolka.
Journal of Aquatic Plant Management, Vol. 15, p 5-9, June, 1977. 2 fig, 2 ref.

Descriptors: *Water hyacinth, *Aquatic weed control, *Chemcontrol, *Dams, *Reservoirs, River basins, Lagoons, Rivers, Flood plains, Biocontrol, Herbicides, Diquat, Paraquat, 2,4-D, Equipment.
Identifiers: *Eichhornia crassipes, *Fitzroy River(Australia), Australia, Salvinia molesta, Neochetina eichhorniae, Water hyacinth weevil.

The Fitzroy River Basin (Queensland), the second largest in Australia, drains a 143,000 sq km area containing numerous water hyacinth-infested lagoons. In 1970 a dam was erected 61 km above the river mouth to prevent saltwater tidal flow from the Pacific Ocean from entering the river, and to create a 63,600-magaliter freshwater reservoir. The reservoir now provides the water supply for Rockhampton, and also for industry and agriculture. By late 1973 for 50 km above the dam the river was completely covered by water hyacinth colonized from the lagoons and swamps of the flood plain. Flooding in early 1974 allowed flushing of most of the water hyacinth out to sea by opening the dam gates, and enabled initiation of a control program. Various methods were investigated, and the beetle Neochetina eichhorniae was experimentally released in the summer of 1975-76. A chemical spraying system proved the most effective, however. Diquat is used in the water storage area at 2.8-5.5 l/ha, with up to 5.5 l of a non-ionic wetting agent. In other areas 2,4-D 50% amine is applied at 11 l/ha with ionic or non-ionic wetting agent. Wetting the plants thoroughly is vital. Salvinia is becoming a problem as water hyacinth is brought under control, as it is immune to diquat and 2,4-D. Where Salvinia infestation is likely, paraquat is combined with diquat to control both plants. Equipment is discussed. Using these methods, the river has been virtually cleared of water hyacinth. (Lynch-Wisconsin)
W78-01922

WATER HYACINTH CONTROL PLAIN FOR THE ST. JOHNS RIVER,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
C. F. Zeiger, and J. T. McGehee.
Journal of Aquatic Plant Management, Vol. 15, p 10-12, June, 1977.

Descriptors: *Water hyacinth, *Aquatic weed control, *Chemcontrol, Rivers, Florida, 2,4-D, Herbicides, Biocontrol, Mechanical control, Spraying, Fish.
Identifiers: *St. Johns River(FL), *Eichhornia crassipes, Water hyacinth weevil, Neochetina eichhorniae.

Water hyacinth (Eichhornia crassipes), a serious problem on the St. Johns River, FL, since shortly after it was introduced in 1890, currently is controlled at a maintenance level through selective spraying with the herbicide 2,4-D. The U.S. Army Corps of Engineers controls plants on the river from Jacksonville to Lake Harney under the Removal of Aquatic Growth Project. From Lake Harney to the headwaters work is done by the Florida Game and Fresh Water Fish Commission under the Aquatic Plant Control Program. Operations are designed to interfere as little as possible with public use patterns, manatee migrations, and fishing and spawning seasons. Treatment is directed to heavily infested areas and to lakes or wide reaches of the river where plants are moved about by the wind, and not to single plants, scattered mats, narrow reaches flushed by current, or tributaries and coves not essential to navigation. The water hyacinth weevil (Neochetina eichhorniae), released on the river in March-April 1976, does not eliminate the plant, but helps control rapid growth. Mechanical harvestors have not been successful, but future designs will be used where effective. Earlier control methods, tried but discarded, included destroyer boats with saw blade shredders, burning with kerosene, and spraying with a variety of substances, including highly toxic sodium arsenite (1902-05), steam and whale oil soap. (Lynch-Wisconsin)
W78-01923

SELECTED LIFE CYCLE FEATURES OF FANWORT,
Florida Dept. of Natural Resources, Tallahassee.
For primary bibliographic entry see Field 4A.
W78-01924

EFFECTS OF CONSECUTIVE WATER FLUCTUATIONS ON SUBMERSED VEGETATION OF BLACK LAKE, LOUISIANA,
Florida Dept. of Natural Resources, Tallahassee.
T. L. Goldsby, and D. R. Sanders, Sr.
Journal of Aquatic Plant Management, Vol. 15, p 23-28, June, 1977. 2 fig, 4 tab, 15 ref. Army Corps of Engineers, DACW29-72-CO186.

Descriptors: *Fluctuations, *Water levels, *Drawdown, *Reservoirs, *Aquatic weed control, Submerged plants, Louisiana, Impoundments.
Identifiers: *Black Lake(LA), Cabomba caroliniana, Egeria densa, Floating bladderwort, Utricularia inflata, Coontail, Ceratophyllum demersum.

Consecutive drawdowns in a Louisiana reservoir were more effective in controlling aquatic plants than an individual drawdown. Black Lake, a 5,460-ha reservoir located 19 km northeast of Natchitoches, LA, was created by the impoundment of Black Bayou in 1930. Stabilization of water level resulted in severe infestations of Cabomba caroliniana, floating bladderwort (Utricularia inflata), and Egeria densa. Water level fluctuations through drawdowns were used as a control measure. The first drawdown, initiated July 20, 1972, lowered the water level 2.4 m; the second, September 3, 1973, lowered the level 2.6 m. In each case heavy rains beginning in November resulted in refilling to 2.1-3.0 m above normal pool stage. The first drawdown virtually eliminated both egeria and cabomba. Egeria was eradicated after the second, but due to the seed dormancy of cabomba, two drawdowns are not likely to have eradicated the plant. Floating bladderwort was reduced or eliminated in deeper water by the two drawdowns, but in shallow water it tended to increase as a result of the reduction or elimination of the more competitive egeria and cabomba. Coontail was successfully controlled by the consecutive drawdown, although it increased in shallow water after the first drawdown. Both muskgrass and slender spikegrass displayed net increases after the two drawdowns, although neither were serious problems. (Lynch-Wisconsin)
W78-01925

EFFECTS OF LIGHT QUALITY ON GROWTH AND CHLOROPHYLL COMPOSITION IN HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01926

ADAPTATION TO LOW LIGHT LEVELS BY HYDRILLA,
Florida Univ., Gainesville. Dept. of Agronomy; and Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-01927

THE EFFECTS OF CALCIUM SALTS ON THE GROWTH AND UPTAKE OF PHOSPHORUS BY COONTAIL,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-01928

MANAGEMENT OF AQUATIC PLANTS WITH ACROLEIN,
Water Resources Commission, Griffith (Australia).
K. H. Bowmer, and G. R. Sainty.
Journal of Aquatic Plant Management, Vol. 15, p 40-46, June, 1977. 4 fig, 5 tab, 20 ref.

Descriptors: *Herbicides, *Aquatic weed control, Submerged plants, Irrigation canals, Toxicity, Efficiency, Safety factors.
Identifiers: *Acrolein, *Acrylaldehyde, *Dosage, Australia, Floating pondweed, Potamogeton tricarinatus, Ribbonweed, Va-lisneria spiralis, Elodea canadensis.

Acrolein (acrylaldehyde), an extremely toxic general biocide, is widely used in Australia to control submersed plants--especially Elodea canadensis in irrigation canals; a method of calculating the quantity of acrolein required for various conditions is described, and economic and safety aspects of its use is discussed. Acrolein destroys vital enzyme systems on contact with plant cells, causing tissue disintegration; it is also extremely toxic to fish. Acrolein dissipates from water through volatilization, adsorption, degradation, and dilution. The equation E sub o - E sub L exp (Kt) can be used to calculate the dosage required at the injection point (E sub o), where E sub L is the minimum lethal dosage which must be maintained at the downstream limit, K is the acrolein dissipation constant (0.16/hr), and t is the time taken for the herbicide to travel through the weed-infested stretch. The value of E sub L is discussed for various plants and using multiple additions; it is suggested that for single injections, 2 ppm x hr may be used for E sub L. Ribbonweed (Vallisneria spiralis) and floating pondweed (Potamogeton tricarinatus) require higher doses. In tank experiments 80% control of V. spiralis was obtained with 3.7 ppm for 1 hr; P. tricarinatus required 2 ppm for 12 hr or 15 ppm for 1.7 hr. (Lynch-Wisconsin)
W78-01929

THE EFFECTS OF SELECTED HERBICIDES ON PHYTOPLANKTON AND SULPHUR BACTERIA POPULATIONS,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01930

ACUTE TOXICITY OF A HERBICIDAL COMBINATION OF DIQUAT PLUS COPPER ION TO EGGS, ALEVINS, AND FRY OF RAINBOW TROUT AND TWO AQUATIC MACROINVERTEBRATES,
Agricultural Research Service, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-01931

SUCCESSION OF VARIOUS AQUATIC PLANTS AFTER TREATMENT WITH FOUR HERBICIDES,
Florida Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5C.
W78-01932

THE SELECTION AND MANAGEMENT OF FEEDLOT SITES AND LAND DISPOSAL OF ANIMALS WASTE IN BOISE VALLEY, IDAHO,
Boise State Univ., ID.
L. L. Mink, C. M. Gilmour, S. M. Beck, J. H. Milligan, and R. L. Braun.
Ground Water, Vol 14, No 6, p 411-425, November-December, 1976. 11 fig, 9 tab, 30 ref.

Descriptors: *Feedlots, Waste disposal, Idaho, Runoff, Groundwater, Water quality control, Nutrients, Fertilizers, Coliforms, Sprinkler irrigation, Farm wastes.
Identifiers: *Boise River Valley(ID), *Land disposal, Nonpoint pollution.

Two feedlots in Boise River Valley (ID), where much surface water is diverted for irrigation, were analyzed to determine effects of feedlot waste on the subsurface environment. Ground water levels below Feedlot A, on the floodplain, were less than five ft from the surface, while beneath Feedlot B,

located on an alluvial terrace, depth to ground water was over 80 ft. Ground water beneath Feedlot A was affected by the feedlot. However, since transmissivity and thickness of the aquifer were not determined accurately, total contribution of pollutants could not be evaluated. Ground water below Feedlot B was not analyzed, but water degradation was probably low, as no high concentrations of the various chemical constituents analyzed were found in soil samples below 23 ft. In locating feedlots the following instructions should be followed. Slopes over 12% should be avoided to prevent erosion and incomplete formation of the organic mat. Slopes of 2-3% are recommened to minimize ponding. Basalt outcrops should be avoided since ground water contamination could occur through open fractures. The manure pack and especially the semipermeable organic mat should be maintained to reduce infiltration and minimize ground water degradation. Land disposal requires a water table deeper than 5 ft; applications of 40-50 tons/acre/yr should be made in late fall. Surface runoff should be channeled to lined settling ponds in steep, narrow ditches. (Lynch-Wisconsin)
W78-01948

WEST VIRGINIA ACID MINE DRAINAGE STUDY IN NORTH POTOMAC RIVER BAIN.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 5B.
W78-01959

THE ECOLOGICAL EFFECTS OF THE USE OF DALAPON AND 2,4-D FOR DRAINAGE CHANNEL MANAGEMENT, I., FLORA AND CHEMISTRY,
Cambridge Univ. (England). Dept. of Applied Biology.
For primary bibliographic entry see Field 5C.
W78-02007

SUBSTITUTION AND THE CONTROL OF POLLUTION,
State Univ. of New York at Albany. Dept. of Economics.
G. W. Yohe.
Journal of Environmental Economics and Management, Vol. 3, No. 4, p 312-324, December 1976. 6 ref.

Descriptors: *Input-output analysis, *Mathematical models, Economics, Prices, Pollution abatement.
Identifiers: *Substitution, *Price control, *Quantity control, Certainty, Uncertainty.

The relative efficacy of price and quantity controls to handle pollution are examined, where prices are effluent charges and quantities are pollution standards. But using one variable to represent both the pollutant and the positive product by a single variable is inappropriate unless they appear in fixed proportions. In addition, the quantity of a pollutant actually being consumed is typically related to the quantity produced by a variety of weather-related variables, which is a significant source of uncertainty thus far ignored. To ensure that the two alternative controls produce precisely the same outcome, a one-firm model is first generated under certainty. Three basic sources of uncertainty are identified: benefits generated by consuming the final good; the social costs of consuming the pollutant; and the cost of removing pollutants from emission streams. Although pollutants are generally modelled as secondary outputs, economically they behave more like inputs. Compensation must be paid by the producer to the public for pollution, and so pollution is a necessary input in production. The ability to substitute other inputs for the pollutant is found to influence the degree to which cost fluctuation is reflected in the output of the final good. The usual discrepancy between the amounts of pollution actually consumed and emitted alters the region of benefit function into which output is inserted. (Lynch-Wisconsin)
W78-02011

THE RECREATION BENEFITS OF WATER QUALITY IMPROVEMENTS: ANALYSIS OF DAY TRIPS IN AN URBAN SETTING,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 6B.
W78-02016

IMPACT OF NON-POINT POLLUTION CONTROL ON WESTERN LAKE SUPERIOR, RED CLAY PROJECT - WORK PLAN,
Environmental Protection Agency, Chicago, IL. Office of Great Lakes Coordinator.
S. C. Andrews, R. G. Christensen, and C. D. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 293, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-905/9-76-002, February 1976. 146 p, 8 fig, 38 tab, 17 maps, 4 append. G005140 01.

Descriptors: *Clays, *Water pollution control, *Lake Superior, *Sedimentation, Wisconsin, Minnesota, Streams, Water quality control, Pollutants, Suspended solids, Education, Methodology.
Identifiers: *Nonpoint pollution, Red clay area(MN WI), Public information.

Research and demonstration projects carried out by the Soil and Water Conservation Districts of Ashland, Bayfield, Douglas, and Iron Counties in Wisconsin, and Carlton County in Minnesota is described. Erosion of red clay soils on the south shore of Lake Superior have created serious problems in road and railroad building, agriculture, and lake and stream sedimentation. The first systematic study of land use problems in this area of southwestern Minnesota and northwestern Wisconsin was begun in the mid-1950s when an Interagency Red Clay Committee was formed. Suspended clay in lakes and streams was first recognized as a pollutant about 1970, and the committee was requested to inventory the extent of sedimentation and outline a plan for reducing sediment pollution; other local agencies also began work on the problem. Surveys led to selection of sites in target watersheds for assessing various structural and nonstructural erosion and sedimentation control techniques. Areas studied were Nemadji River basin, Fish Creek watershed, Oronto/Parker Creek basin, and the Ashland shoreline. For each study area a general description is followed by a discussion of land capability, streambank erosion, land treatment needs, demonstration projects, research, monitoring, and work plan time schedule. Final sections discuss information dissemination and education, institutional management systems, analytical methods, and budget. (Lynch-Wisconsin)
W78-02017

MEETING THE GROUNDWATER CONTAMINATION PROBLEM,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-02031

PERMISSIBLE CONCENTRATIONS OF ALCOHOLS AND FURFURAL IN WASTE WATER USED FOR IRRIGATION (O DOPUSTIMOM SODERZHANII SPIRTOV I FURFUROLA V STOCHNYKH VODAKH, ISPOL'ZUEMYKH DLYA OROSHENIYA),
For primary bibliographic entry see Field 5E.
W78-02037

A MEAT PACKER'S SOLUTION TO MEETING 1983 EFFLUENT REQUIREMENTS,
Foth and Van Dyke and Associates, Inc., Green Bay, WI.
For primary bibliographic entry see Field 5D.
W78-02089

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations; and Environmental Protection Agency, Washington, DC. Oil and Special Materials Control Div.
March 1977. 42 p, 32 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution, Oily water, Poisons, Waterfowl, Oil wells, Oil-water interfaces, Disasters, Oil wastes, Barges, Water pollution treatment, Secondary recovery(Oil), Aquatic life, Wildlife, Water law, Storage tanks, Hazards, Explosions, *Environmental Protection Agency, *Marine environment, *Hazardous substances(Pollution), *Tankers, Marine ecosystem, Point sources(Pollution), Supertankers, Vessels, Oil spill cleanup.

The objective of the Oil and Special Materials Control Division of the Environmental Protection Agency is the protection of water quality through the prevention of spills and the minimization of the impact of spills on the environment. The three major goals of the federal program are to prevent spills, to detect spills, and to contain, remove, and clean up those spills which do occur. To fulfill the public information aspect of these goals, survey sections are presented which describe some of the more significant spill incidents and the mechanisms, both managerial and technological, to deal with them. Specifically, sections concerning the effects of spills, the prevention of spills, the response to spills, and spill surveillance are included. In addition, a catalog of the major spills of oil and hazardous substances occuring in the 1960's and 1970's, along with their causes and consequences are briefly discussed. A list of references to more detailed presentations of the laws, regulations, and other subjects pertaining to spills is included. (Brightman-Florida)
W78-02095

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY,
Black and Veatch, Kansas City, MO.
O. J. Schmidt.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 1, No. 6, p 935-46, December, 1975.

Descriptors: *Water quality, *Kansas, *Missouri, *Water pollution control, *Sewage districts, Management, Coordination, Septic tanks, Water quality control, Wastewater treatment, Municipal wastes, Waste treatment, Inter-agency cooperation, Water management(Applied), Watershed management, City planning, Interceptor sewers, Sewage treatment, Tertiary treatment, Watersheds(Basins), *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972.

Neighboring communities within one watershed need to share responsibility for water pollution control. Problems result from fragmented efforts at pollution control. For instance, political boundaries pose obstacles to coordinated, well-planned pollution control programs. Differing policies of treatment standards and differing methods of financing construction develop when political and administrative boundaries do not coincide with watershed boundaries. Also, a lack of support programs, such as laboratory facilities and monitoring programs, results in a lack of data on plant performance. After examining these and other problems the author examines options for management agencies which would reduce fragmentation

and promote coordination in eight counties on both sides of the Kansas-Missouri border comprising the Kansas City watershed. These approaches include retaining the presently decentralized pattern of management agencies, seeking a centralized operational entity, creating county based agencies, creating watershed based agencies, and some combination of county and watershed based agencies. Local governments are most likely to accept the consolidation of county watershed agency. In the Kansas City area this could result in a reduction of operational agencies from 160 to 6. (Spector-Florida)
W78-02096

WATER USES AND MISUSES: A WORLD VIEW,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-02097

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS),
P. J. Bernstein.
The Nation, Vol. 224, No. 3, p 73-77, January 22, 1977.

Descriptors: *Oil industry, *Oil spills, *Oil pollution, *Ships, *Coast Guard regulations, Oily water, Continental shelf, Coasts, Federal jurisdiction, Exploration, Atlantic Ocean, Gulf of Mexico, Oil, Recreation, Transportation, Hazards, Wastes, Water quality, Wetlands, Water users, Water pollution, Design standards, Safety, Offshore platforms, *Tankers, *Supertankers, *Vessels, Coastal waters, Deep-water ports, Outer continental shelf.

Oil tanker spills threaten incalculable damage to the coastal environment. Safety regulations which govern the construction and operation of foreign and domestic oil tankers are needed. However, there is a common practice among firms owning oil tankers of registering their ships in foreign countries which do not impose standards for construction or operation similar to those imposed in America. The federal Ports and Waterways Safety Act of 1972 gave the Coast Guard the authority to issue rules and regulations designed to minimize shipping hazards, including dangers to the coastal environment. So far, the Coast Guard has only formulated rules for American vessels in domestic trade. It has yet to formulate rules covering foreign ships or American ships in foreign trade. The author discusses the Coast Guard's consideration of the regulations concluding that the Coast Guard was biased in favor of the oil shipping industry and that the regulations are inadequate. The author also advocates a program of federal exploratory drilling in the continental shelf area before the sale of oil-production rights. He points out that Puerto Rican statehood could ensure American control of that island's offshore oil. (Wright-Florida)
W78-02099

MARINE POLLUTION AND THE ABSOLUTE CIVIL LIABILITY OF THE SHIPOWNER UNDER THE LAWS OF THE UNITED STATES AND EGYPT,
Howard Univ. School of Law, Washington, DC.
A. N. Roushdy.
The Journal of International Law and Economics, Vol 10, No 1, p 117-82 (1975).

Descriptors: *International law, *Oil spills, *Water pollution control, *Law of the Sea, International commissions, Legal aspects, Foreign waters, International waters, Treaties, Oil industry, Federal government, Judicial decisions, Penalties(Legal), Law enforcement, Water law, Oceans, Navigation, Ships, Water pollution sources, Rivers and Harbors Act, Transportation, *Territorial seas(Jurisdiction), *Egypt, *Absolute liability, *International conventions, Coastal waters, Sovereign immunity, Tankers, Supertankers, Liability, Certification.

After tracing United States legislative efforts to control marine pollution and briefly examining Egyptian law including Law No. 93, discussion focuses on international attempts to control marine pollution and emphasizes oil pollution. The 1973 International Conference on Marine Pollution, for example, adopted an extensive, but exception ridden, convention which applied to all types of ships and vessels, required inspection of each ship before issuance of an Oil Pollution Certificate, and imposed responsibility for the ship's operation on the issuing government. In both the United States and Egypt, tort law makes a shipowner liable for the acts of the master and crew either as a wrongdoer, an employer, or a guardian. The 1969 International Convention on Civil Liability for Oil Pollution imposes strict liability on shipowners for damage caused by oil escape or discharge from their vessels. This convention limits the amount of recovery, however, and contains several exceptions to strict liability itself. The author concludes that the numerous national and international controls are insufficient to cope with a rapidly growing problem. Only a uniform law of the sea accepted by all coastal states will permit uniform pollution control and enforcement. (Moorhouse-Florida)
W78-02101

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W78-02102

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPLE WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 145, Price codes: A99 in paper copy, A01 in microfiche. 1976. 1,299 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Planning, *Waste water treatment, *Cost sharing, Federal government, Regulation, Sewage treatment, Waste water disposal, Treatment facilities, Administrative agencies, Federal budget, Financing, Cities, Local governments, Research priorities, Zoning, Sewers, Separated sewers, Public hearings, Effluent guidelines, Land use controls.

Hearings were held in Atlanta, Kansas City, San Francisco, and Washington, D.C., to obtain comments from local waste water treatment officials regarding problems with the Federal Water Pollution Control Act. Officials discussed federal funding of local waste water systems and addressed funding priorities of governmental units faced with choices between crime control and water treatment programs. Complaints were heard from local residents regarding high sewer charges necessary to fund treatment systems. Zoning regulations, joint federal-local efforts and the ratios of joint funding, characteristics of projects funded, and the merits of funding storm sewers as well as sanitary sewers were considered by various speakers. Officials proposed increased efforts in research and development, more stringent or relaxed quality standards, revisions in bonding procedures, deviations in compliance from established standards, private waste disposal operations, extension of deadlines and surveys of needed projects. No conclusions or consensus of recommendations were reached, as only the comments were transcribed for publication. (Molloy-Florida)
W78-02104

E.P.A. ENFORCEMENT, DECEMBER 1972 TO NOVEMBER 1974. AIR, WATER, PESTICIDES.
Environmental Protection Agency, Washington, DC. Office of General Counsel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 948, Price codes: A18 in paper copy, A01 in microfiche. 1975. 398 p.

Descriptors: *Law enforcement, *Pollutants, *Water pollution, *Pesticides, Air pollution, Air pollution effects, Administrative agencies, Federal government, Effluents, Wastes, Discharge(Water), Liquid wastes, Judicial decisions, Legal aspects, Legal review, Penalties(Legal), Water law, Permits, Water pollution control, Water pollution effects, *Environmental Protection Agency, Environmental policy, Administrative regulations, Effluent limitations, Federal Water Pollution Control Act Amendments of 1972, Effluent guidelines, National Pollution Discharge Elimination System.

Several broad pollution status were passed in 1972 placing extensive enforcement responsibility upon the Environmental Protection Agency (EPA). The Federal Water Pollution Control Act Amendments of 1972 established a permit requirement for discharges into United States water. The Marine Protection, Research and Sanctuaries Act created safeguards against pollution of marine waters. The Federal Environmental Pesticide Control Act strengthened provisions governing the use of hazardous substances. This report reviews the EPA's enforcement efforts over the two-year period from December 1972 through November 1974 in the major program areas of air, water, and pesticide pollution. The publication includes a basic summary of enforcement actions and their results, a specific discussion of stationary and mobile air pollution sources, a review of the National Pollutant Elimination Discharge System permit program and enforcement actions against its violators, and also a specific analysis concerning pesticide pollution violators. The report concludes with several statistical tables and charts. (Moorhouse-Florida)
W78-02105

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT).
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 514, Price codes: A99 in paper copy, A01 in microfiche. EPA/440/9-75/009. November 1975. 783 p, 453 ref.

Descriptors: *Toxicity, *Chemical analysis, *Chemicals, *Data collections, Salts, Chemical wastes, Persistence, Solubility, Pollutant identification, Chemical properties, Administrative agencies, Federal government, Inorganic compounds, Nitrates, Sodium compounds, Ions, Ionization, Statistics, Synoptic analysis, Chemical industry, Chemical reactions, Pesticides, Regulation, *Hazardous substances(Pollution), *Environmental Protection Agency, Federal Water Pollution Control Act Amendments of 1972.

The Environmental Protection Agency (EPA) has compiled documents relating to chemicals proposed as hazardous substances under Section 311 of the Federal Water Pollution Control Act of 1972. These chemical profiles represent the bulk of the data utilized in determining which substances were placed on the initial listing of substances. Each profile, dealing with a substance as a unique compound or parent ion of various salt forms, contains physical, chemical, and toxicological data as well as information concerning the substance's

manufacture, handling, and shipment. Since the sole purpose of assembling the data wat to provide a technical basis to meet the regulation requirements under Section 311, the data should not be viewed as valid for alternative uses. The EPA does not represent the data as final and complete. An extensive bibliography on toxic substances and their environmental effects is included. (Moorhouse-Florida)
W78-02106

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION (4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972).
Environmental Protection Agency, Washington, DC. Water Quality Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 145, Price codes: A99 in paper copy, A01 in microfiche. September 21, 1972. 625 p.

Descriptors: *Governmental interrelations, *Lake Michigan, *Standards, *Water pollution control, Agricultural runoff, Federal government, Illinois, Indiana, Law enforcement, Michigan, Pesticides, Phosphorus compounds, Regional analysis, River basins, State governments, Streams, Surveys, Thermal pollution, Water law, Water pollution, Water treatment, Regulation, Wisconsin, *Administrative regulations, *Environmental Protection Agency, Effluent limitations, Interstate waters, State policy.

The Environmental Protection Agency held a conference to discuss the current problems faced by state and federal agencies charged with the duty of protecting Lake Michigan from the deleterious effects of the various types of pollution. One major topic of the conference was a review of the status of compliance by the various pollution dischargers with the recommendations of previous conferences. These recommendations included adequate treatment, 80 percent total phosphorus removal from municipal waste, industrial waste control, and elimination of pollution from combined sewer systems. Tables are included showing the status of compliance with enforcement conference requirements of sources in those states bordering Lake Michigan. The representatives from each agency detailed their enforcement efforts and results in an attempt to coordinate the Lake Michigan policy as a whole. In addition, testimony was received from experts as to the effectiveness of previous conference decisions and standards, and on the advisability of changing those standards or continuing them. (Jordan-Florida)
W78-02108

RELLA V. BERLE (STANDARDS FOR APPROVING WELL APPLICATION FOR DEVELOPMENT OF PUBLIC WATER SUPPLY).
For primary bibliographic entry see Field 6E.
W78-02109

UNITED STATES STEEL CORP. V. TRAIN (EFFLUENT LIMITATIONS ON NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
For primary bibliographic entry see Field 6E.
W78-02114

RYAN V. COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES (FORMER LESSEE REQUIRED TO ABATE NUISANCE CREATED DURING TENANCY).
For primary bibliographic entry see Field 6E.
W78-02115

COASTAL FACILITIES REVIEW ACT.
For primary bibliographic entry see Field 6E.
W78-02117

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-02120

FLOATING BOOM,
Cascade Industries, Inc., Edison, NJ. (Assignee).
R. E. West.
U.S. Patent No. 4,030,304, 6 p, 6 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 996, June 21, 1977.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Water pollution treatment, Floating, Equipment, Deflection, Booms, Containment.

A floating boom designed to confine oil or other floating pollutants is adapted to be connected in end to end relationship and to fold in accordian style when not in use. The end-connecting hinges are secured to the end edges of an elongate, generally rectangular flexible skirt which is formed from a liquid-impervious plastic material. Secured to the upper edge portion of the skirt are pairs of floats. Each float comprising identical but oppositely arranged sections are secured to opposite faces of the skirt. The sections, when so secured, impart to each float a cross-sectional configuration which may be appropriately described as comprising bulbous lower portion merging into recessed midportions which in turn merge into bulbous upper portions smaller in cross-sectional size than the lower portions. The recesses, thus, extend continuously along the length of each float, and are so designed as to serve as wave deflectors adapted to receive waves or wavelets, and turn them back into the area about which the boom extends. (Sinha-OEIS)
W78-02125

COMBINED LEACHING AND SUMP CATCH-BASIN,
R. M. Hicks.
U.S. Patent No. 4,031,009, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 1229, June 21, 1977.

Descriptors: *Patents, *Runoff, *Storm runoff, *Surface runoff, *Drainage systems, Urban drainage, *Leaching, Water quality control, Catch-basins.

A pre-cast reinforced concrete catch-basin of larger than conventional size includes a solid horizontal bottom wall with solid, hollow, cylindrical side walls standing up to about half the height of the catch-basin. The lower half thus forms a sealed, unapertured, undrained, sump receptacle for collecting drain water and silt and allowing sand to settle out. The hollow, cylindrical, upper half contains leaching openings which extend through from the inside to the outside of the wall, from top to bottom, for discharging cleared water to the surrounding, stone-lined earth without plugging, or clogging, and without polluting nearby wells, brooks, etc. (Sinha-OEIS)
W78-02131

CRYOTHERMAL MANIPULATION OF PETROLEUM SPILLS ON WATER,
S. L. Ross, and O. Shuffman.
U.S. Patent No. 4,031,707, 9 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, no 4, p 1465-1466, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water pollution control, *Cryogenics, Freezing, Equipment.

The invention relates to a method and apparatus for controlling or manipulating a body of crude, refined, or used petroleum such as in the herding and recovery of an oil spill in a body of water. It can also be used in temporarily stopping a leak in an oil tanker caused by a cracked hull, in recovering oil inadvertantly spilled on a beach front, in plugging an oil casing pipe to control an oil fire at sea on a drilling platform, in effecting preliminary refinement of oil at the oil rig site, in transporting oil from the Arctic or Antarctic region without resorting to complicated and costly apparatus, and in many other applications. The method basically comprises exposing the petroleum mass either to a transient atmosphere or environment of a freezing, sub-freezing, or cryogenics temperature, or contracting the petroleum with a substance or mechanism exhibiting freezing, sub-freezing, or cryogenics temperatures. The apparatus comprises mechanisms for handling substances at freezing, sub-freezing or cryogenics temperatures and capable of maintaining the material in the vicinity of the petroleum mass. The reaction of petroleum to cryogenics temperatures causes the petroleum mass to move or to pull in or contract very rapidly. The reaction of petroleum is to move very sharply and very quickly away from the lower temperature and at the same increase its surface tension. Because of the development of the surface tension and the very orderly arrangement of the molecules of the petroleum mass, as opposed to the amorphous disposition, the petroleum literally squeezes out any foreign matter. (Sinha-OEIS)
W78-02132

SKIMMER FOR A BODY OF LIQUID WITH FLOATING SOLIDS,
Societe Anonyme Texaco Belgium N.V., Brussels. (Assignee).
E. V. M. De Visser, and K. I. Ghyselen.
U.S. Patent No 4,032,449, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1708, June 28, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Skimming, Solid wastes, Suspended solids, Waste disposal, Equipment.

The object of this invention is to provide an improved skimmer that includes an apparatus for effectively breaking up lump-forming solid matter that is floating on the surface being skimmed. The skimmer for use on a body of water having solid matter floating on the surface comprises in combination weir means for drawing off liquid from the surface and means for adjustably supporting the weir vertically relative to the surface. It also comprises tooth means for beaking up solids having greater than a predetermined size and tending to be carried over the weir when the water is drawn off. (Sinha-OEIS)
W78-02137

OIL-WATER SEPARATOR,
V. S. Pedone.
U.S. Patent No. 4,032,453, 6 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1709-1710, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution control, Pollution abatement, Filtrations, Resins, Bilge water, Hydrophobic conditions, Oleophilic conditions.

The water and oil that is normally collected in the bilge of small boats is pumped overboard by a bilge pump with the oil being removed from the bilge water by a filter having layers of different size expanded resin particles that are hydrophobic and oleophilic. When operation of the bilge pump ceases, a valve will release the back pressure that would otherwise be caused by the filter, to facilitate start-up of the pump. At the discharge and visible on the exterior of the boat, there is an indicator that will change color when it is in con-

tact with oil, to provide a visual indication when the filter needs changing. (Sinha - OEIS)
W78-02139

METHOD AND APPARATUS FOR ULTRASONICALLY REMOVING CONTAMINANTS FROM WATER,
Ocean Ecology Ltd., Edmonton (Alberta). (Assignee).
J. N. Koblanski.
U.S. Patent No. 4,032,438, 6 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1704, June 28, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, *Water pollution treatment, Water quality control, *Ultrasonics, Sound waves, Equipment.

An apparatus employing an ultrasonic focusing transducer is provided for removing a contaminant such as oil which is floating on the surface of a body of water. The transducer is supported beneath the water surface with its focal region aimed at the underside of the contaminant oil. A source of alternating current is connected to the transducer to generate ultrasonic waves which travel through the water and converge at the focal region. The apparatus includes a collecting arrangement which catches most of the oil bounced upwardly as the result of the focused ultrasonic waves before that upward discharged oil can fall back onto the water surface. (Sinha - OEIS)
W78-02141

OIL SPILL CONFINING AND DIRECTING APPARATUS AND METHOD USING WATER SPRAY BOOMS,
Marine Construction and Design Co., Seattle, WA. (Assignee).
J. L. McGrew.
U.S. Patent No. 4,033,869, 8 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 305, July 5, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water quality control, Skimming, Sprays, Spraying, Booms, Equipment, Oil spill recovery.

The object of the invention is to devise an improved non-submersion type boom or similar oil spill confining, sweeping or directing apparatus and method. It has been found that the requisite fluid flow forces effective as a sweep curtain to confine and sweep an oil spill may be created by use of water, and more specifically by forming sprays of water sufficient in velocity and volume to entrain air inductively with the water droplets, sufficiently large by their momentum effect to have the requisite carrying effect over the varying distances to wave crests and troughs, yet sufficiently small in droplet size and impact effect on the oil spill that the oil is not dispersed or emulsified by the spray. Furthermore, by providing a series of successively spaced water spray nozzles along support booms, preferably in the form of water headers or conduits supplying the pressure nozzles, overlapping spray patterns are formed with the effect of a continuous uninterrupted curtain of fluid impacting the water's surface. With such booms divergently positioned ahead of and at opposite sides of an oil spill recovery vessel, oil is confined and directed into the path of advance of the recovery vessel from a wide swath with minimum expenditure of energy, i.e. merely the pumping of water through the nozzle system. With sprays of relatively thin and wide configuration overlapping each other at or before impact with the water's surface gaps in the lines or zones of coverage are avoided through which oil would otherwise escape. (Sinha-OEIS)
W78-02150

SPILLED OIL RETRIEVER AND ANTI-WATER POLLUTION WATER CRAFT,
D. L. Cocjin, and A. M. Masongsong.
U.S. Patent No. 4,033,876, 5 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 308, July 5, 1977.

Descriptors: *Patents, *Water quality control, *Oil pollution, *Oil spills, *Water pollution treatment, Boats, Skimming.

A watercraft which is capable of gathering spilled oil or liquids lighter than water which pose as a health hazard to people and marine life is described. The water craft has a pointed bow and incorporates curved pivotable gates to partially for the bow along with an underwater scoop. The scoop has a horizontal surface beneath the water. The gates open to permit water and oil to move onto that surface and upward over an inclined surface leading to a horizontal trough amidships above the water craft. The trough opens for gravity deposit of the oil and water into a water and oil separating tank within the rear of the water craft hull. (Sinha-OEIS)
W78-02153

APPARATUS FOR SEPARATING OIL AND WATER,
M. Seo, and Y. Seo.
U.S. Patent No. 4,035,302, 5 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 2, p 782, July 12, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Separation techniques, *Water treatment, Water pollution control, Water pollution treatment, Equipment, Filtration, Water quality control.

An apparatus for separating oil and water comprises a pipe coiled annularly along the inner surface of the upper portion of a treating chamber and contains a large number of small diameter members arranged parallel to one another. The pipe is connected at its lower end to an inlet for an oil and water liquid mixture. The pipe is open at its upper end to form a rough separating section having an upper oil accumulating portion with an oil discharge pipe. A distribution layer is mounted below the rough separating section to form a flow distribution section for passage of a roughly separated water. A filter tube having a wall composed of a filter layer comprising a mixture of lipophilic fibers and hydrophilic fibers is mounted in the lowe portion of the treating chamber to form a fine separating section having an oil accumulating portion at the top with an oil discharge pipe and a separated water discharge pipe at the bottom. (Sinha-OEIS)
W78-02166

SCOPE OF RESEARCH NEEDS,
Environmental Protection Agency, Denver, CO.
A. W. Dybdahl.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p 35-36.

Descriptors: *Pollution abatement, *Remote sensing, Water pollution control, Air pollution, Regulation, Legal aspects, Enforcement.

Remote sensing needs are identified by the Office of Enforcement and General Counsel (OEGC) of the National Field Investigations Center (NFIC), EPA. These are: (1) interdisciplinary coordination to better define tasks related to the dilution of air and water pollutants; (2) remote sensing keys for each class of industrial and municipal facilities and discharges, consisting of a catalogue of facility and discharge characteristics; (3) airborne detection systems which operate a round the clock for the enforcement program; (4) identification and quantification of all types of pollutants; (5) analysis of the nonlinear optical properties of wastewater for pollutant fingerprinting; (6) a detection system for oil or grease emulsified water; (7) a real-time airborne air quality monitoring system; (8) pooling together of all remote sensing techniques; and (9) much better access to Earth Resources Technology Satellite (ERTS) digital tapes and transparencies at the NASA Goddard Space Center. (Lynch-Wisconsin)
W78-02172

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS,
Environmental Protection Agency, Seattle, WA. Region X.
R. B. Bauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, December 1973, Section IX, p. 32-34.

Descriptors: *Pacific Coast Region, *Water pollution control, *Water pollution sources, Remote sensing, Eutrophication, Nutrients, Alaska, Oregon, Rivers, Willamette River(OR), Nonpoint pollution, Snake River.

EPA's Region X (Pacific Northwest) generally has clean air and an abundance of high quality water. Point source pollution should be reasonably well controlled within the next five years. A notable success is the virtually complete control of liquid waste discharges in the Willamette River (OR). However, nonpoint pollution sources are a significant problem; for example, only 32% of the phosphorus loading in the Upper Snake River can be accounted for by point sources. Because the Region covers 845,000 sq mi, remote sensing holds great potential for monitoring environmental problems. These problems include fugitive dust from unpaved roads and agricultural activities, urban runoff, stream sedimentation and thermal pollution due to logging, particulates from slash burning, leaching from solid waste dumps, irrigation return flows, animal feeding operations, drainage from abandoned mines, eutrophication, oil spills, and accidental radioactivity releases. The greatest drawbacks of aerial imagery are the inability: to quantify concentrations of chemical toxicants and nutrients; to correlate concentration with depth, and to penetrate cloud cover. (Lynch-Wisconsin)
W78-02176

REMARKS, REGION VIII,
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5A.
W78-02179

BIOLOGICAL INTEGRITY--1975,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
For primary bibliographic entry see Field 6G.
W78-02184

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SUBSTITUTION AND THE CONTROL OF POLLUTION,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.

LIBRARY OF THE URBANA-CHAMPAIGN

W78-02011

6B. Evaluation Process

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT),
Systems International, Inc., Gambrills, MD.
For primary bibliographic entry see Field 7B.
W78-01739

RECREATION ACTIVITIES IN THE NATION'S ESTUARINE ZONE,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5G.
W78-01770

THE ROLE OF CITIZEN ACTION GROUPS IN PROTECTING AND RESTORING WETLANDS IN CALIFORNIA,
Horan, Lloyd, Dennis, and Farr, Carmel, CA.
For primary bibliographic entry see Field 2L.
W78-01810

ESTABLISHING THE ECONOMIC VALUE OF ESTUARIES TO U.S. COMMERCIAL FISHERIES,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 2L.
W78-01816

ORGANIZATION ARRANGEMENTS FOR MANAGEMENT OF ATLANTIC COAST ESTUARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-01817

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT,
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
J. P. Merchant, and D. M. Dornbusch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 241, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, 1977. 168 p, 16 fig, 28 tab, 210 ref, 2 append. OWRT C-7042(No. 6205)(1), 14-34-0001-6205.

Descriptors: *Water rights, *Indian reservations, Feder reservations, Public lands, South Dakota, North Dakota, *Model studies, *Water supply, Legal aspects, Economic impact, *Rosebud Sioux Reservation(South Dakota), *Fort Berthold Reservation(North Dakota), *Water law, *Linear programming, *Economic development.

The importance of water supply to economic development was analyzed for the Fort Berthold (North Dakota) and Rosebud Sioux (South Dakota) Reservations. A linear programming model was developed for each Reservation's economy to determine the importance of water as a factor of production. Marginal productivity curves for water were constructed by varying the water supply assumed to be available to each Reservation. Full development of Fort Berthold's potential coal and agricultural resources would consume 240 thousand acre-feet per year, less than the available supply. Development of the Rosebud Sioux agricultural resources would be limited by available water supplies of 266 thousand acre-feet per year. Marginal value added for an acre-foot of water ranged from $0 to $325 on the Fort Berthold Reservation and from $175 to $400 on the Rosebud Sioux Reservation. Both Reservations face substantial legal barriers to the full use of available water supplies. Should the Fort Berthold and Rosebud Sioux Reservations lose key legal contests, the resulting water shortage could limit the value added to their economies to 74 percent and 50 percent of their respective full potentials. Other factors which impede full development of Reservation resources include lack of financing, jurisdictional uncertainties, land ownership patterns, and a shortage of managerial and labor skills. The study offers guidelines for asserting water rights and for ameliorating some of the conditions inhibiting development.
W78-01821

RECREATIONAL BOATING IN DADE COUNTY 1975-76,
Miami Univ., Coral Gables, FL.
C. B. Austin, R. Brugger, J. C. Davis, and L. Siefert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 032, Price codes: A08 in paper copy, A01 in microfiche. Miami University Sp. Sea Grant Report No. 9. March 1977. 143 p, 25 fig, 57 tab, 12 ref, 2 append.

Descriptors: *Florida, *Boating, *Recreation demand, Fishing, Marinas, Boats, Recreation facilities, Recreation, Surveys, Baseline studies, Benefits, Water sports, Water pollution sources. Identifiers: Dade County(FL).

A comprehensive profile of recreational boating in Dade County, Florida, in 1975-76 is based on: (1) boat registrations, (2) census data, (3) original data taken from in-situ surveys of berthed boats, (4) aerial counts of offshore boats, (5) telephone interviews with all marina operators, (6) 4,275 interviews with owners of trailerable and wet-berthed boats, (7) a random 'creel census' of fish catches, and (7) 1,104 questionnaires returned by boat owners. Of 346,353 boats registered in Florida, Dade County possesses the most, 35,923 or about 10%; per capita ownership is lower than in some rural counties, however. Five waterfront recreational boating sites are operated by the county. Compared with average Dade County residents, boat owners tend to be older (44 vs. 34 years), have been county residents longer, are more apt to live in single-family homes (84% vs. 42%), and earn higher incomes (57% vs. 13% have incomes over $20,000). About 20% of registered boaters (7,000-8,000) are responsible for most of the active boating recorded at county and commercial marinas, with a boat use of about three times per month. Some 70% of recreational boating is done by trailerable boat owners, and larger (16-25 ft) trailerable boats are growing in popularity. Berthed boat owners expressed most concern about security, while trailerable boat owners were interested in more parking space and an increase in the number of longer launching ramps. (Lynch-Wisconsin)
W78-01889

ASSESSING THE RECREATION POTENTIAL OF RIVERS,
Michigan State Univ., East Lansing. Dept. of Geography.
M. Chubb, and E. H. Bauman.
Journal of Soil and Water Conservation, Vol. 32, No. 2, p 97-102, March-April 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Recreation, *Model studies, *Rivers, Michigan, Evaluations, *National Forest Recreation Survey, Pine River(MI), Manistee River(MI), Looking Glass River(MI).

A computer method is outlined for assessing reaction potential of rivers by evaluating environments for 16 different recreational activities. The method involves analysis of a range of pertinent natural and cultural variables and is applicable to rivers of all types from slow moving streams in urban areas to torrents in wilderness locations. And it permits comparisons between rivers of various types or between segments of the same river or different rivers. Four steps are involved. There is an initial inventory of variables, treating each river mile as a separate unit. The second step is to 'float' the river, checking information obtained from aerial photos or agencies for each river segment. The third step weighs values to reflect relative importance in determining feasibility of a particular activity. In the final step the computer program sums the weighted scores for each variable and expresses the total as a percentage of the maximum possible. The method was tested on three Michigan rivers, the Pine, the Manistee and the Looking Glass River. The approach is described as sound. The scoring system outlined worked well in the field, although it was possibly weak in some areas. (Coyle-Wisconsin)
W78-01910

ON THE TAXATION OF NONREPLENISHABLE NATURAL RESOURCES,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-02008

THE USE OF SITE SURVEYS IN THE COLLECTION OF RECREATION DATA, WITH PARTICULAR REFERENCE TO THE CONGLETON DISTRICT OF CHESHIRE,
Crewe and Alsager Coll., Alsager (England). Environmental Studies.
C. Chave, C. Fairhurst, and M. P. Thomas.
International Journal of Environmental Studies, Vol 10, No 4, p. 245-251, 1977. 1 fig, 10 tab, 3 ref.

Descriptors: *Data collection, *Recreation, *Surveys, Recreation demand, Recreation facilities, Attitudes, Sites, Scenery, Tourism. Identifiers: England, Cheshire(England), Congleton District(England).

Site surveys were conducted at five recreation spots in the Congleton District of Cheshire (England) to collect data for management and planning use. The sites were: The Cloud, a scenic hill area with paths and views of the Cheshire Mow Cop and Congleton Edge, with moorland walks and scenic views: Shakerley Mere, a sand pit now containing a fishing and boating pond; and Sandbach Flashes, a group of salt subsidence lakes of ornithological interest. All surveys were carried out in June and July 1974 on Sunday afternoons, and visitors were asked 12 questions regarding length of trip, number and ages in party, means of transportation, occupation, reasons for coming, and how crowded they thought the site was. A total of 395 interviews were conducted, ranging from 21 at Sandbach Flashes to 124 at Shakerley Mere. The most important reason given for choice of site was that people simply 'liked what they knew' and returned often to familiar sites. Other important reasons were walking, scenery, quiet, the houses (at Moreton Hall and Congleton Edge), and wildlife (Sandbach Flashes). Nonmanual workers dominated at all sites (68-95%); groups with children were dominant at three sites, while at two it was evenly divided. Most respondents did not consider the sites crowded. The average distance travelled was 21.7 km. (Lynch-Wisconsin).
W78-02012

THE RECREATION BENEFITS OF WATER QUALITY IMPROVEMENTS: ANALYSIS OF DAY TRIPS IN AN URBAN SETTING,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
C. S. Binkley, and M. W. Hanemann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 719, Price codes: A12 in paper copy, A01 in microfiche. Final Report to EPA, June 1976. 251 p, 3 fig, 42 tab, 45 ref, 4 append. EPA-68-01-2281.

Descriptors: *Recreation demand, *Water quality standards, *Beaches, Model studies, Surveys, De-

mand, Massachusetts, Swimming, Social aspects, Regression analysis, Recreation, Decision making. Identifiers: *Boston(MA), Willingness to pay, Water quality improvements, Water quality indices, Opinion analysis.

A questionnaire survey of 467 households in the Boston area was conducted in December 1974 to assess the influence of beach water quality improvements on recreation demand. Conclusions reached were: (1) perceived water quality is not related to actual water quality; beach reputation for water quality is more important as a determinant than actual water quality; (2) proximity, beach cleanliness, setting, and facilities are more important determinants of beach choice than water quality; (3) despite the insensitivity of recreation demand to water quality, respondents were willing to pay $20-26 per family per year for improved water quality, indicating that attempts to quantify benefits of improvements on the basis of consumption are misguided; water quality appears to be a highly valued good merit; (4) people are willing to pay more to maintain existing water quality as sites with high water quality than at sites with poorer water quality. Twenty-nine fresh and salt water beaches within 50 miles of Boston were sampled for 13 water quality parameters, and a beach quality catalogue was compiled. Statistical analysis of sampling and questionnaire data included tabulation, factor analysis of water quality parameters to develop water quality indices, correlation analysis between perceived and actual water quality, multiple regression analysis to estimate determinants of willingness to pay and recreation behavior, and specification and estimation of two multi-site models. (Lynch-Wisconsin)
W78-02016

WATER USES AND MISUSES: A WORLD VIEW,
Resources for the Future, Inc., Washington, DC.
K. D. Frederick.
Resources, No. 55, (Resources for the Future), p 1-5, April-June, 1977.

Descriptors: *Water allocation(Policy), *Water distribution(Applied), *Water utilization, *Water management(Applied), Irrigated land, Water resources, Water shortage, Water demand, Surface waters, Water conveyance, Water users, Groundwater resources, Water resources development, Water supply, Water pollution, Water rights, Surface water availability, Environmental effects, Water quality, Waste disposal, Inter-basin transfers, *Federal Water Pollution Control Act Amendments of 1972, Aswan Dam, Property interests, United Nations Water Conference.

As the demand for water increases, the problems associated with limited natural water resources become more apparent. This article explores the numerous problems that occur when water supplies are used excessively or abused. Water management institutions usually fail in their objectives to use water efficiently because water is a common property resource accessible to many while belonging to no one. Governmental agencies have shown their inability to evaluate benefits and costs associated with alternative water uses. The United States is used as an example of short-sighted water management. Water quality has been impaired in the East through the use of water for waste disposal. The absence of water conservation in the West has resulted in an increasing scarcity of water. The demands on the Colorado River threaten not only the quality of the water in the downstream areas but even the very existence of the river. The High Plains region is dependent on a declining and essentially non-renewable supply of groundwater. The expensive solution of interbasin water transfers is still being considered for this region. The author urges developing nations to profit from the United States' poor example. (Quarles-Florida)
W78-02097

HAZARDOUS WASTES: A RISK-BENEFIT FRAMEWORK APPLIED TO CADMIUM AND ASBESTOS,
Stanford Research Inst. Menlo Park, CA.
K. D. Moll, S. Baum, E. Capener, F. W. Dresch, and R. M. Wright.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 951, Price codes: A12 in paper copy, A01 in microfiche. SRI Report No EGU-3561, September 1975. 26 fig, 16 tab, 92 ref. Report to EPA, Washington, D.C., Office of Research and Development. EPA 68-01-2915.

Descriptors: *Methodology, *Cadmium, *Asbestos, *Waste disposal, *Decision making, Economics, Pollutants, Wastes, Systems analysis, Environmental effects, Toxicity, Feasibility studies, Cost-benefit analysis, Model studies, Evaluations, Methodology, Risk-benefit analysis.

A multidisciplinary analysis was used to develop a decision-making framework for evaluating hazardous waste disposal standards in terms of social risks and product benefits. Risk-benefit analysis was considered most appropriate in assessing environmental effects of various dose levels of hazardous materials. The framework was applied to cadmium and asbestos case studies. The advocated approach begins with examination of existing standards and contamination sources to provide a base of comparison with alternative controls. The data are subjected to economic analysis, and human exposures are related to health effects. To determine feasibility, alternate controls are compared with one another and with other decision considerations; feasible alternatives are further analyzed to select the best overall approach. The case studies involved two sample controls for cadmium (a zinc smelter scrubber and scrubbers on municipal incinerators) and two for asbestos (asbestos manufacturing exhaust filters and asbestos substitutes in automobile brakes). All four showed severe cost-effectiveness deficiencies. (factors of 10 - 1,000 below desired efficiencies). Several types of data refinement are needed for further application of the methodology, such as reasonable threshold dose estimates, physiological responses to high and low dose levels, and long-term and ecological effects. (Lynch-Wisconsin)
W78-02182

THE EFFICIENCY AND EQUITY OF COST ALLOCATION METHODS FOR MULTIPURPOSE WATER PROJECTS,
Central Connecticut State Coll., New Britain. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-02186

BENEFITS OF FLOODWATER MANAGEMENT IN THE CLOSED DEVILS LAKE BASIN,
For primary bibliographic entry see Field 4A.
W78-02191

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ON THE TAXATION OF NONREPLENISHABLE NATURAL RESOURCES,
Kentucky Univ., Lexington. Dept. of Economics.
H. S. Burness.
Journal of Environmental Economics and Management, Vol. 3, No. 4, p. 289-311, 1976. 17 ref.

Descriptors: *Taxes, *Mathematical models, *Natural resources, Fixed costs, Costs, Resource allocation, Economics, Optimization, Social aspects.
Identifiers: Severance tax, Subsidies.

Effects of various tax-subsidy policies on producers of natural resources and on the composite industry are assessed. Nonreplenishability is assumed, in order to reduce the problems associated with intertemporal dynamics to a minimum. A limiting assumption of this and earlier analyses is that fixed costs must be avoidable through the ultimate termination of the production process. Both the competitive and monopolistic cases are considered. Taxes may be devised to generate private sector optimal production and depletion rates which are identical to socially optimal rates. In terms of policy, in the absence of free entry no single tax will ordinarily suffice; a combination of tax (subsidy) instruments is necessary. A complete taxonomy of the effects of various taxes or subsidies is presented. Imposition of a severance tax on coal is seen to result in no change in output as long as firms are earning economic rents. Hence, the entire burden of the tax falls on the coal producer, not shifted to the consumer as has been argued by proponents of coal severance taxes. In the case of restricted entry, a tax-subsidy optimizing behavior consists of a franchise tax (subsidy) and a severance tax (subsidy). For free entry, a single ad-valorem or per-unit severance tax ensures the same outcome. (Lynch-Wisconsin)
W78-02008

SUBSTITUTION AND THE CONTROL OF POLLUTION,
State Univ. of New York at Albany. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-02011

DESIGN SPECIFICATION FOR THE SEWER AND WATER ACCOUNTS PROCESSING MODULE.
Reading, PA. USAC Project.
For primary bibliographic entry see Field 3E.
W78-02181

THE EFFICIENCY AND EQUITY OF COST ALLOCATION METHODS FOR MULTIPURPOSE WATER PROJECTS,
Central Connecticut State Coll., New Britain. Dept. of Economics.
J. C. Loughlin.
Water Resources Research, Vol 13, No 1, February 1977, p. 8-14. 4 tab, 26 ref.

Descriptors: *Cost sharing, *Cost allocation, *Cost benefit ratio, *Separable costs, *Specific costs, *Economic efficiency, Joint costs, Equity, Evaluation, *Alternative justifiable expenditure, *Use of facilities method (Cost allocation), Water resource program, Separable costs-remaining benefits(SCRB), Marginal cost pricing, Justifiable costs.

A three-way review of separable costs-remaining benefits (SCRB), alternative justifiable expenditure and use of facilities methods of cost allocation on federal water resource programs, concludes that only SCRB satisfies all three economic efficiency requirements. From the equity standpoint, however, all three methods fall short of acceptable measures. None of the three assigns to a project purpose a proportional share of the savings resulting from a multiple purpose development. For the SCRB and alternative justifiable expenditure methods, a simple adjustment is proposed to produce the same result. Because of difficulty in defining reservoir use, no adjustment to that method will result in cost allocation equity. The proposed SCRB adjustment applies to the cost allocation procedure, producing a method which meets both efficiency and equity criteria. The adjustment assigns a credit to separable costs in the same ratio as justifiable costs for a project purpose, plus justifiable costs for all otherpurposes to the total project cost. The result is a tendency for savings assigned to each purpose to relate proportionatlly to savings from including each purpose in a project. (Coyle-Wisconsin)

W78-02186

6D. Water Demand

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT,
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 6B.
W78-01821

HYDROLOGIC RECONNAISSANCE EVALUATION OF THE FEDERAL CAPITAL TERRITORY AND SURROUNDING AREAS, NIGERIA,
Geological Survey, Menlo Park, CA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01859

MUNICIPAL, INDUSTRIAL, AND IRRIGATION WATER USE IN WASHINGTON, 1975,
Geological Survey, Tacoma, WA. Water Resources Div.
N. P. Dion, and W. E. Lum, II.
Open-file report 77-308, 1977. 34 p, 7 fig, 10 tab, 3 ref.

Descriptors: *Water supply, *Water consumption(Except consumptive use), *Surface waters, *Groundwater, *Washington, Municipal water, Industrial water, Irrigation water, Freshwater, Saline water, Water users, Water utilization, Evaluation.

An assessment of water use in 1975 in the 39 counties and 62 Water Resources Inventory Areas of Washington, indicated that 2.49 trillion gallons of water was used for municipal, industrial, and irrigation purposes. That amount represents a 10-percent increase over a similar water-use assessment in 1965, but a slight decrease from that of 1970. Total municipal water use, which includes municipally supplied industrial water, was 283 billion gallons. Industry used 442 billion gallons, of which 121 billion gallons was from municipal systems and 321 billion gallons was for self-supplied systems. Of the 604 billion gallons of water used for municipal and industrial supplies 145 billion gallons was ground water, 444 billion gallons was fresh surface water, and 14.8 billion gallons was saline surface water. A compilation of statewide industrial use as categorized by SIC (Lumber and Wood Products), SIC 28 (Chemicals and Allied Products), and SIC 20 (Food and Kindred Products)--accounted for about 65 percent of the total water used in industrial processes, In 1975, 5.79 million acre-feet of irrigation water (1,890 billion gallons) as applied to 1.52 million acres. This water was 95 percent surface water and 5 percent ground water. About 97 percent of the irrigation water was supplied in eastern Washington, to about 94 percent of the irrigated acreage in the State. (Woodard-USGS)
W78-01865

THE USE OF SITE SURVEYS IN THE COLLECTION OF RECREATION DATA, WITH PARTICULAR REFERENCE TO THE CONGLETON DISTRICT OF CHESHIRE,
Crewe and Alsager Coll., Alsager (England). Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-02012

6E. Water Law and Institutions

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01717

CONTROLLING INDUSTRIAL WATER POLLUTION--PROGRESS AND PROBLEMS (REPORT TO THE CONGRESS).
Comptroller General of the United States, Washington, DC.; and Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-01718

RESPONSIBILITIES, ACTIVITIES AND AUTHORIZATIONS OF FEDERAL AGENCIES HAVING BEARING ON U.S. MARINE FISHERIES,
Coopers and Lybrand, Washington, DC.
J. M. Kirk.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 250, Price codes: A20 in paper copy, A01 in microfiche. Prepared for Gulf States Marine Fisheries Commission, 531 St. Louis Street, New Orleans, La. 70130. September, 1975. 292 p, 97 ref, 4 append. GSMFC-002.

Descriptors: *Marine fisheries, *Commercial fishing, *Marine fish, *Fisheries, Fish, Federal government, Fishing, Administrative agencies, Legislation, Fish conservation, Fish populations, Fish harvest, Sport fish, Budgeting, Decision making, Regulation, Recreation, Fish management, *Marine resources, Department of Commerce, Department of the Interior, Fisheries policy, Fishing industry.

In response to a 1973 Congressional resolution calling for a national fisheries policy, the Gulf States Marine Fisheries Commission contracted for a survey which was to provide the basis for certain recommendations to be made to Congress. The result is an inventory of all federal agencies having responsibilities which relate in any way to commercial or recreational marine fisheries. Included are discussions of the activities of the agencies surveyed; pertinent budget information; and the goals outlined in the National Marine Fisheries Service National Plan for Marine Fisheries, correlated with the chronological list of legislative authorities published by the Fisheries Service. It appears that there are some areas of overlapping responsibility among various agencies, and also some areas in which responsibility is not clearly or fully delineated. Agency annual reports and budget requests are synthesized as well as other public documents; the report also includes an extensive bibliography. (Sloan-Florida)
W78-01719

STAFFING AND BUDGETARY GUIDELINES FOR STATE WATER POLLUTION CONTROL AGENCIES,
Public Administration Service, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-01720

LAWS AND REGULATIONS AFFECTING COAL WITH SUMMARIES OF FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS PERTAINING TO AIR AND WATER POLLUTION CONTROL, RECLAMATION, DILIGENCE AND HEALTH AND SAFETY.
Department of the Interior, Washington, DC. Office of Minerals Policy and Research Analysis.
For primary bibliographic entry see Field 5G.
W78-01721

GEOTHERMAL ENERGY AND THE LAW: THE FEDERAL LANDS MANAGEMENT PROGRAM DRAFT REPORT,
National Science Foundation, Washington, DC. Research Applied to National Needs.
C. D. Stone, and J. McNamara.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 592, Price codes: A13 in paper copy, A01 in microfiche. September 1975, 259 p, 5 tab.

Descriptors: *Regulation, *Public lands, *Geothermal studies, *Energy, Thermal conductivity, Planning, Federal government, Geophysics, Heat flow, Thermal properties, Heat, Water law, Legal aspects, Leases, Public rights, Regional development, Economics, Social aspects, Regional analysis, Land use, Electric power production, *Energy crisis, *Geothermal energy, *Alternate energy sources.

Although the federal government has the capacity to invoke a broad range of proprietary powers as 'owner' of fuel mineral resources, federal management has not been integrated into an overall national energy program. Geothermal energy, the energy latent in the heat of the earth's interior, is a potential source of electric power. However, its development is hampered by a number of factors including: (1) pre-leasing procedures, public vs. private assessment; (2) exploratory permits and related strategies; (3) the rate of geothermal leasing, past and future; (4) competitive and non-competitive bidding procedures; (5) lessee qualifications; (6) lands available for leasing; (7) non-compensatory lease terms; (8) ongoing leasehold and production requirements; (9) problems of secondary geothermal uses; and (10) water law conflicts. Confrontations are likely to arise between a geothermal developer and state water right holders, state engineers, and the federal government. A basic legal issue in geothermal development involves the extent of interconnection of geothermal fluid with the groundwater supply. Another issue hinges on the geothermal's place in a state water regulatory scheme. Resource ownership and federal water rights are additional potential areas for legal conflict. (Moorhouse-Florida)
W78-01724

POLLUTION OF NAVIGABLE WATERS OF THE DETROIT RIVER, LAKE ERIE AND THEIR TRIBUTARIES WITHIN THE STATE OF MICHIGAN.
Public Health Service, Rockville, MD.
For primary bibliographic entry see Field 5G.
W78-01725

PROCEEDINGS OF JOINT MEETING OF FEDERAL AND STATE GOVERNMENTS ON MISSISSIPPI RIVER TEMPERATURE STANDARDS (2ND SESSION) HELD AT ST. LOUIS, MISSOURI ON MARCH 3, 1971.
Environmental Protection Agency, Office of Water Quality. Washington, D. C.
For primary bibliographic entry see Field 5G.
W78-01726

WATER FOR FOOD AND FIBER PRODUCTION.
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-01727

WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
For primary bibliographic entry see Field 5G.
W78-01728

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
F. J. Trelease.
Land and Water Law Review, Vol. 12, No. 2, p. 385-429, 1977.

Descriptors: *Legislation, *Water law, *Water management(Applied), *Water rights, *Local governments, Water pollution control, Legal aspects, Riparian rights, Water allocation(Policy), Water quality control, Water control, Water conservation, Water consumption(Except consumptive use), Water supply development, Law enforcement, State governments, Environmetal control, Water utilization, *State policy, Licenses, Environmental policy, Property interests.

There are many problems faced by water lawyers in developing a water law system which will not only facilitate and achieve efficient allocation of resources and environmetal protection, but also promote attainment of social and national goals. The author limits this discussion to the law of water rights with emphasis on aiding a draftsman in developing a modern water law system which promotes the welfare of water users, accomplishes the state's social and economic objectives, coordinates private activities with state projects, protects the interests of the public, and integrates the activities of individual and corporate users into comprehensive state plans for water development and management. Included are suggestions to aid draftsmen in approaching the task of writing water rights laws, in analyzing the problems which must be solved, in choosing solutions to those problems and in drafting the laws themselves. A detailed discussion of the major features and central principles applicable to every water law makes up the bulk of the article. Features examined are the scope of the law, initiation of rights, preservation of existing uses and the nature of the water right. (Howard-Florida)
W78-01729

TROUBLE IN 'THE ESTUARIES' (TECHNOLOGICAL AND LEGAL PROBLEMS ASSOCIATED WITH CONTROLLING SURFACE WATER RUNOFF IN A COASTAL ZONE RESIDENTIAL DEVELOPMENT),
Spessard L. Holland Law Center, Gainesville, FL.
P. Baker.
Available from Eastern Water Law Center, University of Florida, Gainesville, 32611, $3.10. Spring, 1977, 62 p.

Descriptors: *Surface runoff, *Florida, *Coastal marshes, *Drainage effects, *Land development, Sedimentation, Pollution, Disposal, Natural flow doctrine, Drainage water, Comprehensive planning, Ecosystems, Stagnant water, Riparian rights, Urban runoff, Agricultural runoff, Groundwater recharge, Saltwater intrusion, Erosion, Flood plain insurance, Judicial decisions, Wetlands, Floods, Storm runoff, *Non-point sources(Pollution), *Land use controls, *Property interests, Federal Water Pollution Control Act Amendments of 1972, Coastal waters, Coastal zones, Marine ecosystem, State policy, National Environmental Policy Act, Environmental Protection Agency, National Pollution Discharge Elimination System.

Pollution and disposal are the two major problems associated with surface water run-off in a coastal zone development. Flooding, reduction of underground drinking water and damage to coastal ecosystems primarily caused by sedimentation, could result from a poor surface water run-off plan. Surface water run-off plan problems are complex, but not impossible to solve. At law, damages and injunctive relief are the traditional remedies in pollution and damage suits caused by surface water run-off. Florida courts have not formally adopted any specific rule in this area, but case law basically reflects the Natural Flow Doctrine tempered with the idea that reasonable use and modifications are permissible. Surface water run-off laws and regulations have been generally left to local and regional governments in Florida. Although some state statutes, the most prominent being the Florida Air and Water Pollution Control Act, attempt to regulate surface water run-off, local city and county ordinances provide most of such control. The future responsibility for maintenance and repair of an approved system is usually locally decided. (Easterbrook-Florida)
W78-01730

PUBLIC USE OF COASTAL BEACHES,
North Carolina Univ. at Chapel Hill. Center for Urban and Regional Studies.
D. W. Owens, and D. J. Brower.
Sea Grant Publication UNC-SG-76-08, Sea Grant College Program, North Carolina State University, Raleigh, September 1976, 335 p.

Descriptors: *Recreation facilities, *Public access, *Beaches, *Seashores, Recreation, Sands, Seashores, Shores, Natural resources, Riparian rights, Coasts, Boundaries(Property), Littoral, Easements, Zoning, Land resources, Water resources, Water utilization, Judicial decisions, Intertidal areas, Dune sands, Dunes, Public rights, Cities, *Public trust doctrine, Coastal waters, Property interests.

Although the public has property rights in coastal tidelands, private ownership and control of the dry sand and uplands threaten public enjoyment of beaches. Expanding public rights into dry sand areas and providing public passageways onto the beaches are two main aspects of the beach access problem. References to case law trace the public trust doctrine, its history and enforcement in wet sand areas. For dry sand and upland areas, the authors examine the judicial development of implied dedication as a basis for establishment of public beach ownership by use, as well as doctrines of prescriptive easement, customary rights, and implied reservation. Proposed and existing federal and state legislation regarding public rights are discussed including the Texas Open Beaches Bill. Additional public ownership, use, and access rights in the beach resource may be acquired either by purchase, sometimes prohibitively expensive, or through noncompensatory means such as zoning and subdivision ordinances. The authors also discuss the special problems relative to a dynamic shoreline and the issue of nonresident access to municipal beaches. An extensive bibliography of judicial decisions, books, governmental reports and periodical material is included. (Mulligan-Florida)
W78-01731

A RECALL FOR GREENWAYS,
H. Deardorff.
Parks and Recreation, Vol. 12, No. 2, p. 39a-40a, February 1977.

Descriptors: *Grassed waterways, *Land use, *Land development, *Water conservation, Land reclamation, Pollution control, Flood control, Planning, Landscaping, Land management, Environmental control, Water supply, Legislation, Public rights, Recreation, Land resources, Regional economics, Non-structural alternatives, Zoning, *Federal Water Pollution Control Act Amendments of 1972, *Open-space planning, Environmental policy, Administrative regulations, Real property law, Non-point sources(Pollution), Property.

New opportunities for greenway development are appearing with regard to water oriented land. The stereotype of a greenway as a wide, uninterrupted expanse of forest and meadow does not fit the context of existing waterfronts around the country where a wide range of landscape and land-use characteristics can be found. The water, under 201 and 208 water cleanup programs, is scheduled to be clean by 1983 thus providing water-oriented greenway opportunities. To realize the opportunities, it should be understood that one of the most significant values of a greenway is environmental protection. Water-oriented greenways can provide nonstructural controls to prevent flooding and direct storm drainage. Industries and wastewater treatment facilities need not be considered ugly intrusions on the waterfront but should be more carefully sited and designed so that public will know they exist. In planning a greenway, it must be realized that water is a shared resource and while more prohibitive stances are appropriate in undeveloped areas, replacing vital industrial uses with open space is senseless. Communities must acquire greenway water frontage now and plan for the future. (Maass-Florida)
W78-01732

LEGAL ASPECTS OF THERMAL DISCHARGES,
New York Power Authority, NY.
A. J. Martin.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 100, No. 7, p. 1059-69, July 1974. 34 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water temperature, *Water pollution, Water law, Legal aspects, Watercourses(Legal aspects), Temperature, Riparian rights, Prior appropriation, Rivers and Harbors Act, Water pollution sources, Pollution abatement, Environmental effects, Discharge(Water), Heated water, Cooling water, Fishkill, Aquiculture, Fish farming, Legislation, Regulation, Water quality standards, *Administrative regulations, *Environmental policy, *Federal Water Pollution Control Act Amendments of 1972, Environmental Protection Agency, Licenses, Citizen suits, Nuisance(Legal aspects).

Thermal pollution, defined as the effect on a water body from any heated effluent, may be remedied by private suits. The greatest weakness of private remedies is the requirement that the pollution have occurred before suit is commenced. Federal regulatory authority stems from several statutes. Structures for cool water intake or thermal discharge may come under the provisions of the 1899 Refuse Act authorizing the Corps of Engineers to issue permits for dredging and filling in navigable waters. The Atomic Energy Act, as interpreted in the light of the National Environmental Policy Act, compels the Atomic Energy Commission to consider environmental effects of nuclear power plants. Under the Federal Power Act, the Federal Power Commission may include thermal standards in licenses for hydro-electric plants. The Federal Water Pollution Control Act Amendments of 1972 specifically recognized thermal discharges as a major source of pollution, and provided for citizen suits. The author suggests that the proper statutory approach to regulation of thermal dicharges lies with flexible numerical criteria capable of modification on a case-by-case basis rather than the federal approach of strict and rigid criteria. (Jones-Florida)
W78-01733

HOW SHOULD CONGRESS AMEND PL 92-500,
Los Angeles County Sanitation Districts, CA.
J. D. Parkhurst.
Water and Sewage Works, Vol. 123, No. 12, p. cover, 4, 59, December 1976.

Descriptors: *Waste water(Pollution), *Water pollution control, *Federal Water Pollution Control Act, *Legislation, Water quality, Water quality control, Sewage treatment, Industrial wastes, Municipal wastes, Water treatment, Water pollution, Water pollution treatment, Water quality standards, Discharge(Water), Pre-treatment(Water), Toxins, Waste water treatment, Grants, Financing, Research and development, Construction, *Effluent guidelines, *Environmental policy, *Federal Water Pollution Control Act Amend-

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ments of 1972, *National Pollution Discharge Elimination System, *Environmental Protection Agency, Effluent limitations, Non-point sources(Pollution), Point sources(Pollution), Effluent charges, Pretreatment standards(Effluent).

Efforts to make Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, more functional have been stifled by the fact that it has been treated as a public works program. The Act is inflexible because of its detailed administrative requirements and time tables. In addition, the cost of implementing the Act was grossly underestimated. Limited available funds could be maximized by distributing them to the States on the basis of population and needs, allowing the States to set treatment priorities. Environmental Protection Agency requirements for secondary treatment should be deferred where plants using oxidation ponds or deep ocean discharges are operative. Some grants or additional funding should be utilized for research into water quality treatment rather than going entirely to construction of facilities. The provisions of the Act pertaining to user charges, toxic pollutants, and pretreatment standards should be revised to provide a needed flexibility. The Congressional attitude toward no revision of the Act should be relaxed in favor of well-considered changes which would enhance its ability to achieve its goals. (Jones-Florida)
W78-01736

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
John Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 6F.
W78-01737

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE, (MEETING 75-4, 1975).
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
Minutes of the 75-4 Meeting, December 9-10, Las Vegas, Nevada, 186 p.

Descriptors: *Colorado River Basin, *Governmental interrelations, *Southwest US, Administrative agencies, Federal government, Governments, State governments, Drainage programs, Institutions, Interstate, Irrigation programs, Planning, Regulation, California, Nevada, Arizona, Wyoming, Colorado, Stochastic processes, Utah, New Mexico, Water management(Applied), *Federal Water Pollution Control Act Amendments of 1972, Groundwater management, Environmental policy, Dam effects.

The Pacific Southwest Interagency Committee is composed of representatives of various federal and state agencies concerned with water and land use planning. The federal agencies include the Departments of Commerce, Army, and Transportation. The states involved are Arizona, California, Colorado, New Mexico, Utah and Wyoming. Organizationally the Committee is divided into geographical districts and technical subcommittees. The minutes of the Committee's last meeting of 1975 reflect discussion on environmental and recreational problems, vegetation management, and water management projects undertaken by subcommittees. Topics included efforts to designate certain rivers as part of the federal Wild and Scenic Rivers System; conversion of brush and range land to irrigated agricultural land; augmentation of the southern Nevada water supply; vegetative management in stripmined lands; and reports on numerous federal activities such as projects of the Water Resource Council, the Bureau of Reclamation, and the Corps of Engineers. Each state filed a report on its water projects and water resource development activities. (Sloan-Florida)
W78-01738

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CARACAS SESSION AND ITS AFTERMATH.
American Society of International Law, Washington, DC. International Law and Relations Subcommittee.
Case Western Reserve Journal of International Law, Vol 8, No 1, p 13-32, Winter 1976.

Descriptors: *International waters, *United Nations, *Conferences, *Mining, *Water resources development, Political aspects, Political constraints, Treaties, Continental shelf, Water pollution, Anadromous fish, United States, Legal aspects, Water rights, Water law, Economic impact, Economics, Water resources, Fishing, Jurisdiction, Foreign countries, International law, Coasts, *Third United Nations Law of the Sea Conference, *Economic resource zone, Archipelagos, Coastal waters, Marine environment, Marine resources, Seabed mining.

The Subcommittee on International Law and Relations met at the Caracas session of the Law of the Sea Conference held during the summer of 1974. The committee adopted procedural rules, set up committee structure, and allocated agenda items. During plenary sessions, the most significant change of position was the conditional acceptance of the 200-mile economic resource zone concept by the United Kingdom, the Soviet Union and the United States. However, major issues with respect to seabed mining remained unresolved. The three mining issues are: the question of which countries may exploit seabed resources; the degree of specificity of prospective mining codes; and the impact of seabed mining on the economies of participating nations. The conference accomplished little in bridging the large conceptual gap between developing and developed countries on almost all issues. Most observers agree that the current trend towards a nationally-oriented economic zone is shortsighted. They also note the possibility of a polarization of issues as the trend towards assertion of national jurisdiction over coastal resources is coupled with increasing voting power of developing countries in world organizations. The positions of the United States generally lacked support. Consequently, some suggest the United States act unilaterally to protect its interests. Recommendations for intersessional research are included. (Josepher-Florida)
W78-01740

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CURRENT STATUS AND THE 'INFORMAL NEGOTIATING TEXT'.
American Society of International Law, Washington, DC. International Law and Relations Subcommittee.
Case Western Reserve Journal of International Law, Vol 8, No 1, p 33-45, Winter 1976.

Descriptors: *International waters, *International law, *United Nations, *Conferences, *Coasts, Foreign countries, Treaties, Jurisdiction, Water resources development, Water rights, Legal aspects, Water law, Economic impact, Economics, Mining, Political aspects, Water resources, Political constraints, *The Third United Nations Law of the Sea Conference, Seabed mining.

Discussed here are salient data concerning the Geneva session of the Conference, organizational and procedural aspects of the session, and an analysis of the outcome. Approximately 140 states participated in the Conference which was held from March to May in 1975 to continue the work begun at the Caracas meeting during the summer of 1974. No treaties dealing with the law of the sea were adopted. However, the session did produce an 'Informal Single Negotiating Text' consisting of three parts, each drafted by one of the main committees. The first section deals with general principles, the seabed authority and its machinery, and financial issues. The second portion covers the exclusive economic zone, the territorial sea and contiguous zone and colonial domination. The third section deals with marine environment and the transfer of technology. The Informal Text is not binding and has no legal effect. However, it does provide a focal point for further sessions. The report recommended possible further intersessional research. (Josepher-Florida)
W78-01741

DEEP OCEAN MINING: BEGINNING OF A NEW ERA,
J. M. Murphy.
Case Western Reserve Journal of International Law, Vol 8, No 1, p 46-68, Winter 1976. 1 fig.

Descriptors: *Mining, *Oceans, *International waters, *International law, *Conferences, Water resources development, Economic impact, Political aspects, Legal aspects, United States, Water rights, Nickel, Copper, Cobalt, Manganese, Foreign waters, Economics, Mining engineering, Mineral industry, Deep water, Excavation, *Third United Nations Law of the Sea Conference, *Seabed mining, *Minerals, Manganese nodules.

The formation of an international seabed regime to deal with seabed minerals was the most contentious of the issues before the Third Law of the Sea Conference. The mining industry estimates that approximately three trillion dollars worth of nickel, cobalt, manganese and copper is located at depths of 12,000 feet below the surface of the world's oceans. The current dependence of the United States upon foreign sources of these minerals could be vastly reduced or virtually eliminated by 1990 if American companies would use their present expertise to mine ocean seabeds. However, private companies have withheld taking such action because of the uncertainty surrounding the seabed mining issue at the Conference. Although there is no existing international law restricting the freedom of the seas for seabed mining purposes, the current absence of political sponsorship and security of tenure is an unacceptable business risk. International and domestic laws affecting seabed mining are discussed chronologically. Citing the dismal failure of the Conference to develop a seabed regime, the author urges the United States to pass legislation enabling it to maintain an independently secure source of valuable minerals through mining of the seas. (Josepher-Florida)
W78-01742

CANADA AND THE UNITED STATES: DISPUTE SETTLEMENT AND THE INTERNATIONAL JOINT COMMISSION - CAN THIS EXPERIENCE BE APPLIED TO LAW OF THE SEA ISSUES.
M. Cohen.
Case Western Reserve Journal of International Law, Vol 8, No 1, p 69-83, Winter 1976. 2 tab.

Descriptors: *International Joint Commission, *Canada, *International Commissions, *Treaties, *Law of the Sea, Oceans, Fishing, Continental shelf, Conferences, Political constraints, Political aspects, Water resources development, Water rights, Mining, Water resources, Economic impact, Boundaries(Property).
Identifiers: *Boundary waters treaty.

The Third United Nations Conference on the Law of the Sea has an importance for Canada and the United States which is both bilateral and multilateral. Many of the oceanic issues being raised at the Conference affect these two countries in their capacities as neighbors. This article briefly describes the basis of Canadian-United States relations and the experience of the two countries under the Boundary Waters Treaty and with the International Joint Commission. The question is raised as to whether the concepts underlying the Treaty and the Commission can provide a model for the settlement of some pending Canadian-

United States oceanic disputes if the Conference produces a final binding agreement. The prime lesson from the International Joint Commission is that if facts cannot be commonly perceived and followed through to the same conclusions, disputes will fester, thriving on ambiguity and rhetoric. This lesson seems applicable to the unsettled law of the sea disputes which would be suitable subjects for common fact-finding on a permanent basis. A stabilizing influence in Canadian-United States relations would hopefully result. (Josepher-Florida)
W78-01743

THE POSITION OF THE AMERICAN BAR ASSOCIATION ON THE LAW OF THE SEA,
American Bar Association, Washington, DC. Natural Resources Law Section.
L. W. Finlay.
Case Western Reserve Journal of International Law, Vol 8, No 1, p 84-109, Winter, 1976.

Descriptors: *International waters, *International law, *Water resources development, *United Nations, *Treaties, Economic impact, Legal impact, Political constraints, Political aspects, Water rights, Mining, Resource development, Deep water, Coasts, Conferences, Legal aspects, Political aspects, Continental shelf, Law of the Sea.
Identifiers: *Third United Nations Law of the Sea Conference, *Territorial sea, Deep water ports, Territorial seas(Jurisdiction).

Substantive paragraphs are extracted here from the entire text of the American Bar Association (ABA) 1973 resolution regarding natural resources of the sea. The ABA's position is compared to that taken by the United Nations Committee of the World Peace Through Law Center. Among other things, the ABA's resolutions urge the following: (1) that the United States protect all seabed resources within its continental margin; (2) that any international seabed resource authority have regulatory and administrative powers only with no control over volume of production or pricing; (3) that the United States implement exploration and exploitation of seabed resources beyond its national jurisdiction; (4) that straits which have been historically open for international maritime traffic be protected international waters; and (5) that coastal states have the right to establish and control deep water ports on their continental margins adjacent to their territorial sea. The author contends that to be viable, any treaty evolving from the Third United Nations Conference on the Law of the Sea must gain broad acceptance from the community of nations. The need for a consensus of those nations whose existing rights under present norms of international law would be significantly impaired is also vital. (Josepher-Florida)
W78-01744

INTERNATIONAL ENVIRONMENTAL LAW, INTERNATIONAL CONVENTIONS CONCERNING OIL POLLUTION AT SEA,
Inter-Governmental Maritime Consultative Organization, London (England). Legal Div.
T. A. Mensah.
Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 110-130, Winter 1976.

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, *International waters, *International law, Accidents, Environmental effect, Environment, Transportation, Water pollution sources, Ships, Oil industry, Environmental control, Conferences, Water resources, Water quality, Pollution abatement, Oil wastes, Water pollution, Treaties, Political aspects, Oceans, Tankers, Supertankers, Vessels, Discharge(Oil), Territorial waters.

Hydrocarbon oil has recently emerged as one of the most notorious sources of marine pollution attracting the concern of national and international movements and organizations. The risk of pollution from accidents in the production and transportation of oil increases with the increasing world-wide use and development of oil. There is general agreement that the pollution problem can be effectively handled only if dealt with on an international basis. The international legal community has taken measures through international conventions to ensure effective protection of the seas from oil pollution. The conventions and their objectives are discussed, including: (1) the prevention and minimization of intentional oil discharges from ships; (2) the prevention of accidents which may result in the escape or discharge of oil; (3) the establishment of arrangements and procedures for dealing with pollution or the threat of pollution as a result of accidents; and (4) the establishment of procedures for assigning liability for damages as a result of pollution. (Josepher-Florida)
W78-01745

IMCO: AN ENVIRONMENTALIST'S PERSPECTIVE,
Center for Law and Social Policy, Washington, DC.
E. V. C. Greenberg.
Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 131-48, Winter 1976.

Descriptors: *Oil pollution, *International commissions, *Water pollution control, *International law, International waters, United Nations, Oceans, Oil spills, Accidents, Water pollution sources, Water pollution effects, Treaties, Ships, Oil industry, Oil wastes, Water pollution, Political aspects, Environmental effects, Environment, Environmental control, *Intergovernmental Maritime Consultative Organization, Supertankers, Tankers, Vessels, Discharge(Oil).

The frequency of oil tanker accidents has increased as has the growth of the total amount of oil discharged into the oceans from normal tanker operations. The troublesome environmental problems resulting from the growth of oil traffic must be solved with international solutions. Presently, the Intergovernmental Maritime Consultative Organization (IMCO) is the agency charged with providing such solutions. This paper explores the structure, history, and current activities of IMCO in an effort to evaluate whether IMCO is capable of providing these solutions. IMCO, created at the 1958 United Nations Maritime Conference held in Geneva, to deal with maritime affairs, has been the dominant international agency in the area of vessel source pollution. It has, over the years, developed guidelines and recommendations relating to marine pollution from ships. However, environmentalists criticize IMCO charging that it is dominated by shipping interests. Further, until spring of 1975, none of its agreements negotiated since 1966 had come into force. The author concludes that the nations of the world rather than IMCO are to blame for many of our present marine pollution problems since IMCO is only as effective as its member nations allow. (Josepher-Florida)
W78-01746

TERRITORIAL WATERS-OWNERSHIP AND CONTROL, THE UNITED STATES HAS SOVEREIGN RIGHTS TO THE SEABED BENEATH THE ATLANTIC OCEAN LYING BEYOND THE 3-MILE TERRITORIAL LIMIT TO THE EXCLUSION OF THE ATLANTIC COASTAL STATES (COMMENT ON UNITED STATES V. MAINE).
Case Western Reserve Journal of International Law, Vol. 8, No. 1, p. 240-56, Winter 1976.

Descriptors: *Atlantic Ocean, *Ownership of beds, *Boundary disputes, *State jurisdiction, *Continental shelf, Water resources development, Maine, Beds, Coasts, Boundaries(Property), United States, State governments, Exploration, Exploitation, Environmental effects, Water resources, Judicial decisions, Legal aspects, Federal jurisdiction, *Coastal states, *Territorial limits, Territorial waters, Territorial seas(Jurisdiction).

In a 1975 case decided by United States Supreme Court, the United States filed a complaint against the Atlantic Coastal States from Maine to Florida. The United States claimed exclusive sovereign rights in submerged lands beneath the Atlantic Ocean located beyond the three miles seaward from the outer limits of each respective state's coastal waters and the outer edge of the continental shelf. The United States also sought declaratory relief to obtain such rights for the purposes of exploration and exploitation of the seabed. With two exceptions, defendant states claimed that they held title to the disputed areas by virtue of succession to the title formerly held by England, never having divested themselves of this title when joining the Union. A Special Master found in favor of the United States and the Supreme Court affirmed, reasoning that title to the seabed became vested in the federal government when the defendant states were admitted to the Union. The possible effect of this decision on the law of other nations, on the petroleum and fishing industries, and on environmental protection policy is discussed. This decision leaves undecided the issue of whether states could have rights beyond the three mile limit if a twelve-mile territorial limit is adopted. (Josepher-Florida)
W78-01747

SHORELINE EROSION ALONG LAKE ONTARIO (HEARINGS ON S. 3548, A BILL TO PROTECT THE SHORELINE OF LAKE ONTARIO).
Hearings--Subcomm. on Water Resources, Comm. on Public Works, U.S. Senate, June 15, 1976, Serial 94-H50. 154 p.

Descriptors: *Lake Ontario, *Erosion, *Shores, *Shore protection, Great Lakes, St. Lawrence River, St. Lawrence Seaway, Real property, Property values, Water levels, Legislation, Riparian land, Legal aspects, Canada, Treaties, International law, Land tenure, International Joint Commission, *Congressional hearings, *Corps of Engineers, *Dam effects, Property interests, Private interest groups, Navigability.

Residents along Lake Ontario have reported that severe shoreline erosion was continuing unabated due to artificial maintenance of the lake at abnormally high levels. Senate Bill S. 3548 was the focal point of a hearing to investigate the problem. The bill directs the Army Corps of Engineers to present a plan for shoreline protection to Congress. Lakeshore residents testified to the extent of damage done to their property as a result of the high levels of the lake, which they attributed to regulation by the International Joint Commission (IJC). Their testimony indicated a feeling that the interests of the competing users, the shipping and power industries, were being preferred over their poperty interests. They requested an overall decrease in the level of regulation. Testimony from the Chairman of the United States section of the IJC, a technical advisor, and a manager of a power authority attributed the higher lake levels to greater snowmelt runoff and rainfall; their testimony stated that under existing structural and regulating constraints, everything possible had been done. Statements, communications, and photographs are appended to the hearing transcript. (Jones-Florida)
W78-01748

LAW OF THE SEA (NEW YORK SESSION OF THE THIRD U.N. LAW OF THE SEA CONFERENCE).
Hearings--Subcomm. on Oceans and International Environment--Comm. on Foreign Relations, U.S. Senate, May 20, 1976, 40 p.

Descriptors: *Law of the Sea, *Treaties, *Water pollution control, *Mining, *Ships, Foreign waters, International law, Mineral industry, Marine geology, Continental shelf, Negotations, Usufructuary right, Federal jurisdiction, Water rights, Governments, Oceans, Water law, Legal aspects, *Congressional hearings, *Law of the Sea Conference, *Minerals, *Seabed mining, Coastal waters, Coastal zones, Territorial seas(Jurisdiction), Territorial waters, Vessels.

The head of the United States delegation to the Law of the Sea Conference reported on the progress of the conference negotiations. The Committee I negotiations dealt with the exploitation of the deep seabed; Committee II delimited the zones of control into a 12-mile territorial sea and a 200-mile economic zone; and Committee III dealt with the area of pollution and scientific research. A fourth section of the treaty provided for compulsory and binding settlement of disputes. Other topics upon which the delegate was questioned related to the effectiveness of the treaty's pollution control provisions; the reason for denying environmental groups access to a seabed tribunal; and whether the Senate's power to ratify treaties would be affected by provisional application of the treaty in selected areas. Additional problem areas discussed include: creation of a deep seabed tribunal; the extent of the seabed authority to regulate pollution; access of landlocked nations to the ocean resources; and environmental regulations for vessels passing through territorial seas. An appendix to the hearing record contains the delegate's responses to additional questions for the record. (Jones-Florida)
W78-01749

STATE V. SAN LUIS OBISPO SPORTSMAN'S ASSOCIATION (RIGHT TO FISH ON STATE-OWNED LANDS).
138 Cal. Rptr. 332-38 (App. 1977).

Descriptors: *Fishing, *Reservoirs, *California, *Public rights, *Public lands, Reservoir operation, Reservoir fisheries, Contracts, Operations, Recreation, Regulation, Water supply, Fish, Fisheries, Sport fishing, Legal aspects, Water quality, Water quality control, Constitutional law, Trespass, Water pollution, Domestic water, *Water rights(Non-riparian).

The plaintiffs, city and state, sought to enjoin fisherman from trespassing at a reservoir claiming danger of contamination of the reservoir water. The defendant sportsmen's association cross-claimed for an order compelling the city and state to provide fishing in the reservoir with appropriate regulations, control and management. The plaintiffs then sought declatory relief that entry into the reservoir for fishing purposes was without legal right so long as the reservoir was not opened to public fishing. The Second District Court of Appeal of California affirmed the lower court which held the plaintiffs responsible for providing adequate fishing facilities and maintaining the quality of the reservoir based upon a contract between the parties. This included an implicit agreement by the plaintiffs to finance their fair share of the costs. However, the court noted that under the California Contitution not all state-owned land is 'public lands' on which a right to fish exists. Where the property had been private property before its acquisition by the state, the presence of a non-navigable stream or creek did not give any person a right to fish therein. (Kastner-Florida)
W78-01750

CHARLESTONE STONE PRODUCTS CO., INC. V. ANDRUS (WATER DEEMED A MINERAL WITHIN MEANING OF PLACER MINING LAWS).
553 F.2d 1209-16 (9th Cir. 1977).

Descriptors: *Placer mining, *Economic justification, *Water wells, *Water utilization, Nevada, Gravels, Sands, Mining, Productivity, Profit, Construction materials, Mineral industry, Groundwater, Water law, Water rights, Legislation, Hydraulic mining water, Legal review, Judicial decisions, Administrative decisions, *Minerals.

Defendant Secretary of the Interior challenged the validity of placer sand and gravel mining locations claimed by plaintiff stone company. The Ninth Circuit Court of Appeals affirmed the district court decision finding sixteen valid claims and granting access to a seventeenth for water utilization purposes. The court upheld the plantiff's right to appropriate and utilize as a mineral the water within any claims which met a two prong test of value and success in development. The court noted that the term 'mineral' had been held to embrace water, particularly subterranean water, irrespective of the character and quantity of salts and gases which may be in solution. Acts of Congress which allowed a prospector to enter and patent placer claims for valuable minerals did not expressly exclude water and the court declined to find an implication that Congress intended to reserve water from those minerals allowed to be located and recovered. The court was satisfied that plaintiff had shown a profitable market for water recovered upon the seventeenth claim and held that its claim for the extraction of that water is valid. (Mulligan-Florida)
W78-01751

DREDGING OPERATIONS.
Nev. Rev. Stat. sec. 503.425 (1975).

Descriptors: *Nevada, *Rivers, *Dredging, *Permits, Administration, Legal aspects, Fish conservation, Control, State jurisdiction, Administrative agencies, Legislation, Mechanical equipment, Environmental control, Regulation, Projects, Lakes, Protection, Bodies of water, Streams, *Licenses, Administrative regulations, Environmental policy, State policy.

Permits are required before any person may use vacuum or suction dredge equipment in any river, stream, or lake of Nevada. Applications for a permit shall specify the location and the type and size of the equipment to be used. If the dredging operations will not be deleterious to fish, a permit shall be issued. It is unlawful to conduct dredging operations without a permit, to conduct such operation outside the area designated on the permit, or to utilize equipment other than that specified in the permit. (Cocheu-Florida)
W78-01752

PROTECTION OF LAKE TAHOE AND ITS WATERSHED.
Nev. Rev. Stat. secs 445.080 thru 445.120 (1975).

Descriptors: *Nevada, *Permits, *Water pollution control, Construction, Watershed management, Sewage disposal, Water management(Applied), Regulation, Dredging, Public health, Shore protection, Control, Administrative agencies, Water quality control, Penalties(Legal), Lake basins, Watersheds(Basins), Legislation, Law enforcement, Water law, Effluents, *Administrative regulations, Environmental policy, Fill permits, Hazardous substances(Pollution), Liability, Licenses, State policy.

Written permission must be obtained from the bureau of environmental health before any person, firm, association or corporation can construct any dwelling or building for human occupancy or commercial use, any drinking water procurement or distribution system, or any sewage collection or disposal system in the Lake Tahoe watershed. Permission is also required for any construction in Lake Tahoe, any alteration of the shoreline, or any dredge and fill operation. No permits will be issued if a health hazard or threat to water quality would result. Discharge of wastes into the lake or its watershed is prohibited except in certain instances which require a discharge permit. The bureau of environmental health is authorized to enforce reasonable regulations and to inspect any property in the watershed area to determine compliance with the regulations. Anyone violating any provisions of this act or any regulations promulgated to enforce it shall be quilty of a misdemeanor. (Cocheu-Florida)
W78-01753

ADJUDICATION OF VESTED WATER RIGHTS.
Nev. Rev. Stat. sec 533.090 thru 533.320 (1975).

Descriptors: *Nevada, *Legislation, *Adjudication procedure, *Water rights, Decision making, Legal aspects, Water law, Administrative agencies, Preferences(Water rights), Water allocation(Policy), Relative rights, Remedies, Prior appropriation, Priorities, Flow, Water distribution(Applied), Stream, Judicial decisions, Water policy, *Administrative regulations, Property interests, State policy.

The state of Nevada has enacted legislation relating to the adjudication of water rights. The state engineer makes determinations of relative rights of claimants to water of any stream system. He is required to investigate the flow of the stream and to gather other data needed for determining the water rights. After a hearing, the state engineer enters an order of determination which is filed with the evidence and transcript of testimony with the clerk of the district court. This order is equivalent to a complaint in a civil action and a hearing date is set. After hearings, the court enters a final decree affirming or modifying the order of the state engineer. An appeal may be taken from this decree within three years. Upon final determination, the state engineer issues certificates of relative rights. Guidelines are provided for administration of the stream system including: (1) appointment of commissioners; (2) supervision of water distribution and related funds; (3) establishment of state water districts; and (4) distribution of water rights not adjudicated in the above manner. Guidelines are established for the state engineer's budget for stream system or water district expenses. (Mulligan-Florida)
W78-01754

DAMS AND OTHER OBSTRUCTIONS.
Nev. Rev. Stat. secs 535.010 thru 535.120 (1975).

Descriptors: *Nevada, *Legislation, *Dam construction, *Dams, *Regulation, Barriers, Diversion, Dam design, Diversion dams, Bypasses, Dikes, Electric power, Fish barriers, Fish passages, Flood control, Flow control, Reservoirs, River regulation, Water control, Water storage, Water supply, Beavers, Obstruction to flow, *Dam effects.

Dam construction in Nevada requires a permit to appropriate water as well approval by the state engineer of the proposed structural plans. Copies of applications for the construction of dams are filed with the state board of fish and game commissioners. In the construction, alteration, or enlargement of a dam the dam owner must provide for fishways over or around dams and for protection of fish in streams. The state engineer shall make safety inspections of all dams. He may also order removal of any dam, diversion works or obstruction not legally established. Where beaver dams on privately-owned lands interfere with the lawful distribution of water, the state engineer may, upon receiving complaint, serve notice of the planned removal of the beaver and may remove the dam. Construction of a dam on any river within two miles of an incorporated city requires construction of a weir large enough to permit free passage of water not used for irrigation purposes. It is unlawful for an owner of any sawmill, slaughterhouse, brewery, or tannery to obstruct the natural flow of

water. Penalties for removal or destruction of a dam or bridge are set forth. (Mulligan-Florida)
W78-01755

DITCHES, CANALS, FLUMES AND OTHER CONDUITS.
Nev. Rev. Stat. secs 536.010 thru 536.120 (1975).

Descriptors: *Nevada, *Legislation, *Conduits, *Ditches, *Regulation, Canals, Canal construction, Canal design, Conveyance structures, Aqueducts, Civil engineering, Flumes, Gates, Flood control, Sluices, Water conveyance, Irrigation ditches, Bypasses, Water management(Applied), Diversion structures, Right-of-way, Damages.

The state of Nevada has enacted legislation governing ditches, canals, flumes and other conduits. Owners of ditches or canals must maintain a substantial headgate near the point of water diversion as well as any measuring devices required by the state engineer. Refusal to comply with these regulations may result in the state engineer's closing the ditch, opening the reservoir sluice gates or installing the required devices at the owner's expense. Where ditches are jointly-owned, responsibility for maintenance work shall be divided proportionately. Guidelines are offered for recovery of the reasonable expense of such work from an owner in default of his responsibility. Requirements for construction of ditches or flumes, including certificate records, examination and survey right of ways, and appraisals of private lands to be used for that purpose, are given. The owner of a ditch or flume shall have the undisturbed right and privilege of water flowing through it, to the extent it does not interfere with any prior or existing claim or right. Penalties for unlawful injury to or destruction of any canal, flume, aqueduct, reservoir, ditch or conduit are set forth. (Mulligan-Florida)
W78-01756

NAVIGABLE WATERS.
Nev. Rev. Stat. secs 537.010 thru 537.030 (1975).

Descriptors: *Nevada, *Navigable rivers, *Ownership of beds, *High water mark, *Navigable waters, Legislation, Governments, Legal aspects, State governments, Colorado River, Banks, Lakes, Boundaries(Property), Streambeds, Bodies of water, River beds, Water law, Rivers, Land tenure, *Navigability, *Property interests, Property, State policy.

All of the Colorado River within Nevada is considered a navigable stream for the purposes of fixing ownership of its banks and beds. All of the Virgin River transversing Nevada and its sources confluent above St. Thomas is a navigable stream for purposes of fixing ownership to its banks and beds. Title to lands below the high water mark of both rivers is held by the state. The Winnemucca Lake located in Nevada is a navigable body of water, and title to its bed is held by the state. (Cocheu-Florida)
W78-01757

STATE OF ALABAMA EX REL. BAXLEY V. ENVIRONMENTAL PROTECTION AGENCY (STANDARDS GOVERNING ISSUANCE OF NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
557 F.2d 1101-14 (5th Cir. 1977).

Descriptors: *Standards, *Federal Water Pollution Control Act, *Waste water disposal, *Industrial wastes, *Permits, Alabama, Discharge(Water), Iron, Steel, Water pollution, Pollutants, Water quality control, Administrative decisions, Water pollution sources, Water quality, Waste treatment, Treatment, Legal review, Water pollution treatment, Water quality standards, Regulation, *Federal Water Pollution Control Act Amendments of 1972, *Environmental Protection Agency, *National Pollution Discharge Elimination System.

Petitions were filed for review of administrative permits and orders issued by the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act (FWPCA). The EPA proposed to issue a National Polutant Discharge Elimination System (NPDES) permit to a pipe and foundry company. The petitioners contended the proposed permit was not consistent with the requirements of the FWPCA Amendments of 1972. The EPA argued that the appropriate 'best practicable technology' (BPT) limitations to be applied in an NPDES permit are those in effect at the time of the initial permit issuance. The Fifth Circuit Court of Appeals agreed and further held that it was appropriate for the EPA to rely pricipally upon its own 'personalized' BPT, as established in a consent decree resolving suit brought by the agency against the applicant for the permit. The court noted that the permit was issued in full compliance with the public participation requirement. The court also held that, in the absence of superseding federal standard lawfully issured by the EPA, the state water quality standard of Fish and Wildlife as a Goal, was the applicable standard until altered by the state itself. (Beamer-Florida)
W78-01758

EISEMAN V. ANDRUS (POWER OF PARK SERVICE TO ALLOCATE USER DAYS ON COLORADO RIVER).
433 F. Supp. 1103-07 (D. Ariz. 1977).

Descriptors: *Colorado River, *Permits, *National parks, *Administrative decisions, *Recreation demand, Regulation, Federal jurisdiction, Arizona, Environment, Water law, Constitutional law, Recreation facilities, Safety, Ecology, History, Planning, Recreation, Rivers, Management, Administrative agencies, Public access, *National Park Service, *Administrative regulations.

Because of the ecological threat to the Colorado River due to intensified use, the defendant National Park Service resticted the use through a plan based on the historic use of the river. The plaintiffs, who were denied permits to run the river privately instead of through the Park concessionaire, challenged the allocation of permits between commercial and non-commercial users. The plaintiffs contended that allocation of user days was rule-making and had been done without complying with the allocation of user days was rule-making and had been done without complying with the Administrative Procedure Act. The United States District Court in Arizona upheld the defendant's interim management plan saying that historical river use was a rational basis for allocation of river use. The court found that the government has a legitimate objective in providing for the greatest possible public enjoyment of the river experience subject to ecological, environmental and public safety limitations. The court also denied the plaintiffs' equal protection argument saying that the dangers in the river run made the commercial/non-commercial distinction necessary. (McPherson-Florida)
W78-01759

BUFFALO RIVER CONSERVATION AND RECREATION COUNCIL V. NATIONAL PARK SERVICE (PRESCRIPTIVE EASEMENT OVER NON-NAVIGABLE RIVER).
558 F.2d 1342-45 (8th Cir. 1977).

Descriptors: *National parks, *Non-navigable waters, *Prescriptive rights, *Land tenure, Arkansas, Legislation, Public rights, Public lands, Parks, Recreation facilities, Bodies of water, Riparian rights, Easements, Public access, River beds, Streambeds, Rivers, Right-of-way, Legal aspects, Water law, Boundaries(Property).

Identifiers: *National Park Service, Injunctive relief, Environmental impact statement, Property interests, Navigation obstructions.

Plaintiff property owners' organization brought an action against the National Park Service and park officials challenging the constitutionality of a statute establishing a national park. The property owners owned land within the park boundaries that had yet to be acquired because of lack of funds. They contended that the district court had erred in holding that the public had acquired a prescriptive right to float down the river and that therefore the property owners could not obstruct the river. The Eighth Circuit Court of Appeals said that the evidence sustained the finding that the public's usage of the non-navigable river and its bed had been open an adverse for more than seven years. The court therefore held that, under Arkansas law, a prescriptive right was obtained by the public to travel over the non-navigable stream and its bed. The court felt that the cases dealing with prescriptive rights-of-way over land were applicable by analogy to rights-of-way over non-navigable streams and their beds. (Beamer-Florida)
W78-01760

ENVIRONMENTAL DEFENSE FUND V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENTS AS A BASIS FOR CONGRESSIONAL DECISIONS).
421 F. Supp. 1083-89 (E.D. Ark. 1976).

Descriptors: *Arkansas, *Federal Project Policy, *Environmental effects, *Watercourses(Legal), Drainage programs, Environmental engineering, Mallard duck, Backwater, Federal government, Dredging, Environment, Environmental control, Wildlife management, Legal review, Groundwater, Downstream, Projects, Sedimentation, Water control, Flooding.
Identifiers: *Environmental Impact Statement, *National Environmental Policy Act, *Corps of Engineers, *Injunctive relief, Flyways, Environmental policy, Mississippi flyway.

By the Flood Control Act of 1950, Congress authorized construction of the Cache River-Bayou DeView Channelization Project to relieve backwater flooding. The Army Corps of Engineers filed a final environmental impact statement (EIS) as required by the National Environmental Policy Act of 1969 (NEPA). A year later, a draft environmental statement was submitted which discussed a plan to mitigate wildlife losses. Plaintiff environmental group successfully enjoined construction because of the inadequacy of the EIS. After filing a new revised final EIS, the Secretary of the Army moved to dissolve the injunction. The United States District Court for the Eastern District of Arkansas held that the final EIS was adequate, even though it did not discuss a plan to mitigate wildlife losses and failed to adequately discuss cumulative effects of the project on mallard duck populations in the Mississippi flyway, on groundwater, and on downstream sedimentation and flooding. The court stated that NEPA does not require delaying the publication of an EIS to incorporate contemporaneous events which could not have been foreseen. In addition, an EIS does not have to be perfect to form a sufficient basis for executive or Congressional decision. (Denker-Florida)
W78-01761

LEDFORD V. UNITED STATES (GOVERNMENTAL IMMUNITY TO NEGLIGENCE ACTIONS FOR RECOVERY OF DAMAGES SUSTAINED BY FLOODING).
429 F. Supp. 204-06 (W.D. Okla. 1977).

Descriptors: *Flood damage, *Floods, *Federal government, *Dams, Damages, Legal aspects, Water law, Reservoir construction, Reservoirs, Flood control, Reservoir leakage, Accidents, Negligence, Field crops, Dam construction, Damsites, Crops, Compensation.

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Identifiers: *Dam effects, *Immunity(Legal aspects), *Liability, Property, Property interests, Federal Torts Claims Act, Immunity Act.

Plaintiff, crop owners, sought compensation for damages to their crops allegedly resulting from defendant United States' negligence in failing to take precautions against flooding in the construction work related to Waurika Dam and Reservoir Project. The defendant moved for dismissal contending that the complaint dealt with a discretionary function, liability for which is precluded by the Federal Tort Claims Act. The defendant further contended that liability was precluded by the Immunity Act which provides that the United States cannot be held liable for any form of flood damage. The plaintiff contended that the omissions which resulted in the flooding were not discretionary in nature and therefore not precluded by the Federal Torts Claim Act, and that the flood in question was excepted from the Immunity Act. The United States District Court for the Western District of Oklahoma dismissed the complaint holding that there are no exceptions to the Immunity Act. The court therefore found it unnecessary to rule on whether the omission was a discretionary function since liability would be denied by the Immunity Act. (Brightman-Florida)
W78-01762

SHELL OIL COMPANY V. TRAIN (ADMINISTRATIVE RULINGS ON EFFLUENT LIMITATIONS CHALLENGEABLE ONLY IN FEDERAL CIRCUIT COURTS).
415 F.Supp. 70-78 (N.D. Cal. 1976).

Descriptors: *Jurisdiction, *California, *Effluents, *Oil industry, *Federal Water Pollution Control Act, Judicial decisions, Legal aspects, Legal review, State governments, Federal government, Administrative agencies, Governmental interrelations, Permits, Control, Legislation, Regulation, Water pollution sources, Discharge(Water), Industrial wastes, Water pollution, Liquid wastes, Oil wastes, *Environmental Protection Agency, *Federal Water Pollution Control Act Amendments of 1972, Effluent guidelines, Effluent limitations.

Plaintiff oil company brought suit in the United States District Court against the Environmental Protection Agency (EPA) challenging regulations governing the petroleum industry and the denial by the state of a variance from specific effluent regulations governing plaintiff's refinery. Defendant EPA moved to dismiss for lack of jurisdiction. The District Court was forced to interpret Section 509 of the Federal Water Pollution Control Act Amendments of 1972 in order to resolve the jurisdictional problem. If the source of the EPA's effluent limitation authority derived from Section 301, exclusive jurisdiction would lie in the Courts of Appeals. If derived from Section 304, jurisdiction would lie in the District Courts under the Administrative Procedure Act. The court noted that the majority position among the Circuit Courts of Appeals found the EPA's authority under Section 301. The court then dismissed plaintiff's action as it found itself without jurisdiction to review the administrative determinations challenged in plaintiff's complaint. The court also refused to find federal action sufficient to invoke federal jurisdiction in the EPA's failure to veto the state's variance denial. (Moorhouse-Florida)
W78-01763

LAND USE CONTROLS AND WATER QUALITY IN THE ESTUARINE ZONE,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5G.
W78-01811

STRUCTURING THE LEGAL REGULATION OF ESTUARIES,
Natural Resources Defense Council, New York.
For primary bibliographic entry see Field 5G.
W78-01812

ESTUARINE MANAGEMENT--THE INTERGOVERNMENTAL DIMENSION,
J. J. Bosley.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL., on Feb 11-13, 1975. EPA Report No. 440/1-77-007B, Mar 1977. Vol 2, p 629-635, 16 footnotes.

Descriptors: *Estuarine environment, *Legal aspects, *Resources development, *Governmental interrelations, Pollution abatement, Management, Water pollution control, *Outer Continental Shelf.

This paper provides a synoptic overview of the principal existing and pending federal laws and policies affecting the management of the nation's estuaries and estuarine zone. Specific attention is given to the influence these laws and policies have on the active management of such resources at the state, regional, and local levels. Using this analysis, the adequacy of extant federal policies to achieve established national goals and objectives on the preservation and conservation of estuarine resources is assessed. Finally, from this analysis current issues are identified, and proposed recommendations are made for federal policies to more adequately provide an institutional and management framework to protect these vital resources. (Sinha-OEIS)
W78-01813

BASIC FACTORS OF POPULATION DISTRIBUTION AFFECTING DEMAND FOR WATER RESOURCES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5G.
W78-01814

ECONOMIC ANALYSIS IN THE EVALUATION AND MANAGEMENT OF ESTUARIES,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5G.
W78-01815

THE IMPORTANCE OF WATER SUPPLY TO INDIAN ECONOMIC DEVELOPMENT,
Dornbusch (David M.) and Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 6B.
W78-01821

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
G. C. Taylor, Jr.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Professional Paper 911, 1976. 146 p, 57 fig, 6 tab.

Descriptors: *Reviews, *Programs, *Water resources, *Foreign countries, *Federal Government, United Nations, Inter-agency cooperation, International commissions, Projects, Publications, Hydrologic data, Surface waters, Groundwater, Available water, Water quality, Water resources development, Training, Costs, *U.S. Geological Survey, *International activities, *Developing countries.

The review describes the history of the U.S. Geological Survey's (USGS) activities in international water-resources investigations and institutional development as well as exchange in scientific and applied hydrology during 1940-70. The bulk of these activities has been carried out under the auspices of the U.S. Department of State, U.S. Agency for International Development and its predecessors, the United Nations and its specialized agencies, and the regional intergovernmental agencies. The central objectives of the USGS' international water-resources activities have been to strengthen the administrative, staff, and operational functions of counterpart governmental hydrological and water-resources agencies; to improve the skills and capabilities of host-country scientific, engineering, and technical personnel; to exchange research specialists and publications in the sharing of advances in hydrological knowledge and methodology; and to participate in mutually beneficial international organizations, symposia, conferences, seminars, and special programs dedicated to various aspects of scientific and applied hydrology. Between 1940 and 1970, USGS hydrogeologists, water chemists, engineers, and hydrologists completed 340 short- and long-term project-oriented international assignments in some 80 host countries. During the same time more than 428 water scientists, engineers, and technicians from 60 countries have received academic and in-service training through USGS water-resources facilities in the United States. Also in this period some 336 reports of a technical and scientific nature have resulted from water-resources projects in the U.S bilateral program. (Woodard-USGS)
W78-01866

JOINT USE OF INTERNATIONAL WATER RESOURCES,
Mahart, Budapest (Hungary).
I. Kovacs, and L. David.
AMBIO, Vol. 6, No. 1, p. 87-90, 1977. 2 fig, 4 ref.

Descriptors: *International waters, *Riparian waters, *Planning, *River basin development, Riparian rights, Water resources, Water utilization, Regulation, Governmental interrelations.
Identifiers: Danube River, Tisza River.

International rivers, natural watercourses which pass through two or more states or forms a border between states, require long-term planning based on a gradual approach, more so than for national basins. The need for international cooperation arises first on separate activities, such as navigation, flood control, water transfer and storage, and water quality protection. Data collection and water demand forecasting come at this stage. Construction of joint projects and coorination of national water management plans are later developments. One method of implementing the gradual approach is for riparian countries to prepare plans for their own part of the basin, and to coordinate the plans at a later stage. A second method is for an international planning team to prepare the long-term plan for the basin. The UN is currently considering the Helsinki Rules of 1966 as a basis for formal codification of international river utilizaton regulatons. The Helsinki Rules prohibit polluting the river or unilateral use which interferes with the rights of neighboring states, and require flood control measures. Traditionally, states are sovereign in the part of the river in their territory, the freedom of merchant shipping is guaranteed during peacetime, navigation is normally free of charge, and trade between two ports of a given state is the right of the state in question. The Danube and Tisza river basins are offered as illustrations of these principles. (Lynch-Wisconsin)
W78-02010

OIL SPILLS AND SPILLS OF HAZARDOUS SUBSTANCES,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations; and Environmental Protection Agency, Washington, DC. Oil and Special Materials Control Div.
For primary bibliographic entry see Field 5G.
W78-02095

WATER QUALITY MANAGEMENT FOR METROPOLITAN KANSAS CITY,
Black and Veatch, Kansas City, MO.
For primary bibliographic entry see Field 5G.
W78-02096

WATER USES AND MISUSES: A WORLD VIEW,
Resources for the Future, Inc., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-02097

THE LAKE CHELAN CASE--ANOTHER VIEW,
Washington State Bar Association, Seattle.
E. A. Rauscher.
Washington Law Review, Vol. 45, No. 2, p 523-33, April 1970.

Descriptors: *Washington, *Riparian rights, *Lake shores, *Land tenure, *Land development, Landfills, Boundaries(Property), Judicial decisions, Banks, Shores, Navigation, Recreation, Water law, Recreation facilities, Legal aspects, Water resources development, Water rights, Public rights, Navigable waters, Prescriptive rights, Riparian land, Water utilization, *Submerged lands, Navigability, Property, Property interests, Real property law, State policy, Land use controls.

One interpretation of the Washington Supreme Court decision in Wilbour v. Gallagher, ordering the removal of landfill as an obstruction to public navigation rights, is that the rule extends beyond the artificially fluctuating levels of Lake Chelan to all tidelands and shorelands are not precluded from development by that decision. The author feels that the fact situation of the Wilbour case is unique and limited. Private ownership of such lands in Washington is historically and legally well established, and has never been in conflict with the public's navigation rights. Public and private rights are delineated by the inner harbor line, the line of extremely low tide, or the line of navigability. The author asserts that it is too late for the state to prevent developers from filling previously sold lands by extending public navigation rights. He concludes that doctrines such as eminent domain, grant from the owner, or prescription must be employed to acquire public rights in privately-owned tidelands or shorelands since the Lake Chelan decision did not overrule established principles of private ownership. (Mulligan-Florida)
W78-02098

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS),
For primary bibliographic entry see Field 5G.
W78-02099

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING,
W. M. Kleppinger.
Land and Water Law Review, Vol 12, No 2, p 457-84, 1977.

Descriptors: *Wyoming, *Reservation Doctrine, *Water rights, *Federal-state water rights conflict, *Adjudication procedure, State jurisdiction, References(Water rights), Jurisdiction, Legal aspects, Federal government, Federal reservations, Federal jurisdiction, Arid lands, Judicial decisions, Legal review, Water supply, Supply, Water shortage, Water demand, Prior appropriation, Appropriation, Legislation, *Sovereign immunity, State policy, Procedural aspects, Declaratory judgments.

Increasing populations in the western United States have expanded demand for water to the point that potential demand far exceeds present ability to increase supply. A product of this increase in demand has been the development of conflicting claims between federal and state authorities to the ownership, control and administration of western waters. At the center of the federal-state controversy is the reservation doctrine which operates to create water rights in the federal government independent of and paramount to private water rights derived through state law. This paramount federal claim has tended to impair planning and development at the state level. The McCarran Amendment, enacted as a waiver of sovereign immunity, granted the states the power to enjoin the United States in any general litigation involving all water rights on a stream. The Wyoming legislature attempted to provide a mechanism, under the McCarran Amendment, whereby federal claims to water based on the reserved rights doctrine might be quantified and coordinated with rights derived from state law. The primary question concerning the statute is whether the adjudication procedure is truly a general, non-private proceeding governed by the Amendment. (Kastner-Florida)
W78-02100

MARINE POLLUTION AND THE ABSOLUTE CIVIL LIABILITY OF THE SHIPOWNER UNDER THE LAWS OF THE UNITED STATES AND EGYPT,
Howard Univ. School of Law, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-02101

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W78-02102

RECORD OF PUBLIC HEARINGS ON POSSIBLE ADMINISTRATION PROPOSALS TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT (P.L. 92-500) AS IT RELATES TO THE MUNICIPLE WASTE TREATMENT CONSTRUCTION GRANTS PROGRAM.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-02104

E.P.A. ENFORCEMENT, DECEMBER 1972 TO NOVEMBER 1974. AIR, WATER, PESTICIDES.
Environmental Protection Agency, Washington, DC. Office of General Counsel.
For primary bibliographic entry see Field 5G.
W78-02105

HAZARDOUS SUBSTANCES REGULATIONS TO SECTION 311 OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED 1972 (SUPPLEMENT TO DEVELOPMENT DOCUMENT).
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-02106

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-02107

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN (PROCEEDINGS OF CONFERENCE, SESSION (4TH), HELD AT CHICAGO, ILLINOIS ON SEPTEMBER 19-21, 1972).
Environmental Protection Agency, Washington, DC. Water Quality Office.
For primary bibliographic entry see Field 5G.
W78-02108

RELLA V. BERLE (STANDARDS FOR APPROVING WELL APPLICATION FOR DEVELOPMENT OF PUBLIC WATER SUPPLY).
397 N.Y.S. 2d 227-30 (App. Div. 1977).

Descriptors: *New York, *Water wells, *Well permits, *Administrative decisions, *Water supply, Legal review, Water sources, Wells, Water table, Deep wells, Water yield, Water level, Water flow, Water supply development, Water quality control, Water levels, Gaging stations, Gages, Measurements, Water flow, Sewage disposal, Administrative agencies, Rivers, *Administrative regulation, *Procedural aspects, Public hearings, State policy.

The plaintiffs, a village and a conservation association, sought to annual a decision of the Commissioner of Environmental Conservation to approve the defendant water company's application to develop ten additional wells for a public water supply from a river along the village. The plaintiffs argued that the Commissioner's decision did not meet the requirements of substantial evidence when measured against statutory criteria; failed to consider alternatives to the proposal advanced by the defendant when he had an affirmative duty to seek such alternatives; and, failed to make proper findings of fact as required by law. The Supreme Court of New York, Appellate Division, affirmed the Commissioner's determination. The court found that the 'public necessity' standard of the statutes was met and the protective measures required were completely justified to insure he village an adequate water supply. In addition, state policy only required the Commissioner to determine whether the applicant had met his burden of proof and did not to place any affirmative duties on him. The court felt the Commissioner's decision revealed that he clearly and concisely evaluated the issues presented, and upon conflicting testimony, came forth with well-reasoned conclusions. (Kastner-Florida)
W78-02109

PARKER V. U.S. (ACCRETION DOCTRINE NOT APPLICABLE WHERE ORIGINAL BOUNDARIES ARE DETERMINABLE).
431 F. Supp. 226-31 (W.D. Okla. 1977).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Boundaries(Property), *Boundary disputes, Legal aspects, Adjacent land owners, Erosion, Streambeds, Judicial decisions, Riparian rights, Federal government, Land tenure, Rivers, Water rights, Water law, Real property, Nonnavigable waters, *Real property law, Property.

Plaintiff landowner brought action against the United States to quiet title to certain lands, the record title to which was vested in defendant. The parties were both landowners of land north of a non-navigable river, the defendant's land being riparian and the plaintiff's land lying to the north of defendant's land. As a result of the river's slow migration northward, all of the government land and a major portion of the plaintiff's land were submerged; the river then receded, so that all of the plaintiff's land and portions of the defendant's land re-emerged. The plaintiff contended that he owned both his lands and the government lands through accretion to the center line of the river. The court re-affirmed the Oklahoma exception to the accretion doctrine, which states that where the boundaries are capable of determination, upon recession of the stream the respective landowners can claim title only to land they held before the erosion occurred. The plantiff won favorable

judgment as to one tract of land but lost as to other claims by application of the exception. (Jones-Florida)
W78-02110

CHOCTAW AND CHICKASAW NATIONS V. TIBBETTS (PREVIOUSLY SUBMERGED LAND RESTORED TO ORIGINAL RECORD TITLE HOLDERS UNDER DOCTRINE OF RE-EMERGENCE).
430 F. Supp. 714-17 (E.D. Okla. 1976).

Descriptors: *Oklahoma, *Accretion(Legal aspects), *Avulsion, *Boundaries(Property), Boundary disputes, Indian reservation, Adjacent land owners, Erosion, Streambeds, Riparian rights, Water law, Judicial decisions, Land tenure, Legal aspects, Rivers, Real property, *Real property law, *Property.

The plaintiffs and defendants were landowner of adjacent property with the plaintiff's tribal lands being located in the western portion of Lots 1 and 2 and the defendants' land located in the eastern portions of the same lots. Before 1927 the Arkansas River had moved by accretion to the east, submerging the land of both parties. By the avulsive movement of the river in 1927, all of the land re-emerged. The parties stipulated that the boundaries of their lands were capable of determination. Although each party originally claimed ownership to all of the land in question under the principle of accretion, these claims were waived and the court was requested to quiet the title of each party in and to the lands they respectively held before the accretion. The United States District Court applied the Oklahoma doctrine of re-emergence which restored title to the original record title holders if the boundaries were capable of determination after the re-emergence of the land whether by avulsion or accretion. Judgment was entered according to the parties' request. (Jones-Florida)
W78-02111

LUPPOLD V. LEWIS.
563 P.2d 538-46 (Mont. 1977).

Descriptors: *Montana, *Irrigation, *Water allocation(Policy), *Water rights, *Streams, Administrative agencies, Irrigation practices, Irrigation water, Tributaries, State governments, Water control, Diversion, Diversion structures, Water delivery, Water law, Water management(Applied), Water distribution(Applied), Water users, Preferences(Water rights), Adjudication procedure, Administrative regulation, State policy.

Plaintiff water users sought clarification of a water right decree involving Four Mile Creek, a stream that sometimes flows into the North Fork of Smith River. The river is administered by a water commissioner. The plaintiffs contended that the creek was adjudged in an 1890 water rights decree so that the commissioner has authority to distribute its waters. In order to interfere with the water commissioner's management of creek water, the defendants locked and rendered inoperable headgate controls on diversions from the creek. The Supreme Court of Montana found that the 1890 decree was uncertain and susceptible of different interpretations. However, the court held that there was substantial evidence that Four Mile Creek was included in the 1890 decree because some of the land described in the decree could only be irrigated from the creek. The court also held that under the 1890 decree the creek was a tributary of the river and, therefore, governed by the decree. The water commissioner was given control of the creek to distribute the water under the rights assigned by the 1890 decree. (Jordon-Florida)
W78-02112

MIMBRES VALLEY IRRIGATION COMPANY V. SALOPEK.
564 P.2d 615-19 (N. Mex. 1977).

Descriptors: *New Mexico, *National forests, *Recreation, *Reservation doctrine, *Water rights, Preferences(Water rights), Water law, Water management(Applied), Water policy, Water users, Watercourses, Judicial decisions, Water demand, Recreation demand, Federal government, State government, Streamflow, Water utilization, Priorities, Water allocation(Policy), Water control, Water distribution(Applied), *Minimum instream flow, Instream uses, Land use controls, Property interest.

This suit was originally filed as a private action to enjoin alleged illegal diversion of the Rio Mimbres which flows through the Gila National Forest. The state of New Mexico was allowed to intervene and the suit proceeded as a general statutory adjudication of all the water rights on the stream system. Among the named defendants was the United States which claimed reserved water rights within the Gila National Forest for minimum instream flows and for recreational purposes. United States argued that when the federal government reserves land, by implication it reserves the water rights sufficient to accomplish the purposes of the reservation. The plaintiffs contended that the reservation doctrine is limited to the purposes for which the reservation was created. The New Mexico Supreme Court rejected the United States' argument that recreation had always been an integral purpose of national forests. The court held that the original purpose of Gila National Forest was to ensure favorable conditions of water flow and to furnish a continuous supply of timber. The court denied the United States' claim for minimum instream flows and recreational purposes. (Jordan-Florida)
W78-02113

UNITED STATES STEEL CORP. V. TRAIN (EFFLUENT LIMITATIONS ON NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMITS).
556 F.2d 822-55 (7th Cir. 1977).

Descriptors: *Industrial wastes, *Chemical wastes, *Effluents, *Waste water treatment, State jurisdiction, Standards, Water quality standards, Administrative agencies, Technology, Water pollution sources, Industrial plants, Acidic water, Industrial water, Thermal pollution, Pollution abatement, Indiana, Oil, Phenols, Water pollution, Pollutant identification, Chemicals, Injection wells, Waste disposal wells, Jurisdiction, *National Pollution Discharge Elimination System, *Effluent limitations, *Environmental Protection Agency, Point source(Pollution), Effluent guidelines, Best Possible Technology, Steel industry, Total suspended solids.

Plaintiff steel company sought review of an Environmental Protection Agency (EPA) order granting a National Pollution Discharge Elimination System (NPDES) permit. The company challenged the conditions imposed by the permit. The permit imposed technology-based limitations governing pH, total suspended solids (TSS), oil and grease at each individual outfall. Other limitations, based on state water quality standards, were imposed on thermal discharge and on six chemicals. The permit also restricted discharge of acid wastes to a deep waste-injection well and required monitoring of such discharges. The plaintiff argued that the state limitations were invalid and impossible to achieve with present technology and that the federal effluent limitations were not based on the Best Possible Technology (BPT) available. The plaintiff also challenged the EPA's authority to regulate deep-well injection. The Seventh Circuit Court of Appeals affirmed the validity of the NPDES permit. In a lengthy opinion the court held that a state may require water pollution standards more stringent than federal standards, that state effluent limitations need not be technology-based, that the federal effluent limitations were within the BPT limits, and that the EPA has deep well injection jurisdiction. (Curran-Florida)
W78-02114

RYAN V. COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES (FORMER LESSEE REQUIRED TO ABATE NUISANCE CREATED DURING TENANCY).
373 A.2d 475-78 (Pa. Commonwealth, 1977).

Descriptors: *Solid wastes, *Public health, *Leachate, *Landfills, *Pennsylvania, Legal aspects, Leases, Land, Water pollution, Groundwater, Percolation, Water law, Permits, Penalties(Legal), Third party effects, Waste disposal, Organic matter, Public rights, Environmental sanitation, *Nuisance(Legal aspects), Solid Waste Management Act, Clean Streams Law, Property, Property interests.

The former lessee of land appealed from an order of the Department of Environmental Resources which required him to abate the nuisance created by him during the lease period. The lessee had leased the land for the purpose of operating a sanitary landfill on the site but had failed to obtain the necessary authorization for such a project. The landfill evidently did not conform to solid waste disposal regulations and created a public health hazard. The lessee contended that the Department lacked the power to issue such an order since the Solid Waste Management Act covered orders directed only to present landowners or land occupiers. He also insisted that the Department could not act under the Administrative Code of 1929 since the landfill was not a nuisance. The Commonwealth Court of Pennsylvania held that the Department had the power to issue the order under the Administrative Code since the discharge of leachate into groundwater constituted a nuisance under the Clean Streams Law and the present landowner consented to the Department's action. (Quarles-Florida)
W78-02115

BARRY V. GRELA (RIGHT TO USE PRIVATE LAND FOR ACCESS TO PUBLIC JETTY FOR FISHING).
361 N.E. 1251-52 (Mass. 1977).

Descriptors: *Massachusetts, *Boundaries(Property), *Public access, *Fishing, Public rights, Land tenure, Jetties, Legal aspects, Boundary disputes, Adjacent landowners, Recreation, High water mark, Low water mark, Coastal structures, Engineering structures, Harbors, Easements, Intertidal areas, Mud flats, Beaches, *Property interests, Real property law.

The plaintiff and defendants own land fronting on a harbor. A public jetty extends from the beach on the defendants' land into the water. The defendants do not claim to own the jetty. The plaintiffs brought suit to establish their right to cross the defendants' beach between the mean high water mark and mean low water mark to enable them to reach the jetty for fishing. The previous owner of the land had allowed this access, but the defendants have refused to permit it since they acquired the property. The Supreme Judicial Court of Massachusetts upheld the plaintiff's right to use the land between the high and low water marks as part of the 'free fish and fowling' granted by the colonial ordinance of 1641-1647. Although in previous cases based on that ordinance, the fishing was done on the flats of the complaining owner by people who came by boat, the court held that the same principle would apply to access over flats on foot on property of others so long as the purpose is fishing. (Maass-Florida)
W78-02116

COASTAL FACILITIES REVIEW ACT.
Md. Code Ann. secs 6-501 thru 6-511 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Permits, *Coastal structures, Comprehensive planning, State governments, Environmental effects, Economic impact, Industrial production, Coastal engineering, Natural resources, Engineering structures, Pipelines, Fossil fuels, Planning, Project planning, Local governments, Construction, Economics, Cost-benefit analysis, Administrative agencies, Regulation, Oil industry, Facilities, Mineral industry, Environmental policy, State policy, Licenses, Coastal Zone Management Act of 1972, *Coastal zone management, Coastal zone, Environmental Impact Statement, Marine resources, Minerals, Procedural aspects, State interests, Environmental law, Mineral resources.

Pursuant to the Federal Coastal Zone Management Act, Maryland is establishing a plan to govern the development of the mineral resources along the State's coastal areas in order to protect the State's environmental and economic interests. As part of that plan, permits from the State's Department of Natural Resources, are required before coastal industrial facilities may be constructed. A permit application should include a complete project description. After receipt of the application the Department must prepare an environmental and economic impact statement. After at least one public hearing on the statement has been held, the permit shall either be granted, granted conditionally or denied by the Secretary of the Department if the facility meets specific statutory criteria. A provision is made for judicial review of the Department's permit action. The Department is required to inspect the facilities periodically to see that the terms of the permit are being met. Penalties are established for violations of the statute. (Malefatto-Florida)
W78-02117

SPATIAL ASPECTS OF SHORELINE MANAGEMENT IN PUGET SOUND RECONSIDERED,
Washington Univ., Seattle. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-02119

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Land Management, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-02120

6F. Nonstructural Alternatives

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
John Hopkins Univ., Baltimore, MD.
M. G. Wolman.
Natural Resources Journal, Vol. 16, No. 4, p. 773-89, October 1976.

Descriptors: *Water resources development, *Decision making, *Alternative planning, *Project planning, Non-structural alternatives, Flood control, Water policy, Political aspects, River basin development, State governments, Damsites, Conservation, Land use, Local governments, Planning, Reservoirs, Legal aspects, Cost-benefit analysis, Environmental effects, Coordination, Colorado River Basin, Flood plain zoning, Potomac River, *Environmental policy, Dam effects, Corps of Engineers, State policy, National Environmental Policy Act, Private interest groups.

Although water resource management planners have reacted enthusiastically to the consideration of alternatives, such a concept is not without problems. The more alternatives and participants in a decision-making process, the more likelihood there is for ineffective or inactive decision-making. The author urges analysts to examine the rules and the agenda proposed in any water resource management decision making. Because all possible alternatives can never effectively be considered, those alternatives normally selected usually reflect the values or biases of those responsible for the inquiry. To expand the policy alternatives and to inject new ideas, will require the inclusion of new interest groups on the agenda. By expanding conflicting views, the range of political optons may improve decision-making. The author presents examples in which a broader-based decision-making process has resulted in better water resource plans. (Cocheu-Florida)
W78-01737

6G. Ecologic Impact Of Water Development

THE FUTURE OF HARD MINERALS MINING ON THE CONTINENTAL MARGIN: THE NEW ENGLAND EXAMPLE,
Sylvester Underseas Inspection, Rockland, MA.
For primary bibliographic entry see Field 5C.
W78-01714

PORTSMOUTH GASEOUS DIFFUSION PLANT SITE, PIKETON, OHIO (ENVIRONMENTAL IMPACT STATEMENT).
Energy Research and Development Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01722

NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-01729

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: THE CARACAS SESSION AND ITS AFTERMATH.
American Society of International Law, Washington, DC. International Law and Relations Subcommittee.
For primary bibliographic entry see Field 6E.
W78-01740

ENVIRONMENTAL DEFENSE FUND V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENTS AS A BASIS FOR CONGRESSIONAL DECISIONS).
For primary bibliographic entry see Field 6E.
W78-01761

ESTUARINE LAND USE MANAGEMENT: THE RELATIONSHIP OF AESTHETIC VALUE TO ENVIRONMENTAL QUALITY,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-01769

THE VALUE OF ESTUARINE FISHERIES HABITATS: SOME BASIC CONSIDERATIONS IN THEIR PRESERVATION,
Development and Resources Corp., Sacramento, CA.
F. H. Bollman.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 95-120, 9 fig, 4 tab, 48 ref, 2 append.

Descriptors: *Estuariies, Estuarine fishery, *Habitats, *Water pollution effects, Land use, Baseline studies, Resources development, Environmental effects.

Two broad sources of degradation of fishery habitats are foreseen as resulting from population growth and economic development. Direct pollution of nutrients and toxic materials is the first source. The physical alterations are the second source. Three intensifications of use are identified as compounding the difficulty of maintaining fishery resources in estuaries: (1) increasing loads of municipal and industrial wastes; (2) the leakage of petroleum and petroleum products into estuaries; and (3) upstream activities affecting freshwater inflows. Land and water use in the coastal zone is interrelated with that in the hinterland. There is an urgent need to improve environmental impact statements so that the full extent of the values is displayed for the decision makers. A major national commitment in training, research, and funding is involved in staffing state and federal agencies with the economic and biological expertise necessary for the informed management of the nation's estuaries. (Sinha-OEIS)
W78-01771

THE EXTRACTIVE INDUSTRIES IN THE COASTAL ZONE OF THE CONTINENTAL UNITED STATES,
East Carolina Univ., Greenville, NC.
For primary bibliographic entry see Field 5G.
W78-01772

STATUS OF ESTUARINE ECOSYSTEMS IN RELATION TO SPORTFISH RESOURCES,
Conservation Foundation, Washington, DC.
J. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 (and contained in) PB-265 467, Price codes: A99 in paper copy, A01 in microfiche. In: Estuarine Pollution Control and Assessment, Proceedings of a Conference held at Pensacola, FL, on Feb 11-13, 1975. EPA Rep No. 440/1-77-007A, Mar 1977. Vol 1, p 139-147, 3 fig, 3 tab, 23 ref.

Descriptors: *Estuaries, *Ecosystems, *Estuarine fisheries, Sport fishing, Resources, Coastal zone.

Increasing numbers of anglers--ten million at this time--fish along the coastal shores, an estimated 57 percent of them in the estuaries. Factors affecting the ecosystem are discussed. Recommendations are made to meet management needs, on the federal, state, and local levels. (Sinha-OEIS)
W78-01773

LIMITING FACTORS AFFECTING COMMERCIAL FISHERIES IN THE MIDDLE ATLANTIC ESTUARINE AREA,
State Univ. of New York at Stony Brook.
For primary bibliographic entry see Field 5G.
W78-01774

OUR ESTUARIES AND COMMERCIAL FISHING TRENDS,
Living Marine Resources, Inc., San Diego, CA.
For primary bibliographic entry see Field 2L.
W78-01775

LIMITING FACTORS AFFECTING THE COMMERCIAL FISHERIES IN THE GULF OF MEXICO,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 5G.
W78-01776

ENVIRONMENTAL ASPECTS OF DREDGING IN THE GULF COAST ZONE WITH SOME ATTENTION PAID TO SHELL DREDGING,
Espey, Huston and Associates, Inc., Austin, TX.

For primary bibliographic entry see Field 5G.
W78-01780

NUTRIENT LOADING IN THE NATION'S ESTUARIES,
American Univ., Washington, DC.
For primary bibliographic entry see Field 5G.
W78-01781

EFFECTS AND CONTROL OF NUTRIENTS IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5G.
W78-01782

THE EFFECTS OF INDUSTRIALIZATION ON THE ESTUARY,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W78-01786

IMPACT OF WASTE HEAT DISCHARGED TO ESTUARIES WHEN CONSIDERING POWER PLANT SITING,
United Engineers and Constructors, Inc., Philadelphia, PA.
For primary bibliographic entry see Field 5G.
W78-01788

THERMAL DISCHARGES AND ESTUARINE SYSTEMS,
Maryland Univ., Solomons.
For primary bibliographic entry see Field 5G.
W78-01789

EFFECTS OF THERMAL DISCHARGES UPON AQUATIC ORGANISMS IN ESTUARINE WATERS WITH DISCUSSION OF LIMITING FACTORS,
Ecological Analysts, Inc., Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-01790

EFFECTS OF SELECTED POWER PLANT COOLING DISCHARGES ON REPRESENTATIVE ESTUARINE ENVIRONMENTS,
Pacific Gas and Electric Co., San Francisco, CA.
For primary bibliographic entry see Field 5G.
W78-01791

THE IMPACT OF OFFSHORE PETROLEUM OPERATIONS ON MARINE AND ESTUARINE AREAS,
American Petroleum Inst., Washington, DC.
For primary bibliographic entry see Field 5B.
W78-01799

ESCAROSA: THE ANATOMY OF PANHANDLE CITIZEN INVOLVEMENT IN ESTUARINE PRESERVATION,
University of West Florida, Pensacola.
For primary bibliographic entry see Field 2L.
W78-01808

THE ROLE OF THE PUBLIC IN TEXAS ESTUARY PROTECTION,
Public Relations Consultant, Corpus Christi, TX.
For primary bibliographic entry see Field 5G.
W78-01809

SEVEN WAYS TO OBLITERATION: FACTORS OF ESTUARINE DEGRADATION,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
For primary bibliographic entry see Field 5G.
W78-01819

INTERACTIONS OF POLLUTANTS WITH THE USES OF ESTUARIES,
Maryland Univ., Cambridge.
For primary bibliographic entry see Field 5C.
W78-01820

ASSESSMENT OF THE WATER QUALITY IN THE SALT RIVER PRIOR TO ITS IMPOUNDMENT IN ANDERSON AND SPENCER COUNTIES, KENTUCKY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W78-01822

THE BIOLOGY OF BARBERSPAN, WITH SPECIAL REFERENCE TO THE AVIFAUNA,
Transvaal Provincial Administration, Pretoria (South Africa). Div. of Nature Conservation.
P. le S. Milstein.
The Ostrich, Supplement 10, p 3-25 and 72,74, 1975. 11 fig, 5 tab, 39 ref.

Descriptors: *Water birds, Nature conservation, Aquatic ecosystems, Climatology, Ecological studies, Primary production, Lentic environment, Zooplankton, Phytoplankton, Mollusks, Lakes, *Barberspan, *Arthropoda, *South Africa, *Alkaline lakes.

Barberspan is a shallow alkaline lake in the Western Transvaal. The surrounding countryside was grassveld, now largely under the plough, with relice patches of Kalahari Thornveld. Due to a far-sighted diversion in 1918 of the Harts River into its fossil course, the pan is locally unique in having permanent water. This factor and its large area when full of over 1 700 ha have contributed to its importance to birds. One of the only two official bird-ringing stations in Southern Africa was established at Barberspan. From 1955 to 1970 inclusive, at least 61 920 birds of 164 species were ringed, mainly waterfowl. In view of extensive reorganization begun in 1968, this paper attempts to consolidate previous data on Barberspan. A better ecological background for current long-term research is supplied. The recorded avifauna of 320 species has been brought up to data until the end of 1970. To those previously published, 71 species have been added. Breeding data received only passing reference, but the highlight was the first recorded Transvaal breeding of the caspian Tern Sterna caspia in 1968. Aspects of bird management at Barberspan have been incorporated. Due to a current more specialized study with all the Barberspan waterfowl data now computerized, only some diagrams of movements in better-represented species are presented. Some recorded avian extoparasites are recorded. (So. African Water Info Center)
W78-01832

RELATIVE ABUNDANCE OF WATERFOWL IN THE ORANGE FREE STATE,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Nature Conservation.
J. N. Geldenhuys.
The Ostrich, Vol 47, No 1, p 27-54, March 1976. 23 fig, 16 ref.

Descriptors: *Water birds, Aquatic ecosystems, Population studies, Food chains, Breeding, Dams, Reservoirs, Pans, Species distribution, *Ducks, *Orange Free State, *South Africa.

During 1971-1972 a census was conducted in the Orange Free State, Republic of South Africa, to investigate the relative abundance of duck species. The survey was carried out in both the wet and dry seasons. The results are presented by plotting seasonal distribution within quarter degree squares and classifying all records for each species into group size classes. Comparisons are made of total numbers, frequencies of occurrence and seasonal habitat utilization. Overall abundance, arranged according to percentages of the total duck population, was as follows: Rare to uncommon (smaller than 1%) - White faced Duck, Whistling Duck, Hottentot Teal, Maccoa Duck, Black Duck, White backed Duck and Knob-billed Duck; common (4-9%) - Cape Teal, Cape Shoveller, Southern Pochard, Red-billed Teal and Spurwinged Goose; very common (19-20%) - Yellow-billed Duck and South African Shelduck; abundant (32%) - Egyptian Goose. (So African Water Info Center)
W78-01843

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. I INDUSTRIAAL SUMMARY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01892

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. II. INDUSTRY PRIORITY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01893

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. III. IRON AND STEEL INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01894

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. IV. PETROLEUM REFINING INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01895

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. V. PULP AND PAPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01896

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VI. OLEFINS INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01897

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VII. AMMONIA INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01898

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. VIII. ALUMINA/ALUMINUM INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01899

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANU-

FACTURING PROCESS OPTIONS: VOL. IX. TEXTILE INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01900

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. X. CEMENT INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01901

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XI. GLASS INDUSTRY.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01902

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIII. PHOSPHORUS/PHOSPHORIC ACID INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01903

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XIV. PRIMARY COPPER INDUSTRY REPORT.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01904

ENVIRONMENTAL CONSIDERATIONS OF SELECTED ENERGY CONSERVING MANUFACTURING PROCESS OPTIONS: VOL. XV. FERTILIZER INDUSTRY REPORT,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-01905

ENVIRONMENTAL EFFECTS OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, NY.
R. Gerard.
Marine Technology Society Journal, Vol. 10, No. 7, p 7-16, September 1976. 2 tab, 5 fig, 49 ref. NSF IDO-72-06424.

Descriptors: *Mining, *Manganese, *Environmental effects, Mining engineering, Pacific Ocean, Oceans, Water resources development, Deep water, Hydraulic systems, Dredging, Copper, Nickel, Cobalt, International law, International waters, Bottom sediments, Turbidity, Sediment-water interfaces, *Deep-sea mining, *Manganese nodules, Continuous-line bucket dredging, Airlift-hydraulic dredging.

Manganese nodules on the ocean floor will probably be exploited commercially before 1980 for their nickel, copper, and cobalt content. The eastern equatorial north Pacific nodule zone is the only area of economic interest, where bottom coverage is a minimum of 30-35%, the wet weight concentration is at least 5 kg/sq m, and in the richest sector (east of 150 west longitude) nodules average 1.28% nickel, 1.16% copper, and 0.23% cobalt. The only environmental threat of exploratory activities would be sediment disturbance by dredge sampling to a depth of 0.5 m; significant damage is unlikely. Two mining systems are under development: (1) the continuous-line bucket (CLB) dredge, which consists of a moving loop of synthetic rope extending from surface ship to ocean floor, to which are attached open mesh metal buckets every 20-50 m; (2) the airlift hydraulic (AL) system, employing a pipe extending from ship to sea floor attached to a dredge head with jets, harrow blades, and rake. Both systems are likely to result in: (1) disturbance or destruction of benthic organisms, with mixing and resuspension of sediments by the dredge; (2) resettlement of disturbed sediment, posing a danger to benthic animals; and (3) alteration of bottom water chemistry. The CLB system will probably add to water column turbidity, while discharge by the AL system of bottom water into surface water will transfer rich nutrients and organisms to the surface, and probably also alter light penetration with the turbid discharge. (Lynch-Wisconsin)
W78-01908

ORGANIZATION OF NEW ENGLAND ROCKY INTERTIDAL COMMUNITY: ROLE OF PREDATION, COMPETITION, AND ENVIRONMENTAL HETEROGENEITY,
Massachusetts Univ., Boston. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-01952

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 8B.
W78-01973

JOINT USE OF INTERNATIONAL WATER RESOURCES,
Mahart, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W78-02010

THE THREAT TO OUR SHORES (THOSE RUSTY TANKERS),
For primary bibliographic entry see Field 5G.
W78-02099

NEPA AND THE CONSIDERATIONS OF ALTERNATIVES: A CASE STUDY OF THE CORPS OF ENGINEERS' PLANNING FOR CARMEL RIVER,
Stanford Univ., CA. Dept. of Civil Engineering.
J. Randolph, and L. Ortolano.
Environmental Affairs, Vol 5, No 2, p 213-53, Spring 1976. 1 fig, 1 tab.

Descriptors: *Environmental effects, *Legislation, *Alternative planning, *Administrative decisions, Natural resources, River basins, Planning, Decision making, Comprehensive planning, River basin commissions, Project planning, Investigations, Water resource development, Engineering, Coordination, Project post-evaluation, Water management, Wildlife, Fish, Multiple-purpose projects, Water supply, Flood control, Dams, *Environmental impact statement, *National Environmental Policy Act(NEPA), Corps of Engineers, Environmental policy.

The legislative history and statutory language of the 1969 National Environmental Policy Act (NEPA) indicate that its intent is to require federal agencies to consider environmental factors in all agency planning and decision-making. The influence of NEPA on early planning decisions, as well as the formulation and ranking of alternative actions, was assessed in the Carmel River Basin survey conducted by the Corps of Engineers. The problems investigated by the Corps included insufficient water supply for the growing population and flooding of residential and commercial developments in the flood plain. The Corps conducted environmental studies and proposed alternate solutions in a working paper. Then, the 102 process the events leading up to the drafting of an environmental impact statement, began. Although NEPA has some influence on the river survey, the effectiveness of the 102 process in forcing planners to consider environmental factors in decision-making depends on the quality of information produced, the time the information is put into the planning process, and the extent of integration of information with the decisions. The 102 process in this survey was deficient in all three areas. (Mass-Florida)
W78-02102

CRABTREE CREEK, WAKE COUNTY, NORTH CAROLINA INTERCEPTOR SEWER, ENVIRONMENTAL PROTECTION AGENCY PROJECT NUMBER C370-344 (ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-02107

PROPOSED INCREASE IN OIL AND GAS LEASING ON THE OUTER CONTINENTAL SHELF, (VOLUME 2 OF 3), (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Land Management, Washington, DC.
(1975). 1,039 p.

Descriptors: *Environmental effects, *Oil fields, *Continental shelf, *Leases, *Drilling, Offshore platforms, Oceans, Exploration, Oil industry, Oil spills, Natural gas, Gases, Cost-benefit analysis, Economics, Marine fish, Resources, Recreation, Exploitation, Commercial fishing, Navigation, Beaches, Sites, *Environmental impact statement, *Outer Continental Shelf, *Coastal zones, *Marine ecosystems, Marine resources, Marine environment.

The purpose of this Final Environmental Impact Statement (EIS) is to identify the impacts on the natural environment and the various coastal zone resources, on air and water quality, on land use patterns and on the social order which might result from the proposed acceleration of Outer Continental Shelf (OCS) oil and gas leasing. The EIS does not deal with specific leasing sites but discusses in general terms the sources of impact-generating effluents upon broad groups of resources. The environmental impacts discussed include the natural phenomena in each OCS area and their impact generating potential, major oil spills and the marine environment, generic impacts, impacts not specific to regions and cumulative impacts. Unavoidable adverse impacts discussed include impacts on air and marine quality, interference with navigation and fishing, interference with recreational activities and the degradation of aesthetic values. Suggested alternatives to the proposed action include: no action; reducing the rate of OCS leasing; halting OCS leasing; alternative lease bidding systems; postponing the leasing decision until a national energy plan is developed; and energy conservation. The environmental impacts associated with alternative fuel sources are also considered. (Curran-Florida)
W78-02120

BIOLOGICAL INTEGRITY--1975,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
G. M. Woodwell.
Report No BNL 19929. (1975) 10 p, 1 fig, 1 ref.

Descriptors: *Ethics, *Succession, Water quality control, Pollution abatement, New York, Nutrients, Forests, Agriculture, Social change, Social aspects, Seres, Long Island(NY).

A paper dealing with ethics and other philosophical aspects of societal control of water quality management and pollution control contends that

compromise among competing exploiters is not a sufficient basis for management of the nation's waters. Science can help by emphasizing its two new most basic principles, evolution and succession. The generalized effect of human activities is to shift both terrestrial and aquatic systems from successionally mature stages to less mature managed stages. The flux of nutrients along a sere in central Long Island (NY), from agriculture to oak-pine forest, is examined in a study included in this paper. The quantity of nutrient ions entering the ground water under the various communities of the sere were measured. Two trends were conspicuous. First, for most of the ecosystems the effect was to increase the flux of most ions over that in precipitation. Second, the fluxes out of these systems were substantially higher in the least mature successional systems and lowest in later forest stages. The primary challenge of management is to build closed urban and agricultural systems that mimic in their exchanges with the rest of the environment that mature natural systems they displaced. (Lynch-Wisconsin)
W78-02184

7. RESOURCES DATA

7A. Network Design

MODEL STATE WATER MONITORING PROGRAM.
Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.
For primary bibliographic entry see Field 5A.
W78-01855

SAMPLING ERRORS IN THE MEASUREMENT OF RAIN AND HAIL PARAMETERS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W78-01992

7B. Data Acquisition

DEVICE FOR MEASURING AMOUNT OF SOIL SPLASHED BY RAINDROPS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W78-01709

IMPACT OF REMOTE SENSING UPON THE PLANNING, MANAGEMENT, AND DEVELOPMENT OF WATER RESOURCES (APPENDIX TO FINAL REPORT),
Systems International, Inc., Gambrills, MD.
P. A. Costruccio, H. L. Loats, T. R. Fowler, and S. L. Frech.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28500, Price codes: A05 in paper copy, A01 in microfiche. June 1975. 85 p. NASA-CR-143822, NAS5-20567.

Descriptors: *Water management(Applied), *Hydrologic data, *Research equipment, *Remote sensing, Model studies, Computers, Satellites(Artificial), Surveys, Research and development, Research facilities, Comprehensive planning, Instrumentation, Water resources development, Analytical techniques, Administrative agencies, Governments, Data collections, Universities, Local governments, Federal government, State governments.

In developing water management plans, numerous governmental and private entities utilize data acquired through remote sensing devices employed by aircraft, spacecraft, or unmanned orbiting satellites. The National Aeronautics and Space Administration's Goddard Space Flight Center has published a report on the general impact of remote sensing in the field; this document comprises twelve appendices to the report. The appendices include: a list of the agencies and private firms surveyed; separate listings of the hydrologic models used by state and federal agencies and by private firms; a summary of the activities and budgets of the eleven major federal water resources research agencies; summaries of the water resources activities of universities and of state and local governments according to the percentage of time devoted to different areas of research; and a listing of the computers used by each entity, indicating total use and percentage of total utilization for water resource activities. (See also W76-08536) (Sloan-Florida)
W78-01739

GEOPHYSICAL INVESTIGATIONS IN SALDANHA BAY,
Cape Town Univ. (South Africa).
For primary bibliographic entry see Field 2L.
W78-01834

TECHNIQUES FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-01875

CORRELATION OF CHLOROPHYLL, SUSPENDED MATTER, AND RELATED PARAMETERS OF WATERS IN THE LOWER CHESAPEAKE BAY AREA TO LANDSAT-1 IMAGERY,
Old Dominion Univ. Research Foundation, Norfolk, VA.
For primary bibliographic entry see Field 5A.
W78-01946

LASER ABSORPTION TECHNIQUES FOR THE MEASUREMENT OF ATMOSPHERIC WATER VAPOR CONCENTRATION,
University of Western Ontario, London. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W78-01997

TOTAL WATER CONTENT INSTRUMENT,
Office of the Secretary (Air Force), Washington, DC. (Assignee).
R. G. Hooper.
U.S. Patent No. 4,031,753, 4 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 959, No 4, p 1481, June 28, 1977.

Descriptors: *Patents, *Sampling, *Water sampling, *Moisture content, *Meteoric water, Precipitable water, Atmosphere, Monitoring, Measurement, Electrical equipment.

This invention is concerned with providing a total water content instrument suitable for continuously giving an electrical output response that is directly proportional to the total percentage water concent of a sample solid or liquid water particles in a sample area of the atmosphere. The sample areas can be associated with clouds of either liquid water, ice, or snow as well as areas of precipitation not necessarily defined by clouds. A large funnel shaped scoop with the wide end facing forward allows high volume collection of particles at nominal aircraft speeds. The time lag for routing of water into the detection device is around 12 seconds. The detection device is a concentric flow-through capacitor which varies in capacitance according to the dielectric of the fluid enclosed. It is therefore the object of the invention to provide an instrument capable of real-time monitoring of total water content in the atmosphere. (Sinha - OEIS)
W78-02140

AERIAL MONITORING EXPERIENCE,
Environmental Protection Agency, Edison, NJ. Region II.
For primary bibliographic entry see Field 5A.
W78-02167

CONTINUOUS MONITORING BB ION SELECTIVE ELECTRODES,
Pittsburg Univ., PA. Graduate School of Public Health.
For primary bibliographic entry see Field 5A.
W78-02168

LIDAR FOR REMOTE MONITORING,
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-02169

ENVIRONMENTAL KEYS FOR OIL AND HAZARDOUS MATERIALS,
McDonnell Aircraft Co., St. Louis, MO.
For primary bibliographic entry see Field 5A.
W78-02170

DETECTION OF DISSOLVED OXYGEN IN WATER THROUGH REMOTE SENSING TECHNIQUES,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5A.
W78-02171

SCOPE OF RESEARCH NEEDS,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-02172

SINGLE WAVELENGTH FLUORESCENCE EXCITATION FOR ON-SITE OIL SPILL IDENTIFICATION,
For primary bibliographic entry see Field 5A.
W78-02173

REMOTE MONITORING IN REGION VI,
Environmental Protection Agency, Dallas, TX. Region VI.
For primary bibliographic entry see Field 5A.
W78-02174

REGION III'S REPRESENTATIVE REPORT,
Environmental Protection Agency, Philadelphia, PA. Region III.
For primary bibliographic entry see Field 5A.
W78-02175

REGION X ENVIRONMENTAL MONITORING REQUIREMENTS AND APPLICATIONS,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5G.
W78-02176

REGION IV ENVIRONMENTAL MONITORING EQUIPMENT,
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5A.
W78-02177

REMARKS, REGION IX,
Environmental Protection Agency, San Francisco, CA. Region IX.
For primary bibliographic entry see Field 5A.
W78-02178

REMARKS, REGION VIII,
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5A.
W78-02179

MODIFICATION TO AN AUTOMATIC LIQUID SAMPLER TO TAKE MULTIPLE SAMPLES,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 3F.
W78-02185

7C. Evaluation, Processing and Publication

DEVELOPMENT OF HATREMS DATA BASE AND EMISSION INVENTORY EVALUATION,
Midwest Research Inst. Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-01856

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 77-708, 1977. 7 p, 1 ref.

Descriptors: *Data storage and retrieval, *Data transmission, *Information exchange, *Water resources, Methodology, Organizations, Programs, Operations, *National Water Data Exchange, *NAWDEX, Program management, Master water data index, Water data sources directory.

The National Water Data Exchange (NAWDEX) has been established as a nationwide program directed at improving access to water and water-related data and disseminating information about the availability of these data throughout the entire water-resources community. NAWDEX is composed of a confederation of water-oriented organizations working together to facilitate the exchange of data and to improve the technology of data handling and transfer. This report is intended to provide guidelines to assure that all member organizations participate equally and that a climate of cooperation and open communication is established among participating members. (Woodard-USGS)
W78-01860

GEOHYDROLOGY OF PART OF THE ROUND VALLEY INDIAN RESERVATION, MENDOCINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01863

DESCRIPTIONS AND CHEMICAL ANALYSES FOR SELECTED WELLS IN THE EASTERN SACRAMENTO VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-01864

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER', JANUARY 1975, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
G. E. Welder.
Open-file report 77-505, 1977. 1 sheet.

Descriptors: *Water table, *Groundwater, *Aquifers, *Maps, *New Mexico, Altitude, Depth, Water levels, *Water-table gradient, *Roswell basin(N Mex), *Chaves County, *Eddy County.

The altitude and gradient of the water table in the 'shallow aquifer' of the Roswell basin in Chaves and Eddy Counties, New Mexico, for January 1975 is shown on a map, scale of 1/2-inch per mile. The map was prepared by the U.S. Geological Survey in cooperation with the New Mexico State Engineer Office. (Woodard-USGS)
W78-01867

MAP SHOWING THE ALTITUDE AND CONFIGURATION OF THE WATER LEVEL IN THE 'SHALLOW AQUIFER,' JANUARY 1964, ROSWELL BASIN, CHAVES AND EDDY COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
G. E. Welder.
Open-file report 77-506, 1977. 1 sheet.

Descriptors: *Water table, *Groundwater, *Aquifers, *Maps, *New Mexico, Altitude, Depth, Water levels, *Water-table gradient, *Roswell basin(N Mex), *Chaves County, *Eddy County.

The altitude and gradient of the water table in the 'shallow aquifer' of the Roswell basin in Chaves and Eddy Counties, New Mexico, for January 1964 is shown on a map, scale of 1/2-inch per mile. The map was prepared by the U.S. Geological Survey in cooperation with the New Mexico State Engineer Office. (Woodard-USGS)
W78-01868

HYDROLOGIC RECONNAISSANCE OF THE TULE VALLEY DRAINAGE BASIN, JUAB AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-01872

HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1975,
Geological Survey, Houston, TX. Water Resources Div.
C. E. Ranzau, Jr.
Open-file report 77-274, June 1977. 306 p, 20 fig, 15 tab, 3 ref.

Descriptors: *Rainfall-runoff relationships, *Storm runoff, *Urban runoff, *Urban hydrology, River basins, Streamflow, Flow rates, Hydrographs, Mass curves, Basic data collections, *Houston area(Tex).

Detailed rainfall-runoff computations, including hydrographs and mass curves, are presented for nine storm periods during the 1975 water year in drainage basins in the Houston, Texas metropolitan area. The information will be useful in determining the extent to which progressive urbanization will affect the yield and mode of occurrence of storm runoff. (Woodard-USGS)
W78-01873

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1976.
Geological Survey, Okemos, MI. Water Resources Div.
Water-Data Report MI-76-1, June 1977. 615 p, 9 fig.

Descriptors: *Michigan, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 194 gaging stations, stage and contents for 5 lakes and reservoirs, water quality for 75 continuous-record stations, 28 partial-record stations and 5 lakes, and water levels for 27 observations wells. Also included are 88 crest-stage partial-record stations and 33 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Michigan. (Woodard-USGS)
W78-01876

WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1976.
Geological Survey, Trenton, NJ. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 296, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report NJ-76-1, June 1977. 766 p, 9 fig, 5 tab, 30 ref.

Descriptors: *New Jersey, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 83 gaging stations; tide summaries for 9 stations; stage and contents for 31 lakes and reservoirs; water quality for 25 gaging stations, 213 partial-record flow stations, and 118 wells; and water levels for 3 observation wells. Also included are 90 crest-stage partial-record stations and 70 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Jersey. (Woodard-USGS)
W78-01877

WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1976.
Geological Survey, Richmond, VA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 772, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report VA-76-1, September 1977. 363 p, 4 fig.

Descriptors: *Virginia, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells and springs. This report contans discharge records for 196 gaging

stations; stage only for 1 gaging station; stage and contents for 9 lakes and reservoirs; water quality for 31 gaging stations; and water levels for 56 observation wells. Also included are data for 117 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Virginia. (Woodard-USGS)
W78-01878

WATER RESOURCES DATA FOR HAWAII AND OTHER PACIFIC AREAS, WATER YEAR 1976.
Geological Survey, Honolulu, HI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 565, Price codes: A20 in paper copy, A01 in microfiche. Water-Data Report HI-76-1, April 1977. 445 p, 26 fig, 1 tab.

Descriptors: *Hawaii, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Mariana Islands, *Caroline Islands, *Samoa Islands.

Water resources data for the 1976 water year for Hawaii and other Pacific areas consist of records of stage, discharge, and water quality of streams; stage of a reservoir; and water levels and water quality in wells and springs. This report contains discharge records for 158 gaging stations; stage only record for 1 gaging station; water quality for 10 gaging stations, 108 partial-record flow stations and 144 wells; and water levels for 25 observation wells. Also included are 107 crest-stage partial-record stations and 109 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, Territorial, and Federal agencies in Hawaii and other Pacific areas. (Woodard-USGS)
W78-01879

WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
Available from the National Technical Information Service, Springfield VA 22161 as PB-271 706, Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report MA-RI-76-1, June 1977. 300 p, 5 fig.

Descriptors: *Massachusetts, *Rhode Island, *Hydrologic data, *Surface waters, *Ground water, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1976 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 109 gaging stations, monthend contents fo 15 lakes and reservoirs, water quality for 23 gaging stations, and water levels for 44 observation wells. Also included are data for 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. A few pertinent stations in bordering States are also included. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Massachusetts and Rhode Island. (Woodard-USGS)
W78-01880

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR Water Resources Div.
Water-Resources Investigations in Oregon Folder, 1977. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Oregon, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Groundwater, Water quality, On-site investigations, Lakes, Reservoirs, Precipitation(Atmospheric), Networks, *Maps, *Bibliographies, Cooperative water-studies program.

Water-resources studies and investigations in Oregon made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; ground water observation wells; and water-quality observation sites. Small State maps show average annual precipitation, flood prone areas, and inventory of lakes and reservoirs, principal sources of ground water, and discharge of principal rivers. A map, scale 30 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Oregon as of January 1977. (Woodard-USGS)
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO Water Resources Div.
Available from U.S. Geological Survey, Denver, CO 80203. Water-Resources Investigations in Colorado Folder, 1977. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *Colorado, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation(Atmospheric), Streamflow, Runoff, Groundwater availability, Water quality, Dissolved solids, *Bibliographies, Networks, *Maps, U.S. Geological Survey, Cooperative water-studies program.

Water-resources investigations in Colorado in which the U.S. Geological Survey participates are summarized. A bibliography of pertinent reports is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; ground-water observation wells; and water-quality observation sites. Small State maps show principal sources of ground water, mean annual precipitation, discharge of the principal rivers, dissolved solids concentrations in rivers, and chemical type of water in rivers. A map, scale 50 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Colorado as of January 1977. (Woodard-USGS)
W78-01882

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Arthur D. Little, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5A.
W78-01887

8. ENGINEERING WORKS

8B. Hydraulics

OFFSHORE ISLANDS,
Harris (Frederick R.), Inc., New York.
E. H. Harlow.
Journal of the Waterway, Port, Coastal and Ocean Division, Proceedings of ASCE, Vol 103, No WW1, Proc. Paper 12754, p 137-158, February 1977. 7 fig, 68 ref.

Descriptors: *Transportation, *Environmental effects, *Resources development, *Offshore platforms, Defense, Structures, Economics, *Outer Continental Shelf, *Artificial islands.

The sociological and environmental aspects of the construction of artificial islands on the outer continental shelf are considered. The reasons for and functions of such islands are explained. Brief remarks are made on their construction and maintenance, on economics, institutional aspects, financing and risks. Finally the need for environmental planning is examined. The potential of offshore islands is both real and challenging. With suitable research, the civil engineering design questions seem to be susceptible to reasonable answers. The economics for specific sites and purposes will have to be established by comparison with alternative land-based sites. But the legal and institutional framework for new land made out of the sea remains shrouded in a puzzle as impenetrable as a maritime fog. (Sinha-OEIS)
W78-01704

HYDRAULIC RESISTANCE OF GRASS MEDIA ON SHALLOW OVERLAND FLOW,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W78-01823

PLUMBING AND DRAINAGE IN TALL BUILDINGS,
National Building Research Inst., Pretoria (South Africa).
P. R. Crabtree.
Municipal Engineer, Vol 7, No 2, p 97-106, March 1976.

Descriptors: *Plumbing, *Drainage systems, *High buildings, Water supply, Decision making, Research and development, Design criteria, Health aspects, Water storage, Storage tanks, Layout, Underdrainage, Fire fighting, Rainwater, Wastes handling, Noise, Pipes, Fittings, Pressure tanks, Construction techniques, Prefabricated units, Operation and maintenance, South Africa.

Various aspects of drainage and plumbing systems for large buildings are discussed; particularly design and materials selection, problems encountered in high-rise development are highlighted. Much of the content is equally applicable to buildings of any height, and all aspects of the services involving the plumber are covered. (So African Water Info Center)
W78-01846

RECONNAISSANCE OF SEDIMENTATION IN THE RIO PILCOMAYO BASIN, MAY 1975, ARGENTINA, BOLIVIA, AND PARAGUAY,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-01862

OUTLET WORKS AND STILLING BASIN FOR LUCKY PEAK DAM, BOISE RIVER, IDAHO; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 407, Price codes: A05 in paper copy, A01 in microfiche. Report No 43-1, July 1956. 79 p, 18 fig, 7 tab, 26 plate, 21 ref, 3 append.

Descriptors: *Hydraulic models, *Hydraulics, *Outlet works, *Idaho, Spillways, Erosion, Cavitation, Prototypes, Gates, Dams, Froude number, Hydraulic structures, Model studies, Settling basins.
Identifiers: *Flip buckets, *Cavitation damage, *Boise River, Manifolds, Lift gates.

Model investigations of the outlet works and stilling basin for Lucky Peak Dam and Reservoir were conducted in 3 undistorted models. The tests were made to develop the basic design for a cavitation-free manifold and to determine the energy-dissipating facilities required to ensure satisfactory flow conditions in the river channel. The preliminary tests indicated that 6 vertical slide valves in a six-branch manifold would control all flows to and including the design discharge of 30,000 cfs as satisfactorily as the seven 102-in-diam Howell-Bunger valves originally proposed. Subsequent tests indicated a problem of cavitation pressures in and around the valve slots. The problem was not solved completely, but it appeared that damage in the prototype could be prevented by avoiding operation in the range of gate opening in which cavitation was expected. Individual curved bucket sections (flip buckets) were installed downstream from each slide valve to place the area of impact of the flow at a distance from the structure. A stilling basin was used to dissipate the energy of the falling jets. To minimize impingement of flow on the right bank, it was necessary to vary the curvature of the flip buckets and to direct the jets toward the left bank by rotating the manifold 15 degrees. (Adams-ISWS)
W78-01972

ENVIRONMENTAL ANALYSIS AND ASSESSMENT OF THE MISSISSIPPI RIVER 9-FT CHANNEL PROJECT BETWEEN ST. LOUIS, MISSOURI, AND CAIRO, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
J. H. Johnson, R. C. Solomon, C. R. Bingham, B. K. Colbert, and W. P. Emge.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 041, Price codes: A07 in paper copy, A01 in microfiche. Technical Report Y-74-1, November 1974. 143 p, 41 fig, 15 tab, 37 ref, 2 append.

Descriptors: *Mississippi River, *Navigable rivers, *Aquatic habitats, *Channel improvement, *River training, *Wildlife habitats, Geomorphology, Ecology, Model studies, Dredging, Fish populations, Aquatic plants, Wildlife, Flood plains, Rivers, Channel morphology.
Identifiers: Dredging spoil, Side channels.

The Mississippi River 9-ft channel project was authorized by the River and Harbor Acts of 1927 and 1930. The purpose of the project was to maintain navigation from the confluence of the Missouri River to the confluence of the Ohio River. The main channel will be contracted to 1500 ft between riverward ends of dikes throughout the area to maintain the 9-ft depth during periods of low flow. A comprehensive study of the historical geomorphology supplemented by physical models of the river and side channels was made to determine the physica impact of river contraction works on river morphology and behavior. An intensive study of the terrestrial flora and fauna was conducted to inventory the existing organisms and communities located in the unprotected floodplain and to assess the impacts of operation and maintenance activities. The aquatic flora and fauna were studied to inventory the aquatic communities present in the study area and to assess the importance of side channels to the riverine ecosystem. The relative biological importance of each side channel, established by ranking procedures, provided a rational choice of those side channels that could provide maximum benefit to the river's ecology. Operation and maintenance activities include maintenance dredging, disposal of dredged material, and construction and maintenance of levees, dikes, and bank revetments. The mentioned activities were examined, and the potential environmental impacts resulting therefrom were discussed. (Adams-ISWS)
W78-01973

CLOSURE FILL AND SKELETON POWERHOUSE UNITS, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8D.
W78-01974

THE WAVE PUMP: CONVERSION OF WAVE ENERGY TO CURRENT ENERGY,
Norges Tekniske Hoegskole, Trondheim. Inst. for Anleggsdrift og Havnebygging.
For primary bibliographic entry see Field 8C.
W78-01977

BUOYANT RECTANGULAR SURFACE THERMAL PLUMES,
Old Dominion Univ., Norfolk, VA School of Engineering.
For primary bibliographic entry see Field 5B.
W78-01986

APPARATUS FOR PREVENTING EROSION OF THE SEABED IN FRONT OF HYDRAULIC STRUCTURES,
O. F. Larsen.
U.S. Patent No. 4,030,306, 4 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 997, June 21, 1977.

Descriptors: *Patents, *Beach erosion, *Shore protection, *Coastal structures, *Waves(Water), Ocean waves, Hydraulic structures, Deposition(Sediments).

An apparatus for and methods of preventing erosion of the seabed along vertical or steeply inclined hydraulic structures, such as seawalls, piers, jetties, quays, breakwaters, etc. are described. A slope in front of the hydraulic structure is established by means of a sloping or inclined sheet of flexible or rigid material. The hollow beneath the sheet when in place before the hydraulic structure will be filled by sediment and a stable slope is created which breaks the waves and thereby prevents erosion. The hollow space beneath the inclined sheet will fill automatically with sediment caused by wave action, but in order to speed up the process this hollow may be filled artificially by dumping in sand, gravel, rocks or the like. (Sinha-OEIS)
W78-02127

8C. Hydraulic Machinery

THE UPS AND DOWNS OF STEENBRAS.
Construction in Southern Africa, Vol. 21, No. 6, p 69,73,76, 1976.

Descriptors: *Hydroelectric power, Electrical power, Pumps, Reservoirs, Power demand, Dams, *Pumped storage, Water schemes, Impoundments, Pumping, *South Africa, Cape Town, *Steenbras dam.

The Steenbras pumped storage plant will utilize relatively cheap off-peak power, available at night, to pump water from a lower reservoir to an upper mountain reservoir. During peak demand periods the energy thus stored will be available within minutes through the hydro-el tric pumped storage system. (So African Water In Center)
W78-01831

THE RAND WATER BOARD - DEVELOPMENT AND EXPANSION.
For primary bibliographic entry see Field 5F.
W78-01833

THE WAVE PUMP: CONVERSION OF WAVE ENERGY TO CURRENT ENERGY,
Norges Tekniske Hoegskole, Trondheim. Inst. for Anleggsdrift og Havnebygging.
P. Bruun, and G. Viggosson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13317, p 449-469, November 1977. 18 fig, 9 tab, 16 ref, 1 append.

Descriptors: *Waves(Water), *Ocean waves, *Puerto Rico, *Energy, Energy conversion, Pumps, Currents(Water), Flow, Wave pile-up, Structures, Hydraulic structures, Hydraulic models, Model studies, On-site investigations, Hydraulics.
Identifiers: *Wave pumps, Harbor flushing, Flushing mechanisms.

The Wave Pump converts wave energy to current energy utilizing the momentum of waves which are close to or at the breaking stage. To improve the efficiency of the Pump so that even smaller waves become effective, waves are concentrated in a funnel. Funnel geometry, therefore, is an important parameter. So is the wave height over depth ratio. The effectiveness of the pump is not reduced even if the direction of wave propagation deviates + or - approximately 10 deg from the centerline of the pump. The efficiency of the pump may be further improved by the installation of a ramp at the entrance to the discharge channel. The pump has been tested thoroughly by hydraulic model tests. The first prototype was built at the Palmas Del Mar marina on Puerto Rico as a flushing device in a low tidal range area. It has been in operation for approximately 2 yr. The pump also is useful for flushing of ice in arctic waters. It may be used as an energy producing device on a modest scale. (Sims-ISWS)
W78-01977

PUMP STARTING SYSTEM FOR SEA THERMAL POWER PLANT,
Sea Solar Power, Inc., York, PA. (Assignee).
J. H. Anderson.
U.S. Patent No. 4,030,301, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 959, No 3, p 995, June 21, 1977.

Descriptors: *Patents, *Sea water, *Energy conversion, *Electric power plants, Electric power production, Temperature, Equipment, Turbines, Sea thermal powerplant, Temperature gradient.

In a turbine driven power generating plant of the type using a hydrocarbon or halocarbon as the working fluid operating on or near the surface of an ocean, warm surface water is used as a source of heat for a boiler and cold water pumped from substantial depths is used to condense the working fluid after it has been expanded through the turbine. An auxiliary power source for starting the water pumps of the main system includes a prime mover driving a compressor which in turn supplies a high energy working fluid to a turbine coupled to drive the water pumps. The turbine exhaust after being cooled in a heat exchanger by the cold water pumped from the ocean depths, is returned to the suction side of the compressor. (Sinha-OEIS)
W78-02124

LIBRARY OF THE HYDRAULIC RESEARCH

OCEAN TIDE AND WAVE ENERGY CONVERTER,
J. L. Conn, and G. Spector.
U.S. Patent No. 4,034,231, 5 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 1, p 407, July 5, 1977.

Descriptors: *Patents, *Wave(Water), Ocean waves, Energy conversion, Power generation, Coastal structures, Hydraulic structures, Tidal powerplants.

A machine harnesses the motion of ocean waves in order to convert the motion energy into useful electrical power. The machine consists of a large V-shaped frame, submerged near a beach and having its apex pointed away from the beach. The frame supports a series of water turbines connected to an electric generator so that incoming waves toward the beach move along the outer side of the frame while turning the turbine rotors and the outgoing waves move along the inner side of the frame to likewise influence turning the turbine rotors. (Sinha-OEIS)
W78-02156

8D. Soil Mechanics

ANALYSES OF WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED NEAR GALLIANO, LOUISIANA (LAROSE TO GOLDEN MEADOW, LOUISIANA, HURRICANE PROTECTION PROJECT),
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-01861

PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS,
Bureau of Mines, Spokane, WA Spokane Mining Research Center.
For primary bibliographic entry see Field 5B.
W78-01884

CLOSURE FILL AND SKELETON POWERHOUSE UNITS, THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 319, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No 57-1, May 1965. 92 p, 10 tab, 15 photo, 37 plate, 3 ref, 3 append.

Descriptors: *Hydraulic models, *Hydraulics, *Diversion, *Rock fill, *Dam construction, *Columbia River, Hydraulic structures, Dams, Froude number, Riprap, Draft tubes, Cofferdams, Floods, Prototypes, Model studies, Powerplants.
Identifiers: *Dam closure.

The result of model studies to determine quarry rock size, fill placement procedures, and power house draft tube diversion capacity were reported. It was important that the diversion fill be constructed in the shortest possible time. Tests in the 1:40-scale rock fill model indicated that river closure by means of quarry rock placed in vertical lifts from floating barges or an overhead cableway was practical. A pontoon-type haul road across the powerhouse intake channel was feasible. River diversion could be accomplished by use of rocks weighing 0.5 ton maximum during river flows less than 200,000 cfs. With a 250-ft-wide closure fill, maximum bottom velocities in the model occurred when closure was from 90 to 96% completed and varied from 15 to 17 fps for river flows of 150,000 to 200,000 cfs. Superior hydraulic conditions upstream from the skeleton powerhouse units were obtained when the diversion channel was excavated to elev 60, and the left abutments of a temporary cofferdam and haul road across the diversion channel were retained. Model and prototype velocities showed good agreement during the closure operation; water-surface elevations and heads on the fill varied as much as 2.3 ft. Model-prototype correlation was good after all flow was diverted through the skeleton powerhouse. Tests in the 1:25-scale model of a single skeleton unit showed that the draft tube of original design would not pass the required flow without raising the forebay above the spillway crest. The draft tube that was adopted after the model tests was satisfactory. (Adams-ISWS)
W78-01974

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

FISCAL YEAR 1976/HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01716

FISCAL YEAR 1976/CONTROL TECHNOLOGY RESEARCH PROGRAM ABSTRACTS.
Environmental Protection Agency, Washington, DC. Office of Energy, Minerals and Industry.
For primary bibliographic entry see Field 5G.
W78-01717

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN COLORADO--FISCAL YEAR 1977,
Geological Survey, Lakewood, CO. Water Resources Div.
D. E. Hillier, and J. B. Weeks.
Open-file report 77-532, June 1977. 88 p, 30 fig, 1 plate, 1 tab.

Descriptors: *Water resources, *Investigations, *Colorado, *Projects, Surface waters, Groundwater, Water quality, Hydrologic data, Data collections, Water pollution sources, Coal mine wastes, River basins, Rainfall-runoff relationships, Reservoirs, Water supply, Geothermal studies, Reviews, Evaluation, *US Geological Survey, Missouri River basin, Arkansas River basin, Colorado River basin, Rio Grande basin.

Current water-resources data-collection activities in Colorado are summarized for the 1977 fiscal year. The locations of long-term data-collection stations are shown on a map of the State. Forty-three interpretive hydrologic investigations are summarized: 6 statewide investigations, 6 regional investigations, 11 investigations in the Missouri River basin, 5 investigations in the Arkansas River basin, 2 investigations in the Rio Grande basin, and 13 investigations in the Colorado River basin. The summaries of the investigations consist of a map showing the location of the area of the investigation and a brief description of the investigation's purpose, objective, approach, progress, and plans. (Woodard-USGS)
W78-01858

HISTORICAL REVIEW OF THE INTERNATIONAL WATER-RESOURCES PROGRAM OF THE U.S. GEOLOGICAL SURVEY 1940-70,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 6E.
W78-01866

TENTH ANNUAL WATER RESOURCES RESEARCH CONFERENCE REPORT.
Office of Water Research and Technology, Washington, DC.
Report on Tenth Annual Water Resources Research Conference, April 9-10, 1975, Washington, D.C., Office of Water Research and Technology, U.S. Department of the Interior, 95 p.

Descriptors: *Conferences, *Desalination, *Information exchange, *Water resources development, Water resources, Comprehensive planning, Technical societies, Legislation, Regional development, Planning, Water purification, Research and development, Water quality control, Water quality, Water treatment, Publications, Technology, Data collections.

The theme of the Tenth Annual Water Resources Research Conferences was 'Technology Transfer'. Topics considered in the four plenary sessions include: (1) the Congressional viewpoint regarding the water program, including budgeting and proposed legislation; (2) the Office of Technology Assessment, or technology transfer, designed to provide Congress with its own technical expertise; (3) the recommendations of the 1974 Water Resources Research Advisory Panel; (4) a report of the Joint Advisory Committee of the Department of the Interior and the National Association of State Universities and Land Grant Colleges; and (5) a review of the saline water conversion program, its history and current status. Remarks by regional groups and Title II contractor representatives are also included in the report. Persons from the nationwide water community, representatives concerned with saline water conversion activities, and Directors of State Water Resources Research Institutes attended the conference. Appendices to the conference report contain the conference agenda, a list of conference attendees, a directory of the staff of the Office of Water Research and Technology, and a list of state water resources research institutes. (Mulligan-Florida)
W78-02118

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01860

10C. Secondary Publication And Distribution

UTILIZATION OF MANGROVES: I, (IN FRENCH),
For primary bibliographic entry see Field 2H.
W78-01708

FRESHWATER FINDINGS 1967-1976. RESEARCH PUBLICATIONS OF THE ENVIRONMENTAL RESEARCH LABORATORY, DULUTH, MINNESOTA.
Environmental Research Lab.-Duluth, MN.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 244, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/9-77-005, Compiled by Nichole J. Vick. March 1977. 65 p.

Descriptors: *Technical writing, *Abstracts, *Bibliographies, *Freshwater, Biology, Water pollution effects, Pollutant identification, Environmental research.

This bibliography lists publications authored by personnel of the Environmental Research Laboratory-Duluth (formerly the National Water Quality Laboratory). In addition to scientific materials (journal articles, research reports, and other) published by the laboratory staff, project reports prepared by universities, industries, and other government researchers conducting studies under the funding and direction of this laboratory are listed. The publications are grouped in three sections: (1) reports published by the EPA's (and precursor agencies') research series; (2) journal articles from the scientific literature; (3) and other scientific publications. Each category is subdivided into 1976 publications (annotated) and those published from 1967 through 1975. For each year, publications are listed alphabetically by the senior author's last name, and sources of reprints are identified. Introductory materials include a list of standard abbreviations for scientific journals cited and pertinent components of the EPA and the laboratory. The bibliography concludes with an author index for all entries and a key work index for the 1976 publications. (Dorfman-IPA)
W78-01852

WATER-RESOURCES INVESTIGATIONS IN OREGON, 1977.
Geological Survey, Portland, OR Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01881

WATER-RESOURCES INVESTIGATIONS IN COLORADO, 1977.
Geological Survey, Denver, CO Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-01882

10D. Specialized Information Center Services

PROGRAM OF OPERATION FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-01860

DEVELOPMENT OF CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS),
Arthur D. Little, Inc., Cambridge, MA.
For primary bibliographic entry see Field 05A.
W78-01887

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 6
MARCH 15, 1978

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Some documents abstracted in this journal can be purchased from NTIS. Price codes are given in the entries and a current code-price conversion table is attached to the outside back cover. Other documents are available from originating organizations or authors as indicated in the citation.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 6
MARCH 15, 1978

W78-02201 – W78-02700

e Secretary of the U.S. Department of the Interior has de-
mined that the publication of this periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

COMPRESSIBILITY OF DISTILLED WATER AND SEAWATER,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 2K.
W78-02613

2. WATER CYCLE

2A. General

A COMPARISON BETWEEN CONVENTIONAL AND LANDSAT-BASED HYDROLOGIC MODELING: THE FOUR MILE RUN CASE STUDY,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, T. J. Jackson, W. N. Fitch, and R. P. Shubinski.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-17551, Price codes: A07 in paper copy, A01 in microfiche. Final Report, October 1976. 127 p, 27 fig, 27 tab, 27 ref, 2 append. NASA NSG 5017.

Descriptors: *Model studies, *Remote sensing, *Planning, *Methodology, *Flood control, Aerial photography, Channeling, Detention reservoirs, Watershed management, Hydrology, Discharge(Water), *LANDSAT sensors, *Spectral signature, Spectroreflectance, Land cover.

Many of the models designed to support the hydrologic studies associated with urban water resources planning require input parameters that are defined in terms of land cover. Estimating the land cover is a difficult and expensive task when drainage areas larger than a few sq km are involved. The purpose of the reported investigation was to compare conventional and LANDSAT-based methods for estimating the land cover based input parameters required by hydrologic planning models. Comparisons were based on a case study of the 50.5 sq km (19.5 sq mi) Four Mile Run Watershed in Virginia. Results of the study indicated that the LANDSAT-based approach is highly cost-effective for planning model studies. The conventional approach to define inputs was based on 1:3600 aerial photos, required 110 man-days, and had a total cost of $14,000. The LANDSAT-based approach required 6.9 man-days and cost $2,350. The conventional and LANDSAT-based models gave similar results relative to discharges and estimated annual damages expected from no flood control, channelization, and detention storage alternatives. (Singh-ISWS)
W78-02232

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 4, SYNTHETIC STORMS FOR DESIGN OF URBAN HIGHWAY DRAINAGE FACILITIES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02243

ESTIMATION OF AQUIFER DIFFUSIVITY IN STREAM-AQUIFER SYSTEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 2F.
W78-02250

WISCONSIN, A SUMMARY OF ACTIVITIES AND PLANS OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1977,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02415

THE SOIL MOISTURE COMPONENT OF MATHEMATICAL CATCHMENT SIMULATION MODELS,
Seven-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2G.
W78-02598

2B. Precipitation

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, CO.
J. H. Wagner.
Final Report No. FR-807-55, April 30, 1977. 183 p, 28 fig, 4 append. Submitted to Bureau of Reclamation, Denver, Colo., Div of Atmospheric Water Resources Mgmt. Bur Reclam 14-06-D-7551.

Descriptors: *Data collections, *Precipitation(Atmospheric), Microprocessor, Satellite data collection, Aircraft data collection, *Telemetry, Remote data collection, Digital sensors, Digital data systems, Digital data transmission, Digital data recording, Automatic data collection, LANDSAT data systems, Digital cassette data recording, *Remote sensing, *Networks, Equipment, Instrumentation.

Development is described of an automatic microprocessor based data collection system utilizing VHF telemetry links capable of collecting hydrometeorological data from remote sites distributed over a wide area or in relatively inaccessible terrain. Results of an extensive test program are included along with recommendations for improving the reliability and performance of the system. Detailed schematics for all equipment developed are provided and the operation of each piece of equipment is described. (Bur Reclam)
W78-02228

TRACER AND DIFFUSION AND CLOUD MICROPHYSICAL STUDIES IN THE AMERICAN RIVER BASIN,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W78-02229

WORKSHOP REPORT ON ACID PRECIPITATION AND THE FOREST ECOSYSTEM,
Northeastern Forest Experiment Station, Delaware, OH.
For primary bibliographic entry see Field 5A.
W78-02236

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 3, HYDROLOGIC DATA FOR TWO URBAN HIGHWAY WATERSHEDS IN THE SALT LAKE CITY AREA, UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02242

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 4, SYNTHETIC STORMS FOR DESIGN OF URBAN HIGHWAY DRAINAGE FACILITIES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02243

FLUCTUATIONS OF WET AND DRY YEARS, AN ANALYSIS BY VARIANCE SPECTRUM,
Colorado State Univ., Fort Collins.
V. Yevjevich.
Colorado State University Hydrology Paper No. 94, August 1977. 33 p, 10 fig, 6 tab, 10 ref. NSF ENG 74-17396.

Descriptors: *Precipitation(Atmospheric), *Runoff, *Statistical methods, *Effective precipitation, *Regression analysis, Hydrology, Data processing, Analysis, Equations, Computers, Model studies, *Spectral analysis, Stationary series, Independent series.

The spectral analysis was applied to annual series of precipitation and runoff. The precipitation series were divided into homogeneous and non-homogeneous categories. Runoff series are either the observed runoff series or effective precipitation series obtained as difference between precipitation and evaporation. Data from a large number of precipitation and discharge gaging stations from all over the United States were used in the study and were divided into 6 areas. The techniques of spectral analysis were described in a condensed form. Average spectra were estimated for each of the series types in each of the six areas with the proper tolerance limits drawn around the expected values of average spectral densities of independent series. The analyses indicated that annual precipitation series are very close to independent time series. They are stationary series, at least in terms of 100 to 150 years. Annual runoff and effective precipitation are dependent series, with the average first serial correlation coefficient in the range of 0.1 to 0.2. The first- and second-order autoregressive models of series dependence seem sufficiently accurate for use in practical problems. (Singh-ISWS)
W78-02263

ATMOSPHERIC SIMULATION USING STRATIFIED LIQUID MODELS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 3B.
W78-02267

SUMMARY REPORT, GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS.
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 3B.
W78-02407

GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS,
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 3B.
W78-02408

SEASONAL PATTERNS IN ACIDITY OF PRECIPITATION AND THEIR IMPLICATIONS FOR FOREST STREAM ECOSYSTEMS,
Forest Service (USDA), Durham, NH. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5C.
W78-02455

SUMMER SOLAR RADIATION AND TEMPERATURE IN RELATION TO MONSOON RAINFALL,
Meteorological Office, Poona (India).
G. Ramachandran, and R. R. Kelkar.

Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 1, p 81-84, January 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Rainfall, *Air temperature, *monsoons, *Correlation analysis, Regression analysis, Temperature, Precipitation(Atmospheric), Variability, Solar radiation, Forecasting, Model studies, Meteorology, *India.

An examination of observational records of global and diffuse solar radiation during summer from 1964 to 1972 at all stations was made. The results indicated that year-to-year variations of the mean daily radiation received at the surface is small. Further, these variations are not linked to the variations of sub-divisional rainfall during the subsequent monsoon season. Similar results were obtained from an analysis of sub-divisional mean summer temperatures and monsoon rainfall over the period 1936 to 1965. (Sims-ISWS)
W78-02602

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME I, EXPERIMENTAL RESULTS AND OVERALL SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02603

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME II, PRECIPITATION MEASUREMENTS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02604

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME III, METEOROLOGICAL SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02605

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME IV, RADAR SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02606

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME V, HAIL DECLARATION PROCEDURES AND SEEDING OPERATIONS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02607

THE PAST, PRESENT, AND FUTURE OF THE BIOSPHERE,
M. D. Azevedo.
Actual Biol. 44, p 128-173, 1972.

Descriptors: Arid, *Biosphere, Carbon-14, Energy, Inhibition, Land management, Nitrobacter, Nitrosomonas, Nuclides, Pesticides, Photosynthesis, Pollution, Pseudomonas-denitrificans, Radio, Reproduction, Temperature, Water pollution, Air pollution.

The balance of energy consumed in respiration and energy fixed in production of organic matter is of concern. Water is a main ecological importance in minimizing temperature variations, as well as a support for aquatic life and a component of metabolic phenomena. The effect of cultivation of arid lands has not been well studied. Photosyntheses and biological photolysis of water are the main source of O2 in the atmosphere. Ozone impedes passage of UV radiation. O2 is also released by microorganisms metabolizing nitrates and sulfates. The evolution of the biosphere from a primordial reducing atmosphere is discussed. The equilibrium of CO2 liberated during respiration and CO2 consumed during photosynthesis is vital to the C cycle. Concentrations of 14C in the air and dissolved in sea water has been of great interest in recent years. One of the main interventions man has made in biospheric cycles is fixation of N, which constituted 79% of the biosphere. The equilibrium between fixation by synthetic fertilizers and liberation of N2 from organic compost by microorganisms is vital. N fixation requires vast amounts of energy. Microorganisms such as Nitrosomonas, Nitrobacter, and Pseudomonas dentrificans are involved in transformation. Pollution of the atmosphere with combustion products, radionuclides and pesticides, and disruption of the O2 and CO2 equilibria require remidies and controls. The mutagenic effects of radiation and inhibition of reproduction by many pesticides are of particular concern. Curbs on technology and constructions of nuclear energy centers, in particular, are urged in order to restore the equilibria of the biosphere for the future.--Copyright 1974, Biological Abstracts, Inc.
W78-02654

2C. Snow, Ice, and Frost

DESIGN CONSIDERATIONS FOR SAMPLING PROGRAMS IN REMOTE AREAS,
Alaska Univ. College.
For primary bibliographic entry see Field 7A.
W78-02235

THERMAL REGIME OF AN EARTH DAM BUILT ON A PERMAFROST BASE DURING CONSTRUCTION AND INITIAL OPERATION,
Gorkovskii Inzhenerno-Stroitelnyi Inst. (USSR).
For primary bibliographic entry see Field 8D.
W78-02237

GEOCHEMICAL INVESTIGATIONS OF ICE SHEETS IN MIZUHO PLATEAU AND WEST ENDERBY LAND,
Muroran Inst. of Technology, Hokkaido (Japan).
M. Muromizu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 311, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 543, September 1976. 21 p, 2 fig, 24 tab. Translated from Japan Antarctic Record, Vol 54, p 49-67, December 1975.

Descriptors: *Antarctic, *Ice, *Chemical analysis, *Sampling, Cold regions, Snow, Snowpacks, Chemicals, Dusts, Sodium, Potassium, Magnesium, Calcium, Silicates, Analytical techniques, Chemistry, Ice sheets, Condensation nuclei.

Chemical features and profiles of ice sheets in Mizuho Plateau and West Enderby Land (Antarctica) were revealed by means of newly developed analytical techniques such as atomic absorption spectrophotometry and isotope dilution mass-spectrometry. The chemical concentration is at the level of only ppb, even for the major components, Na, K, Ca and Mg, chemical properties being homogeneous in the surface sheet but of much vertical complexity. Silicate dusts which functioned as the condensation nuclei for the formation of snow flakes are poor, while sea salts account for more than 90% of the total weight of components. Annual accumulation of chemical components, micrograms/sq cm, is 0.1 for silicate dusts and 0.40, 0.03, 0.1 and 0.06 for Na, K, Mg and Ca originating in the latter source. (Sims-ISWS)
W78-02239

ICE RIDGE FORMATION: PROBABLE CONTROL BY NEARSHORE BARS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. Seibel, C. T. Carlson, and J. W. Maresca, Jr.
Journal of Great Lakes Research, Vol 2, No 2, p 384-392, December 1976. 4 fig, 2 tab, 13 ref.

Descriptors: *Ice, *Shores, *Great Lakes, *Lake Michigan, On-site investigations, Photography, Ice lakes, Lakes, Ice breakup, Erosion, Sediments, Data processing, Geomorphology, Limnology, *Ice ridges, Offshore bars, Breaker zones.

During the 1973-1974 winter season, a time-lapse photographic system was used to provide a nearly continuous record of ice conditions along a segment of the southeastern Lake Michigan shoreline. By analysis of the photographs, a typical sequence of nearshore ice formation through break-up was identified. From the record of nearshore ice formation, a three-element mechanism for the development of the near-shore ice ridges in the vicinity of the study site was formulated. A quantitative analysis of the photographs was used to test and subsequently to verify the hypothesis that the nearshore ice ridges, offshore bars, and breaker zones are coincident in location at approximately 40, 105, and 205 meters from the water's edge. Observations revealed that large quantities of sediment are incorporated into the nearshore ice, and that the nearshore ice ridges are grounded on the nearshore bottom in the proximity of the offshore bars. It is believed that the grounded nearshore ice ridges simultaneously modify the nearshore topography and protect the shoreline and bluffline from erosion by winter storms. The degree to which the nearshore is protected or modified has not yet been established. (Sims-ISWS)
W78-02254

SUMMARY REPORT, GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS.
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 3B.
W78-02407

GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS,
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 3B.
W78-02408

RECONNAISSANCE HYDROLOGY OF PORTAGE GLACIER BASIN, ALASKA--1972,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02414

HYDROLOGIC RECONNAISSANCE OF THE EASTERN NORTH SLOPE, ALASKA, 1975,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02424

MICROBIOLOGICAL STUDIES OF THE WANDA LAKE (ANTARCTICA), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Mikrobiologii.

For primary bibliographic entry see Field 5C.
W78-02469

NEW TECHNOLOGY OF DRILLING WELLS IN PERMAFROST: CHAPTER 6, DRILLING WITH SIMULTANEOUS FREEZING OF WET, LOOSE ROCKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 8B.
W78-02544

GEOMETRY AND DYNAMICS OF A SURGE-TYPE GLACIER,
Washington Univ., Seattle. Geophysics Program.
R. Bindschadler, W. D. Harrison, C. F. Raymond, and R. Crosson.
Journal of Glaciology, Vol 18, No 79, p 181-194, 1977. 10 fig, 1 tab, 28 ref. NSF GA-36039, GA-36040.

Descriptors: *Glaciers, *Alaska, *Movement, *Ice, Glaciology, Seismic studies, Travel time, Profiles, Stress, Shear stress, On-site investigations, On-site data collections, Temperate, Dimensions, Width, Depth, Size, Measurement, Evaluation, Surveys, Velocity, *Variegated glacier, Surge-type glaciers, Mass balance.

Measurements of geometry, motion, and mass balance from Variegated Glacier, Alaska, portrayed conditions in this surge-type glacier close to the mid-point of its 20 year surge cycle. Comparison of longitudinal profiles of ice depth, surface slope, and surface speed indicated that the motion occurs largely by internal deformation, assuming the ice deforms according to the experimental law of Glen. Surface speed is not noticeably affected by local surface slope on the scale of the ice thickness or smaller, but speed correlates well with slope determined on a longitudinal averaging scale about one order of magnitude larger than the ice depth. The rate of motion on Variegated Glacier agrees well with rates on non-surge type temperate glaciers which have similar depth and slope. Although the flow regime at the time of the measurements is apparently typical of temperate glaciers, a large discrepancy between the balance flux needed for steady-state and the actual flux is indicative of a rapidly changing surface elevation profile and internal stress distribution. On Variegated Glacier and other surge-type glaciers, the course of thickening and steepening which would eventually lead to a steady-state geometry and flow by normal processes is interrupted by the catastrophic instability which leads to the surge. (Humphreys-ISWS)
W78-02579

MICROWAVE EMISSIVITY AND ACCUMULATION RATE OF POLAR FIRN,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
H. J. Zwally.
Journal of Glaciology, Vol. 18, No. 79, p 195-215, 1977. 9 fig, 5 tab, 17 ref.

Descriptors: *Snow, *Firn, *Mathematical studies, *Microwaves, Theoretical analysis, Mathematical models, Analytical techniques, Crystals, Polar regions, Temperature, Remote sensing, Snowfall, Measurement, Emissivity, Radiative transfer, Accumulation rate.

Radiative transfer theory was formulated in terms of a radiative transfer function. An effective physical temperature was defined and used to define a generagl bulk emissivity. An approximate radiative transfer function, which is valid if the volume scattering is small relative to the absorption, was used to calculate the brightness temperature, effective physical temperature, and emissivity in order to illustrate the effects of various absorption and scattering coefficients and temperature variations. It also was used to calculate emissivities based on snow crystal size measurements for comparison with observed emissivities and to estimate the sensitivity of the emissivity to changes in the snow characteristics. An appropriate quantity for comparing calculations and observations is the mean emissivity. The agreement between the observed emissivities at seven locations and the calculated emissivities using one empirical parameter showed that the crystal size variation with depth is a primary parameter influencing the microwave emission of dry polar firn. The estimated sensitivities of the emissivity are such that, given an independent mean surface temperature to an accuracy of 1 K and a radiometer accuracy of 1 K, the accumulation rate should be measurable to an accuracy of the order of 20% at most locations. The importance of a satellite measurement of accumulation will be in the capability to interpolate or extrapolate spatial patterns relative to locations of accurate surface measurements. (Humphreys-ISWS)
W78-02580

PHASE-SENSITIVE RADIO-ECHO SOUNDING AT THE DEVON ISLAND ICE CAP, CANADA,
Bristol Univ. (England). H. H. Wills Physics Lab.
M. E. R. Walford, P. C. Holdorf, and R. G. Oakberg.
Journal of Glaciology, Vol. 18, No. 79, p 217-229, 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Sounding, *Glaciology, *Instrumentation, *Canada, Ice, On-site tests, On-site investigations, Radio waves, Surveys, Monitoring, Networks, Theoretical analysis, Measurement, Testing procedures, Exploration, Analytical techniques, *Devon Island(Canada), Radio-echo sounding.

A radio-echo sounder was built with which both the amplitude and phase of radio echoes can be measured. In experiments with the instrument at the Devon Island ice cap in the Canadian Northern Territories, precise amplitude and phase measurements were made upon radio echoes from the bed of the ice cap. If the measurements are repeated after a number of years, the results, considered in conjuction with snow accumulation and compaction data, will be interpretable as a long-term change in the thickness of the ice cap. Wave dislocations and bend points were observed in radio echoes reflected from the bed. It was suggested that amplitude and phase measurements from a network of sites may be synthesized in order to explore the geometry of the reflecting surface on a fine scale. (Humphreys-ISWS)
W78-02581

MIGRATION OF INSOLUBLE AND SOLUBLE IMPURITIES IN TEMPERATE ICE: STUDY OF A VERTICAL ICE PROFILE THROUGH THE GLACIER DU MONT DE LANS (FRENCH ALPS),
Grenoble-1 Univ. (France). Inst. de Geographie Alpine.
M. Ricq-de Bouard.
Journal of Glaciology, Vol 18, No 79, p 231-238, 1977. 4 fig, 3 tab, 8 ref.

Descriptors: *Glaciers, *Mineralogy, *Profiles, *Surveys, Ice, Chemical properties, Temperate, Alpine, Foreign countries, Foreign research, Sampling, Analysis, Sodium, Calcium, Potassium, Magnesium, On-site investigations, On-site data collections, Cations, Leaching, *France, *Glacier du Mont de Lans.

Ice samples representing at least some twenty years' accumulation, were collected from a crevasse wall at 3,200 m (Glacier du Mont de Lans, Massif de l'Oisans), with a view to studying the behavior of soluble and insoluble impurities in temperate ice. The stratification of the ice from the surface to 2 m and the disappearance of this stratification below 2 m were attributed to a variation in the glacier regime on both sides of the equilibrium line, rather than to a variation in the conditions of deposit of solid debris on the glacier surface, the strata do not necessarily correspond to an annual accumulation. Mineralogical analysis of the solid particles showed two kinds of deposit: that consisting of the local Alpine material (hornblende) and that consisting of a mixture of local material and red sand of Saharan origin (anatase). A study of the distribution of major cations (Na, K, Mg, Ca) along a profile revealed the existence of a process of leaching which follows an exponential law to a first approximation. The leaching produces a rapid evolution in the chemical properties of the ice compared with those of the original precipitation. (Humphreys-ISWS)
W78-02582

GLACIOLOGICAL PROBLEMS SET BY THE CONTROL OF DANGEROUS LAKES IN CORDILLERA BLANCA, PERU. I. HISTORICAL FAILURES OF MORAINIC DAMS, THEIR CAUSES AND PREVENTION,
Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie.
L. Lliboutry, B. Morales Arnao, A. Pautre, and B. Schneider.
Journal of Glaciology, Vol 18, No 79, p 239-254, 1977. 10 fig, 26 ref.

Descriptors: *Solifluction, *Disasters, *Lakes, *Glaciology, *South America, History, Dam failure, Mudflows, Glaciers, Ice, Glacial drift, Dams, Debris avalanches, Avalanches, Lake morphology, Geomorphology, Movement, Erosion, Data collections, Foreign countries, *Peru, *Cordillera Blanca(Peru), Proglacial lakes, Moraimic dams.

The retreat of glaciers since 1927 in Cordillera Blanca has produced dangerous lakes at the front of many glaciers. All the known data, most of them unpublished, were reviewed. The known aluviones were listed, and those of Chavin, Quebrada Los Cedros, and Artesoncocha described in full. In the three mentioned cases a breach in the front moraine came from big ice falls into the lake. The protective devices made on the outlets were described, as well as the effects of the big earthquake on 31 May 1970. In the case of Laguna Paron, which keeps its level thanks to infiltrations, the fluctuations of the discharge of the springs as related to the level of the lake from 1955 to 1969 were reported. The projects for lowering the level of Laguna Paron and for emptying Safuna Alta were described. The latter partially emptied by piping after the earthquake, allowing a final solution. (See also W78-02584 and W78-02585) (Humphreys-ISWS)
W78-02583

GLACIOLOGICAL PROBLEMS SET BY THE CONTROL OF DANGEROUS LAKES IN CORDILLERA BLANCA, PERU. II. MOVEMENT OF A COVERED GLACIER EMBEDDED WITHIN A ROCK GLACIER,
Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie.
L. Lliboutry.
Journal of Glaciology, Vol 18, No 79, p 255-273, 1977. 13 fig, 5 tab, 13 ref.

Descriptors: *Glaciers, *South America, *On-site investigations, *Model studies, Glaciology, Ice, Mathematical models, Creep, Data collections, Movement, Velocity, Glacial drift, Surveys, On-site data collections, Analytical techniques, Springs, Discharge(Water), Melt water, Electrical properties, Resistivity, Exploration, Ablation, Deformation, Physical properties, Lakes, *Peru, *Cordillera Blanca(Peru), *Glaciar Hatunraju.

In front of Laguna Paron there is a huge moraine which turns through 90 deg in the middle of the valley and with a narrow covered glacier on the top. It has been studied by electrical exploration and by using the displacements of 43 marked boul-

ders on the glacier. Assuming a uniform balance on the glacier tongue and semi-elliptical cross sections, it has been possible to estimate the balance and the glacier thickness. A great amount of the measured velocity comes from the creep of the moraine itself, which seems to be a kind of rock glacier, probably without interstitial ice. It must have taken all the Holocene for the moraine to be formed. During its complex history, a proglacial lake must have formed at some time, the rupture of which explains the crooked form. (See also W78-02583 and W78-02585) (Humphreys-ISWS)
W78-02584

GLACIOLOGICAL PROBLEMS SET BY THE CONTROL OF DANGEROUS LAKES IN CORDILLERA BLANCA, PERU. III. STUDY OF MORAINES AND MASS BALANCES AT SAFUNA,
Centre National de la Recherche Scientifique, Grenoble (France). Lab. de Glaciologie.
L. Lliboutry, B. Morales Arnao, and B. Schneider.
Journal of Glaciology, Vol 18, No 79, p 275-290, 1977. 11 fig, 6 tab, 15 ref.

Descriptors: *Glacial drift, *South America, *Glaciers, *Geomorphology, Ice, Exploration, Glaciology, On-site investigations, Surveys, Analytical techniques, Analysis, Ablation, Movement, Velocity, Precipitation(Atmospheric), Climatic data, Climatology, Foreign countries, Air temperature, *Peru, *Cordillera Blanca(Peru), Mass balance.

The authors explained how preliminary results concerning the internal constitution of the big push moraine at Safuna were obtained in 1967. Cross sections which were obtained later through electrical and seismic exploration and arduous borings were given. Under the lake Safuna Alta there exists a layer of dead ice which is probably a remnant from an old glacier advance and over which the active glacier slides, but the dead ice does not extend into the push moraine. Since 1950, Safuna Alta has formed, the glacier tongue has lowered by 0.8 m per year on average, and the big push moraine has moved and settled. The annual balance on the glacier tongue was measured in 1968. It increases by 3.9 m of ice per 100 m in altitude. The discharge of ice near the lake and the annual balance further up-valley allow an estimate of the mean annual balance in the accumulartion zone (between 4,850 and 6,020 m) at 2.30 m of water per year. Until now no annual precipitation higher than 1 m/year had been measured in Cordillera Blanca, but this Cordillera includes many meso-climates. Eight successive moraines are found at Safuna. They are tentatively correlated with the eight existing between Huaraz and Laguna Llaca. Clapperton's 'group 4' was not formed during the 20th, but during the 17th century. His 'group 3' is not from A.D. 1750-1800, but is 5,000 to 7,000 years old, according to the offset of Cordillera Blanca great fault. (See also W78-02583 and W78-02584) (Humphreys-ISWS)
W78-02585

EXPERIMENTS ON THE ORIGIN OF KETTLE-HOLES,
University Coll., London, (England). Dept. of Geography.
J. K. Maizels.
Journal of Glaciology, Vol 18, No 79, p 291-303, 1977. 9 fig, 1 tab, 27 ref.

Descriptors: *Geomorphology, *Glaciology, *Potholes, *Laboratory tests, Ice, Glacial drift, Melting, Land forming, Model studies, Melt water, Land subsidence, Erosion, Topography, Analytical techniques, Foreign research, *Kettle-holes.

Several theories exist on the origin of kettle-holes in pro-glacial outwash deposits. The most widely accepted theory of origin involves the melting of buried ice. Some experiments were carried out in which ice blocks were placed on or in outwash sediments in a tank in order to determine which mechanisms of ice melt would be most likely to give rise to kettle-hole features. The largest kettle-holes were produced by the melting of buried ice blocks; smaller transient depressions, were formed from ice blocks melting in streams of flowing water; while, rather than depressions, ridges resembling pingos and moraines were created by ice blocks melting on a dry or saturated gravel surface. (Humphreys-ISWS)
W78-02586

SOUTHWARD DISPLACEMENT OF THE DISTRIBUTION OF GLACIATION DURING THE THREE MAXIMA OF THE LAST ICE AGE,
Stockholm Univ. (Sweden). Geologiska Institutionen.
N.-A. Morner.
Journal of Glaciology, Vol 18, No 79, p 305-308, 1977. 1 fig, 19 ref.

Descriptors: *Glaciation, *Geologic history, *Evaluation, Ice, Glaciology, Glacial drift, History, Pleistocene epoch, Last ice age, Laurentide ice sheet, Fennoscandian ice sheet.

The Laurentide and Fennoscandian ice sheets had three major glacition maxima during the Last Ice Age. All data from the southern margins of the ice sheets indicate that these maxima, as wells as minor fluctuations, were synchronous. The same synchroneity is supposed to apply also for correlations between fluctuations on the north and south margins, which reveal a continuously southward displacement of the distribution of glaciation during the Last Ice Age. This southward displacement explains the sawtooth pattern of 018 records from deep sea cores in which the first glaciation maximum is under-represented due to its distribution more towards the north. The synchroneity is consistent with a global climatic control of the stadial/interstadial changes and with the recorded global eustatic changes. The southward displacement of glaciation seems to be a general rule also applicable to earlier Pleistocene glaciations. (Humphreys-ISWS)
W78-02587

PLEISTOCENE MOUNTAIN GLACIATION IN ETHIOPIA,
Wisconsin Univ.-Madison. Dept. of Meteorology.
S. Hastenrath.
Journal of Glaciology, Vol 18, No 79, p 309-313, 1977. 4 fig, 9 ref.

Descriptors: *Glaciation, *Africa, *Geomorphology, Pleistocene epoch, Glacial drift, Surveys, On-site investigations, Exploration, Cirques, *Ethiopia.

During a field survey in High Semyen, northern Ethiopia, two moraine complexes were mapped, the lower one extending down to around 3,750 m. Glacial morphology is best developed in the northwestern and western quadrants. Moraines are deeply weathered and carry abundant vegetation. For Mounts Badda, Cilalo, Cacca, and Enguolo in southern Ethiopia, possible moraines are inferred from air photographs; there are indications for more pronounced glaciation in the western quadrant, and moraines seem to extend further down than in High Semyen. Highest moraines at Mount Elgon in northern Kenya, Uganda, were found to below 3,600 m. Major moraine complexes in the mountains of Ethiopia and East Africa suggest some spatial correlation in elevation and appearance, but absolute dates are absent. (Humphreys-ISWS)
W78-02588

TECHNIQUE FOR STUDYING STRUCTURE OF SEA ICE,
National Research Council of Canada, Ottawa (Ontario), Div. of Building Research.
N. K. Sinha.
Journal of Glaciology, Vol 18, No 79, p 315-323, 1977. 9 fig, 10 ref.

Descriptors: *Sea ice, *Laboratory tests, *Analytical techniques, Microscopy, Methodology, Instrumentation, Structures, Physical properties, *Microtoming, Microtechniques, Specimen preparation.

A microtoming and replicating technique was developed for examining the microstructure of sea ice optically and by scanning electron microscope. The dual observation method is useful for studying the grain and sub-grain structure of sea ice, the nature of the brine pockets, and the precipitation pattern of the salt crystals at low temperatures. (Humphreys-ISWS)
W78-02589

THE DISTRIBUTION OF GLACIERS IN THE ROCKY MOUNTAINS OF THE UNITED STATES,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Journal of Glaciology, Vol 18, No 79, p 325-328, 1977. 1 fig, 1 tab, 12 ref.

Descriptors: *Glaciers, *Census, *Montana, *Wyoming, *Colorado, *Rocky Mountain Region, Ice, Size, Data collections, Surveys, Spatial distribution, Distribution.

Evidence from aerial photographs, maps, and field checks indicated that 319 glaciers lie in cirques of the Rocky Mountains, south of the United States-Canadian border. On a subcontinental scale, the distribution of glaciers is highly clustered, with larger and denser clusters located in the northern Rocky Mountains. Lesser concentrations of small glaciers occur in the southern Rocky Mountains. The total area of glaciers in the Rocky Mountains of the USA is 78.9 km. (Humphreys-ISWS)
W78-02590

AN ERROR IN ICE-TEMPERATURE MEASUREMENT,
British Antarctic Survey, Cambridge (England).
T. J. O. Sanderson.
Journal of Glaciology, Vol 18, No 79, p 329-333, 1977. 1 fig, 2 tab, 13 ref.

Descriptors: *Glaciers, *Temperature, *Measurement, *Mathematical models, Ice, Theoretical analysis, Polar regions, Equations, Boreholes, Heat flow, Variability, Thermal conductivity, Measurement error.

An analysis was made of the disturbance in conductive heat flow caused by drilling borehole in ice in which there is a vertical temperature gradient. The model used is that of a perfectly insulating hole placed in a linear temperature gradient; it was shown that the temperature measured at the bottom of the hole deviates from its value before drilling by an amount of the order -0.6aU where a is the borehole radius and U is the temperature gradient. The deviation takes effect in a few hours. The error is typically between 0.005 and 0.1 deg and, therefore, is significant only where very high accuracy is required. The error should not be present in temperate glaciers, nor where the thermometer is properly frozen in, nor if temperatures are measured at the borehole walls far above the bottom. (Humphreys-ISWS)
W78-02591

A COMPARISON OF THE CRREL 500 CU CM TUBE AND THE ILTS 200 AND 100 CU CM BOX CUTTERS USED FOR DETERMINING SNOW DENSITIES,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
T. Carroll.
Journal of Glaciology, Vol 18, No 79, p 334-337, 1977. 1 fig, 1 tab, 7 ref. USBR 14-06-7155-3.

Descriptors: *Snow, *Density, *Measurement, Sampling, On-site tests, Instrumentation, Analytical techniques, Analysis.

The study indicated that no significant difference in snow densities is found when using either the CRREL (Cold Regions Research and Engineering Laboratory) tube or the ILTS (Institute of Low Temperature Science), Sapporo, Japan, box cutters. However, inexperienced workers tend to overestimate snow densities in light snow and depth hoar by 6 and 4% respectively. (Humphreys-ISWS)
W78-02592

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME I, EXPERIMENTAL RESULTS AND OVERALL SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02603

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME II, PRECIPITATION MEASUREMENTS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 3B.
W78-02604

2D. Evaporation and Transpiration

ECOLOGICAL-GEOGRAPHIC CHARACTERISTICS OF TREE TRANSPIRATION, (IN RUSSIAN),
O. N. Solntseva, and V. I. Sutulova.
Ekologiya 6(6), p 86-89, 1975.

Descriptors: *Transpiration(Trees), *Heat-moisture ratio(Trees), Aspen, Birch, Deserts, *Ecological distribution, Elm, Forests, Geography, Lime, Oak, Pine, Red ash, Norway maple.

Transpiration intensity of aspen, Norway maple, common birch, red ash, small-leaved lime, Scots pine, Norway spruce, pedunculate oak and common elm growing in forest, forest-steppe, steppe and semi-desert was studied. Dispersion data showed a decrease in transpiration intensity for most species toward the south. Environmental conditions had the least effect on elm and the highest on aspen and maple transpiration. The effect on birch, ash, lime, pine, spruce and oak decreased from 63-39%, respectively. Correlation between transpiration intensity and specific properties was highest in areas with high moisture supply and lowest in areas where the heat-moisture ratio was close to 1.--Copyright 1977, Biological Abstracts, Inc.
W78-02425

HEAT BALANCE IN A SMALL COASTAL INLET PAUATAHANUI INLET, NORTH ISLAND, NEW ZEALAND,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
For primary bibliographic entry see Field 2L.
W78-02596

SUMMER SOLAR RADIATION AND TEMPERATURE IN RELATION TO MONSOON RAINFALL,
Meteorological Office, Poona (India).
For primary bibliographic entry see Field 2B.
W78-02602

2E. Streamflow and Runoff

THE MOVEMENT OF SUSPENDED PARTICLES DUE TO SUDDEN RELEASE OF WATER FROM A LONG PRISMATIC FLUME,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 8B.
W78-02205

A COMPARISON BETWEEN CONVENTIONAL AND LANDSAT-BASED HYDROLOGIC MODELING: THE FOUR MILE RUN CASE STUDY,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-02232

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 1, COMPUTER ANALYSIS OF RUNOFF FROM URBAN HIGHWAY WATERSHEDS UNDER TIME-AND SPACE-VARYING RAINSTORMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02240

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 2, LABORATORY STUDIES OF THE RESISTANCE COEFFICIENT FOR SHEET FLOWS OVER NATURAL TURF SURFACES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02241

ENVIRONMENTAL MODEL OF KISSIMMEE RIVER BASIN,
Rice Univ., Houston, TX. Dept. of Environmental Science and Engineering.
For primary bibliographic entry see Field 5B.
W78-02258

FLUCTUATIONS OF WET AND DRY YEARS, AN ANALYSIS BY VARIANCE SPECTRUM,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2B.
W78-02263

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02416

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR URBAN STREAMS, METROPOLITAN ATLANTA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02423

MAP SHOWING DRAINAGE BASINS AND LOCATION OF STREAMFLOW-MEASURING SITES, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02431

TECHNIQUES FOR ESTIMATING FLOOD DISCHARGES FOR OKLAHOMA STREAMS,
Geological Survey, Reston, VA; and Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02436

THE SOIL MOISTURE COMPONENT OF MATHEMATICAL CATCHMENT SIMULATION MODELS,
Seven-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2G.
W78-02598

PLANNING FOR URBAN STORMWATER CONTROL, (PART III),
Fell, Brusso, Bruton and Knowles, Inc., Tulsa, OK.
For primary bibliographic entry see Field 5G.
W78-02660

2F. Groundwater

ESTIMATION OF AQUIFER DIFFUSIVITY IN STREAM-AQUIFER SYSTEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
S. R. Singh, and B. Sagar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY11, Proceedings Paper 13362, p 1293-1302, November 1977. 1 fig, 2 tab, 18 ref.

Descriptors: *Diffusivity, *Aquifers, *Groundwater, *Mathematical models, *Streams, Equations, Hydrographs, Model studies, Aquifer characteristics, Water levels, Hydraulic gradient, *Boussinesq equation, *Sand tank models, Spline method.

By specifying an extra boundary condition in terms of hydraulic gradient at the stream-aquifer interface and by using the Green's function of the linearized Boussinesq equation, analytical solutions were developed to determine aquifer diffusivity explicily. Four different types of Dirichlet boundary condition describing stream gage hydrographs were empolyed. They were: (1) linearly rising water level in the stream; (2) exponentially rising water level in the stream; (3) water level represented by a sinusoid; and (4) hydrographs approximated by cubic splines. The last one is quite general and is capable of analyzing different shapes of smooth stream hydrographs expected to occur in nature. Hydraulic gradient at the interface was computed using splines. The solutions were validated by analyzing the stream-aquifer data observed in a sand tank model. They yielded consistent values of the aquifer diffusivity at different times and, therfore, are useful in determining the parameter of the aquifers contiguous to streams. (Visocky-ISWS)
W78-02250

GROUND WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE PORTLAND AREA, MAINE,
Geological Survey, Augusta, ME. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02413

SOLUTION OF THREE-DIMENSIONAL GROUND-WATER FLOW EQUATIONS USING THE STRONGLY IMPLICIT PROCEDURE,
Geological Survey, Reston, VA. Water Resources Div.
P. C. Trescott, and S. P. Larson.
Journal of Hydrology, Vol 35, No 1/2, p 49-60, October 1977. 6 fig, 17 ref, append.

Descriptors: *Model studies, *Groundwater movement, *Aquifer characteristics, *Numerical analysis, *Computer programs, Hydrogeology, Leakage, Hydraulic conductivity, FORTRAN IV, Finite-difference methods, Three-dimensional model.

A three-dimensional numerical model has been coded to use the strongly implicit procedure for solving the finite-difference approximations to the ground-water flow equation. The model allows for: (1) the representation of each aquifer and each confining bed by several layers; and (2) the use of an anisotropic hydraulic conductivity at each finite-difference block. The model is compared with a previously developed quasi-three-dimensional model by simulating the steady-state flow in an aquifer system in the Piceance Creek Basin, Colorado. The aquifer system consists of two aquifers separated by a leaky confining bed. The upper aquifer receives recharge from precipitation and is hydraulically connected to streams. In order to make a valid comparison of results, a single layer was used to represent each aquifer. The need for a layer to represent the confining bed was eliminated by incorporating the effects of vertical leakage into the vertical component of the anisotropic hydraulic conductivity of the adjacent aquifers. Thus, the problem was represented by only two layers in each model with a total of about 2,100 equations. This restricted the effects of flow in the confining layer to the vertical component, but simulations with a third layer in the three-dimensional model permitting horizontal flow in the confining bed show that the two-layer approach is reasonable. Convergence to a solution of this problem takes about one minute of computer time on the IBM/155. This is about 30 times faster than the time required using the quasi-three-dimensional model. (Woodard-USGS)
W78-02428

GROUND-WATER DATA FOR THE DREWSEY RESOURCE AREA, HARNEY AND MALHEUR COUNTIES, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02430

PARTIALLY-SATURATED TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Montana Univ., Missoula. Dept. of Water and Land Resources.
For primary bibliographic entry see Field 2G.
W78-02453

INVESTIGATIONS OF THE DUNES GEOTHERMAL ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART 1, GEOCHEMISTRY OF GEOTHERMAL FLUIDS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
T. B. Coplen, and P. Kolesar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 221, Price codes: A02 in paper copy, A01 in microfiche. August, 1974. 25 p, 3 fig, 18 ref.

Descriptors: *Geothermal studies, *Thermal water, *Geochemistry, Chlorides, Temperature, Stable isotopes, Dissolved solids, Salts, Wells, Brines, Aquifers, Fluid flow, *Salton Sea(California), Colorado River, Bromides.

In order to perform geochemical analyses of the Dunes Geothermal Anomaly in the Imperial Valley of California, the California Department of Water Resources drilled a 612-meter deep test well at the anomaly; fluid samples were subsequently studied by investigators at University of California, Riverside. Chemical and isotopic analysis of samples taken from perforations at 109 and 260 meters suggests that the source of the geothermal fluid is partially evaporated Colorado River water. Further investigation of chloride/bromide ratios indicates that the salt in the Salton Sea geothermal system is derived from the Colorado River, and that this water has not done any leaching nor been mixed with water from other sources. Additional geophysical studies are suggested to locate more precisely the reservoir of geothermal fluid in the Dunes area. (See also W78-02536) (Eberle-NWWA)
W78-02535

INVESTIGATIONS OF THE DUNES ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART II, PETROLOGICAL STUDIES,
California Univ., Riverside. Dept. of Earth Sciences.
W. A. Elders, and D. K. Bird.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 222, Price codes: A02 in paper copy, A01 in microfiche. June, 1974. 14 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Geothermal studies, *Diagenesis, Sandstones, Brines, Heat flow, Geophysics, Surveys, Sedimentary rocks, Quartz, Shales, Permeability, *Salton Trough(California), *Silicification, Hydrothermal processes.

Several localized areas of very high temperature gradients at shallow depth occur within the Salton Trough, the landward extension of the Gulf of California rift system. A 612 meter deep test-well in the Dunes Anomaly indicates that there have been various stages of hydrothermal and diagenetic alteration of the silicified detaic sediments penetrated. Dense cap rock has developed in which seven distinct zones of intensive silicification were observed; highest temperatures recorded are all within shales and intensively silicified sands of low permeability. Evidence suggests that silicification was episodic. It appears that when moderately hot brines encountered colder rocks, precipitation of quartz and feldspar made the rocks impermeable; any further flow through such rocks was through later fractures. Thus, water-dominated systems which operate in porous sandstone are essentially self-sealing, and may have no surface expression. The silica cap rock nonetheless remains a good exploration target for geophysical surveys. (See also W78-02535) (Eberle-NWWA)
W78-02536

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5E.
W78-02537

SIMILARITY SOLUTIONS FOR CONVECTION OF GROUNDWATER ADJACENT TO HORIZONTAL IMPERMEABLE SURFACES WITH AXISYMMETRIC TEMPERATURE DISTRIBUTION
Hawaii Univ., Honolulu. Dept. of Mechanical Engineering.
P. Cheng, and W. C. Chau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 559, Price codes: A03 in paper copy, A01 in microfiche. Hawaii Geothermal Project Technical Report No. 14, April, 1976. 20 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Geothermal studies, *Convection, Groundwater, Flow, Permeability, Mathematics, Numerical analysis, Boundaries(Surfaces), Heat transfer, *Porous media, Axisymmetric temperature distribution.

The prediction of heat transfer rate from a heated or cooled horizontal surface to surrounding ground water has important applications to the assessment of geothermal resources and the design of a geothermal power plant. The problem can be idealized as a horizontal flat plate embedded in a saturated porous medium of infinite extent. Convection in a saturated porous medium and in an incompressible fluid have much in common, thus, it can be conjectured that convective heat transfer in a porous medium at high Rayleigh numbers takes place in a thin layer adjacent to the heated and cooled surfaces. In this paper, the axisymetric buoyancy induced flow in a saturated porous medium above a heated or below a cooled horizontal impermeable surface with prescribed wall temperature being a power function of the radius is studied. Using boundary layer simplifications, the governing non-linear partial differential equations can be transformed into a coupled pair of non-linear ordinary differential equations with two-point boundary conditions that can be integrated numerically by established techniques. Algebraic expressions obtained are useful for a quick estimate of geothermal resources in a given area. (Eberle-NWWA)
W78-02539

NEW SOURCES OF ENERGY: PROCEEDINGS OF THE CONFERENCE, VOLS. 2 AND 3, GEOTHERMAL ENERGY.
United Nations, New York.
For primary bibliographic entry see Field 4B.
W78-02541

GOVERNING EQUATIONS FOR GEOTHERMAL RESERVOIRS,
Systems, Science and Software, La Jolla, CA.
D. H. Brownell, Jr, S. K. Garg, and J. W. Pritchett.
Water Resources Research, Vol. 13, No. 6, p 929-934, December, 1977. 18 ref.

Descriptors: *Geothermal studies, *Numerical analysis, Heat transfer, Momentum transfer, Mass, Energy, Earth-water interfaces, Thermal water, Fluid mechanics, Equations, Balance laws, Constitutive relations, Rock-fluid systems.

In order to study problems characterized by essential alterations in a geothermal reservoir porous matrix, it is necessary to consider fully interacting rock-fluid systems. Examples of such problems include the interaction between pore collapse (subsidence) and fluid extraction rates, the reinjection of collapsed pores by condensate reinjection, and the effects of variations in natural mechanical forces on the state of the geothermal system. For geothermal reservoir applications where fluid velocities are low and times of interest are long, it is possible to simplify the general balance laws previously developed for solid-fluid mixtures. Thus, this paper presents the fully interactive equations for single-phase systems, possible simplifications for single-phase geothermal appplications, and extension to two-phase systems. These are followed by a discussion of constitutive relations. The system of governing equations outlined is quite complex and must be solved numerically. (Eberle-NWWA)
W78-02542

POSSIBLE CONTAMINATION OF GROUND WATERS BY OIL-AND GAS-WELL DRILLING AND COMPLETION FLUIDS,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5B.
W78-02546

RESERVOIR EVALUATION TESTS ON RRGE 1 AND RRGE 2, RAFT RIVER GEOTHERMAL PROJECT, IDAHO,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W78-02549

ESTIMATING AQUIFER PERMEABILITY BY SURFACE ELECTRICAL RESISTIVITY MEASUREMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
W. E. Kelly.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 584, Price codes: A03 in paper copy, A01 in microfiche. August, 1976. 48 p, 16 fig, 3 tab, 28 ref.

Descriptors: *Electrical studies, *Resistivity, *Permeability, *Aquifers, Porosity, Water quality, Electrical properties, Geologic formations, Glacial drift, *Glacial aquifers, Formation factor, Schlumberger electrical survey method.

The object of this investigation was to develop surface electrical resistivity techniques for estimating the water bearing properties of glacial aquifers. Schlumberger electrical soundings were made at six sites in southern Rhode Island where pumping tests had previously been made. Measurements of electrical resistivity and permeability were also made concurrently in the laboratory using a modified falling head permeameter. The sounding curves were interpreted, and layer resistivities and formation factors (the latter computed from layer resistivities and measured specific conductances) were correlated with the permeabilities determined from pumping tests. It was determined that estimates of glacial aquifer permeability from surface resistivity measurements are feasible, and can be made by developing semi-empirical correlations between the apparent formation factor of the saturated zone and permeabilities from pumping tests. Water quality in terms of resistivity plays an important part in the computation of field formation factors as well as the interpretation of soundings for a given site. (Eberle-NWWA)
W78-02551

TWO-DIMENSIONAL SIMULATION OF THE RAFT RIVER GEOTHERMAL RESERVOIR AND WELLS,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 4B.
W78-02552

GEOTHERMAL RESOURCES, EXPLORATION AND LXPLOITATION: A BIBLIOGRAPHY.
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 8B.
W78-02553

2G. Water In Soils

WASTEWATER TREATMENT AND REUSE BY THE SOIL-PLANT SYSTEM,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-02223

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 5, SOIL-COVER-MOISTURE COMPLEX: ANALYSIS OF PARAMETRIC INFILTRATION MODELS FOR HIGHWAY SIDESLOPES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02244

PERSISTENCE OF SOME PHENYLAMIDE PESTICIDES IN THE AQUATIC ENVIRONMENT -- II. ADSORPTION ON CLAY MINERALS,
National Research Centre, Cairo (Egypt). Water Pollution Control.
For primary bibliographic entry see Field 5B.
W78-02264

DETECTION OF A POTENTIAL HEALTH HAZARD IN RECREATIONAL AND OTHER SURFACE WATERS,
Nebraska Univ. at Omaha. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-02405

PARTIALLY-SATURATED TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Montana Univ., Missoula. Dept. of Water and Land Resources.
A. E. Reisenauer, D. B. Cearlock, C. A. Bryan, and G. S. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as BNWL-1713, Price codes: A03 in paper copy, A01 in microfiche. Report BNWL-1713, Battelle Pacific Northwest Laboratories, Richland, Washington, 1975. 55 p, 9 fig, 1 tab, 27 ref, 2 append.

Descriptors: *Unsaturated flow, *Groundwater, *Computer models, *Simulation analysis, Porous media, Soils, Sediments, Hydraulics, Numerical analysis, Equations, Systems analysis, Finite difference approximation, Iterative technique.

Described is the mathematical development of a computer model, the Partially-Saturated Transient Flow Model (PST), used to test the formulation for simulating isothermal, unsaturated, liquid flow in heterogeneous porous media. The fundamental equations and assumptions applying to the model are discussed, and problems encountered in modeling the flow in soils with water contents less than saturation are delineated. Because of the nonlinearities of the descriptive equations, finite difference approximation and an iterative technique were used to obtain solutions. The model, when tested, was computationally slow and impractical as a management tool but did demonstrate that the equation could be solved for flow entering relatively dry soils. Several methods of dealing with the sediment hydraulic characteristics were tested. (Bell-Cornell)
W78-02453

EFFECT OF CHEMICAL AMELIORATION ON BIOLOGICAL PROCESSES IN SOLONETZ SOIL AT DIFFERENT IRRIGATION LEVELS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR). Div. of Soil Science.
N. P. Panov, L. V. Mosina, N. A. Goncharova, N. S. Odinokova, and K. Salekh.
Izv Timiryazev S-Kh Akad 4, p 134-140, 1976.

Descriptors: *Bacteria, Irrigation practices, *Solonetz soils, Actinomyceter, Ammonia bacteria, Cacillus-cereus, Bacillus-idosus, Bacillus-megaterium, Gypsum, Microorganisms, Nitrification, Spore-forming bacteria.

Excessive irrigation in the form of 2-3 mo. flooding decreased the number of ammonizing bacteria and increased number of spore-forming bacteria. The decrease in Bacillus megaterium and B. idosus and increase in B. cereus cells indicated significant decrease in energy of nitrification processes. Gypsum and gypsum in combination with straw as meliorants stimulated growth of all microorganisms and had a positive effect on nitrification and mineralization. Ferrous sulfate inhibited growth. Group composition of actinomycetes was largest in gypsum-straw melioration.--Copyright 1978, Biological Abstracts, Inc.
W78-02499

DETERMINATION OF CARAGARD IN WATER, SOIL AND PLANT MATERIAL BY THIN LAYER CHROMATOGRAPHY, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5A.
W78-02533

STUDY OF WATER-SOLUBLE ORGANIC SUBSTANCES IN NATURAL WATER USING GEL CHROMATOGRAPHY, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR), Div. of Soil Science.
For primary bibliographic entry see Field 5A.
W78-02555

SOME ASPECTS OF THE FIELD WATER CYCLE AFFECTED BY SOIL SURFACE CONDITIONS,
Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.
D. Hillel.
Meded Fac Landbouwwet Rijksuniv Gent. 37(3), p 1114-1131, 1972.

Descriptors: *Soil surfaces, *Percolation, *Induced infiltration, *Soil management, Infiltration, Seepage, Evapotranspiration, Evaporation, Soil properties, Water conservation, Water utilization, Evaporation, Infiltration, Soils.

Water added to soil can either infiltrate, accumulate on the surface or form surface runoff. Infiltrated water is eventually divided between seepage and evapotranspiration. Many attempts have been made to modify the soil surface ozone with the aim of promoting infiltration and suppressing evaporation. This paper analyzes the possibilities for beneficial modification of surface properties to achieve more effective control, conservation and utilization of water in the field.--Copyright 1974, Biological Abstracts, Inc.
W78-02577

THE SOIL MOISTURE COMPONENT OF MATHEMATICAL CATCHMENT SIMULATION MODELS,
Seven-Trent Water Authority, Birmingham (England).
R. E. Manley.
Journal of Hydrology, Vol. 35, No. 3/4, p 341-356, November 1977. 5 fig, 4 tab, 19 ref.

Descriptors: *Watersheds(Basins), *Runoff, Flow, *Model studies, Mathematical models, Soil moisture, Infiltration, Permeability, Overland flow, Precipitation(Atmospheric), Rainfall, Soil water movement, Percolation, Evapotranspiration, Groundwater, Channel flow, Hydrology.

The role of soil moisture in mathematical catchment simulation models was discussed, and requirements for this component of the model were suggested. A model was described which embodies the suggested characteristics, particular emphasis being placed on its soil moisture component. The results from the application of this model were presented. (Sims-ISWS)
W78-02598

NONLINEAR ADSORPTION IN POROUS MEDIA WITH VARIABLE POROSITY,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
S. H. Lin.
Journal of Hydrology, Vol. 35, No. 3/4, p 235-243, November 1977. 6 fig, 17 ref.

Descriptors: *Porous media, *Adsorption, *Dispersion, *Model studies, Mathematical models, Solutes, *Porosity, Seepage, Soil water, Soil water movement, Nutrients, Nutrient removal, Nitrogen, Phosphorus, Liquid wastes, Path of pollutants, Soil properties.

A numerical procedure was presented for predicting the solute dispersion and adsorption in heterogeneous porous media. Several porosity equations with decreasing or increasing porosity were proposed to represent the porosity variation and were used to simulate how the porosity variation affects the solute concentration distribution. The solute responses subject to a step change or

an exponential change input revealed some interesting characteristics. (Sims-ISWS)
W78-02599

EFFECTS OF FINE-PARTICLE AMENDMENTS ON THE SOIL MOISTURE CHARACTERISTICS OF A GRAVELLY SANDY LOAM AND ON CROP YIELDS,
National Vegetable Research Station, Wellesbourne (England).
D. A. Stone.
J Agric Sci. 81(2), p 303-310, 1973.

Descriptors: *Soil amendments, *Crop production, *Moisture availability, *Topsoil, Soil treatment, Soil moisture, Crop response, Sands, Loam, Gravels, Evaporation, Ashes.

Pulverized fuel ash and fluidized combustor ash were used to modify the available-water capacity and moisture characteristics of a gravelly sandy loam soil in a study of the effects of fine-particle amendments on crop yield. Intimate incorporation of the ashes into the top-soil at rates of up to 502t(tons)/ha increased the available water retained in the surface 0.3 m of soil by 40-80%. The increase was mainly water held at potentials of between -0.05 bar and -1 bar. Two sugar beet crops followed by broad beans, salad onions and cabbage were grown in the amended soil. With the highest rate of ash addition yield of the onions was increased by over 30% and of the cabbages by 14%. No improvement in sugar beet or broad bean yields resulted from the treatment. Poor growth of the 2nd sugar beet crop was attributed to a reduced aeration effect but it is suggested that the failure of the increased available water to improve yield consistently in this and a previous experiment was in part caused by rapid evaporative losses from the amended soil.--Copyright 1974, Biological Abstracts, Inc.
W78-02626

PRELIMINARY RESULTS OF UHF RADIOMETRIC AND DIRECT GROUND STUDIES OF SOIL MOISTURE IN 1975,
A. Ye. Basharinov, I. M. Butenko, L. A. Parshina, Ye. A. Reutov, and A. A. Chukhlantsev.
Available from the National Technical Information Service, Springfield, VA 22161 as N76 23785, Price codes: A02 in paper copy, A01 in microfiche. NASA Technical Translation F-17053, May 1976. 18 p, 11 fig, 10 ref. NASA NASw-2792.

Descriptors: *Remote sensing, *Soil moisture, *Irrigation, Aircraft, Rainfall, Crops, On-site data collections, Measurement, Radiation, Soils, Temperature, Equipment, Instrumentation, Agriculture, *USSR, Radiometers.

Data regarding measurement regions of the study, characteristics of weather conditions, methods and certain data of ground measurements of soil parameters, UHF radiometric equipment, tasks and methods of measurements, and the certain results of integrated measurements were investigated. Figures include location of measurement regions, characteristics of the state of a number of fields in the agricultural region, characteristic profiles on relative humidity, data of spatial variations in radiobrightness on the wave of 3.4 cm and results of ground measurements of relative humidity, data on profile measurements, dependence of soil emissivity, and spectral dependence of the degree of radiobrightness decrease over the region of groundwater on the Arabat spit. (Sims-ISWS)
W78-02684

SILVER IN SOILS, STREAM SEDIMENTS, WATERS, AND VEGETATION NEAR A SILVER MINE AND TREATMENT PLANT AT MARATOTO, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry, Biochemistry and Biophysics.
For primary bibliographic entry see Field 5B.
W78-02700

2H. Lakes

BIOLOGICAL AND WATER QUALITY EFFECTS OF WHOLE LAKE MIXING,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5G.
W78-02203

PRELIMINARY ECOLOGICAL STUDY ON THE PERIPHYTIC AND BENTHONIC DIATOMS AS FOOD OF LACUSTRINE AMPHIPODS (LAKE CARDIEL, PROV. SANTA CRUZ), (IN SPANISH),
L. Luchini.
Physis Secc B Aguas Cont Org 34(89), p 85-97, 1975.

Descriptors: *Ecology, *Periphyton, *Benthos, Amphipods, *Argentina(Lake Cardiel), *Diatoms, Ecological distribution, Food chains, Hyalella-fossamancinii, Lacustrine, Lakes, Rupia-cirrhosa.

The epiphytic diatom flora of Rupia cirrhosa in Cardiel Lake (Argentina) was studied. The stomach contents of the amphipod Hyalella fossamancinii were determined, and they appear to be strongly related to the periphyton and the phytobenthos. This amphipod plays an important role in the food chain of the lake. Forty-five entities (species and varieties) were determined, the ologohalobian, alkaline and bottom littoral forms prevailing.--Copyright 1977, Biological Abstracts, Inc.
W78-02216

INTERACTION OF SOLUBLE PHOSPHATE WITH ALUMINUM HYDROXIDE IN LAKES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W78-02222

ICE RIDGE FORMATION: PROBABLE CONTROL BY NEARSHORE BARS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2C.
W78-02254

SEDIMENT PREDICTION IN THE EASTERN UNITED STATES,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-02259

AVAILABILITY AND CONCENTRATION OF POLLUTANTS FROM AMERICAN FALLS RESERVOIR SEDIMENTS TO FORAGE AND PREDACEOUS FISHES,
Idaho State Univ., Pocatello.
For primary bibliographic entry see Field 5B.
W78-02265

OBSERVATIONS ON THE STATUS OF THE DEVIL'S HOLE PUPFISH IN THE HOOVER DAM REFUGIUM,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 8I.
W78-02268

THE LAKE TROUT OF TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 8I.
W78-02269

ECOLOGY OF MYSIS RELICTA IN TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 8I.
W78-02270

THE DELINEATION OF A POINT SOURCE PLUME BY THE STUDY OF BACTERIAL POPULATIONS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-02392

ASSESSMENT OF AQUATIC VEGETATION WITH SATELLITE-DERIVED DATA,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
B. L. Markham, W. R. Philipson, J. Ng, and T. Liang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 768, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, November 1977. 16 p, 3 fig, 6 tab, 15 ref. OWRT A-082-NY(1), 14-34-0001-7068.

Descriptors: *Remote sensing, *Aquatic plants, *Satellites(Artificial), Data processing, Freshwater, *New York, Lakes,
Identifiers: *Landsat data, Multispectral Scanner Data.

Landsat satellite data were analyzed manually and digitally to determine whether they can provide any useful information concerning freshwater, aquatic vegetation. The study focused on central New York State, where aerial photographic coverage and field data for three lakes were available for comparison. With certain limitations, the Landsat digital data could be analyzed to chart the distribution of emergent and floating vegetation; surfaced, submersed vegetation; and, in shallower waters, below-surface, submersed vegetation. The reliability with which submersed vegetation could be identified was generally lower than that associated with emergent and floating vegetation. The most serious limitation was experienced along shorelines. Here, because of Landsat's resolution, aquatic vegetation and the land-water interface may be imaged inseparately in the same pixel.
W78-02401

HYDRAULIC MODELING OF THE RESERVOIR, LOCAL DESTRATIFICATION PHENOMENON,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 5G.
W78-02403

DETECTION OF A POTENTIAL HEALTH HAZARD IN RECREATIONAL AND OTHER SURFACE WATERS,
Nebraska Univ. at Omaha. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-02405

EVALUATION OF CHEMICAL, BIOLOGICAL, AND PHYSICAL CONDITIONS IN THE WINTER HAVEN CHAIN OF LAKES, FLORIDA, MARCH-JUNE 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-02435

STATISTICAL MODELS OF RIVER LOADINGS OF NITROGEN AND PHOSPHORUS IN THE LOUGH NEAGH SYSTEM,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5B.
W78-02441

IMPACTS OF MAN'S ACTIVITIES ON THE CHEMICAL COMPOSITION IN THE SEDIMENTS OF LAKES ONTARIO, ERIE AND HURON,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-02464

THE PROBLEM OF THE SANITARY PROGNOSIS OF THE WATER QUALITY OF THE NIZHNEKAMSK RESERVOIR, (IN RUSSIAN),
Kazan Inst. of Porsgraduate Medicine (USSR).
For primary bibliographic entry see Field 5C.
W78-02468

MICROBIOLOGICAL STUDIES OF THE WANDA LAKE (ANTARCTICA), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Mikrobiologii.
For primary bibliographic entry see Field 5C.
W78-02469

EFFECT OF FERTILIZERS ON THE NUMBER OF BACTERIA INVOLVED IN THE NITROGEN CYCLE IN POND WATER OF THE ASTRAKHAN OBLAST, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W78-02475

STUDIES ON PRIMARY PRODUCTION IN THE GREEN GIRDLE OF NEUSIEDLER LAKE: I. CAREX RIPARIA CURT, (IN GERMAN),
Vienna Univ. (Austria). Pflanzenphysiologishches Inst.
For primary bibliographic entry see Field 5C.
W78-02476

PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W78-02486

NUTRIENT-ALGAL RELATIONSHIPS IN LAKE LILLINONAH, DANBURY, CONNECTICUT, JUNE-SEPTEMBER, 1975.
National Enforcement Investigations Center, Denver, CO
For primary bibliographic entry see Field 5C.
W78-02488

RELEASE OF DISSOLVED ORGANIC MATTER BY PHOTOSYNTHESIZING ALGAE IN LAKE KINNERET, ISRAEL,
Kinneret Limnological Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W78-02492

SPECIFIC ASSOCIATION OF THE BLUEGREEN ALGAE ANABAENA AND APHANIZOMENON WITH BACTERIA IN FRESHWATER BLOOMS,
Department of Scientific and Industrial Research, Taupo (New Zealand).
For primary bibliographic entry see Field 5C.
W78-02493

THE IMPORTANCE OF ALLOCHTHONOUS PARTICULATE CARBON PATHWAYS IN A SUBALPINE LAKE,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W78-02496

CHRONOLOGY OF ORGANOCHLORINE COMPOUNDS IN LAKE MICHIGAN FISH, 1929-66,
Wisconsin Univ.-Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5A.
W78-02497

WATERFOWL AS INDICATOR FOR THE ECOLOGICAL QUALITY OF LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W78-02501

CHEMICAL AND MINERALOGICAL COMPOSITION OF THE SEDIMENTS OF LAKES WITH LOW BIOLOGICAL PRODUCTIVITY, (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 5A.
W78-02504

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX C: MAT-WATER EXCHANGE IN A STRATIFIED BOG LAKE,
Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-02510

MATHEMATICAL MODELING OF DISPERSION IN STRATIFIED WATERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-02511

A BIOLOGICAL AND CHEMICAL COMPARISON OF VARIOUS AREAS OF A RESERVOIR,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02514

WAVES GENERATED BY HORIZONTAL OSCILLATIONS IN BAYS,
Tetra Tech, Inc., Pasadena, CA. Engineering Div.
For primary bibliographic entry see Field 8B.
W78-02600

COASTAL CHANGES, EASTERN LAKE MICHIGAN, 1970-73,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 2J.
W78-02609

SHORELINE AND BATHYMETRIC CHANGES IN AND AROUND UPPER SANDUSKY BAY SINCE 1905,
Ohio Dept. of Natural Resources, Sandusky. Div. of Geological Survey.
For primary bibliographic entry see Field 5C.
W78-02651

FURTHER COLONIZATION AND ACCLIMATIZATION OF MONODACNA COLORATA EICHW. AND MONODACNA PONTICA EICHW. IN INLAND WATERS, (IN RUSSIAN),
Dnepropetrovskii Gosudarstvennyi Univ. (USSR). Inst. of Hydrobiology.
P. A. Zhuravel'.
Gidrobiol Zh 11(3), p 78-79, 1975.

Descriptors: *Acclimatization, Canal, *Colonization, Commercial fish, Feeding, Fish, *Inland waters, Lakes, *Mineralization, *Monodacna-colorata, *Monodacna-pontica, Ponds, Reservoirs, USSR.

Data indicating the prospects for acclimatization of the mollusks M. colorata and M. Pontica in lakes, reservoirs, ponds and canals of the USSR with high mineralization of the water (not less than 0.5 g/l) are presented. The mollusks have food value for commercial fishes, and their larvae (veligers) serve as food for youngfish; the mollusks are efficient filter feeders.--Copyright 1976, Biological Abstracts, Inc.
W78-02658

RESTORATION OF WATER QUALITY IN LAKE WESTON, ORLANDO, FLORIDA,
Orange County Pollution Control Dept., Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-02678

2I. Water In Plants

THE COMPOSITION OF THE BENTHIC FAUNA OF A CROSS SECTION OF THE CLAMOUZE STREAM (HAUTE AUVERGNE, FRANCE), (IN FRENCH)
Rijksinstituut voor Natuurbeheer, Leersum (Netherlands).
L. W. G. Higler.
Ann Stn Biol Besse-en-Chandesse 9, p 219-224, 1974.

Descriptors: *Benthic fauna, Clamouze, Diptera, Ephemeroptera, *France(Clamouze stream), Larvae, Mud, Rocks, Streams, Trichoptera.

The site chosen for study was at an altitude of about 1000 m. The stream was about 3 m wide and 60 cm deep at the deepest point. Samples were taken at 4 different places across the stream in places with different exposure to the water flow, with 3 locations on rocky substrate and 1 on the mud bottom. The fauna at the different locations are tabulated. Ephemeroptera, Trichoptera and Diptera larvae are the most abundant groups found.--Copyright 1977, Biological Abstracts, Inc.
W78-02219

ASSESSMENT OF AQUATIC VEGETATION WITH SATELLITE-DERIVED DATA,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-02401

ECOLOGICAL-GEOGRAPHIC CHARACTERISTICS OF TREE TRANSPIRATION, (IN RUSSIAN),
For primary bibliographic entry see Field 2D.
W78-02425

VEGETATION TYPES IN AN IRREGULARLY FLOODED SALT MARSH ON THE NORTH CAROLINA OUTER BANKS,
North Carolina State Univ. at Raleigh. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W78-02461

MODERATE-TERM WATER STRESSES AND ASSOCIATED CHANGES IN SOME PHOTOSYNTHETIC PARAMETERS IN COTTON,
Agricultural Research Council, Trumpington (England).
H. G. Jones.
New Phytol. 72(5), p 1095-1105, 1973.

Descriptors: *Photosynthesis, Cotton, Stomata, *Moisture stress, *Water stress.

Cotton plants (Gossypium hirsutum L., cv. 'Deltapine smoothleaf') were subjected to 1- or 2-

wk periods of mild water stress using an osmotic soil cell. The treatments were severe enough to affect seriously several photosynthetic parameters, while good night-time recovery of plant water-potential minimized effects on development and lead expansion. Most measurements were made soon after rewatering, owing to very high stomatal resistances in the stressed plants. The stressed plants had lower rates of potential photosynthesis and lower rates of actual photosynthesis (at normal ambient CO2 concentrations) than the controls. Both stomatal and intracellular resistances and the corresponding 'photosynthetic limitations' were greater in the stressed plants than the controls. Most of these parameters showed fairly complete recovery 24 h after rewatering. Parallel changes were observed in the activities of carbonic anhydrase, ribulosediphosphate carboxylase and 14C fixation by leaf slices, all of which were lower in the stressed plants. Although activities of all the processes studies showed parallel changes, there was evidence that the major factor causing reduced photosynthesis in the stressed plants was stomatal closure. There was some evidence that the photosynthetic system adjusted itself to water stress over the periods studied.--Copyright 1974, Biological Abstracts, Inc.
W78-02462

AN ANALYTICAL STUDY ON THE ECOPHYSIOLOGICAL ADAPTATION OF SOYBEAN PLANTS TO LIMITED WATER SUPPLY,
Tokyo Univ. (Japan). Dept. of Botany.
I. Furuhata, and M. Monsi.
J Fac Sci Univ Tokyo Sect III Bot. 11(7), p 243-262, 1973.

Descriptors: *Adaptation, *Soybeans, *Plant growth, *Moisture deficit, Soil moisture, Transpiration, Water balance, Water requirements, Leaves, Leaf/root ratio.

The plants (Glycine max) were grown in pots with moist sand (M: 22.8% on a dry weight basis) or with dry sand (D: 5.2%). Some of the M pots were changed in their soil moisture from M to D condition at different growth stages (M-to-D plants), and vice versa (D-to-M plants). The growth and transpiration of these plants were followed in details. The leaf area growth of the M-to-D plants was inhibited in younger stages of plants. In the later stages when the difference in leaf area between the M and D plants became considerable, the leaves at the lower position were defoliated in a few days after the transfer; and the total area of living leaves of the M-to-D plants approximated eventually to that of the D. Transpiration rate and relative turgidity of leaves were somewhat higher in the M plants than in the D plants. The transpiration rate of the M-to-D plants was decreased, and the water saturation deficit in leaves was increased suddenly to the similar values of the D plants immediately after the soil moisture treatment was completed. A parallel change was observed between the decrease of relative leaf area and the increase of relative transpiration rate; the relative values were indicated respectively in percentages for those of the D plants. Similar results were obtained with Helianthus tuberosus. The soil moisture strongly influenced the leaf/root ratio in dry weight and the distribution ratio of assimilates of the soybean seedlings. The leaf/root ratios of the M-to-D and D-to-M plants indicated tendencies to approach to the ratios of the D plants and M plants, respectively. A competitive relationship between the distribution ratio for leaves and roots was clearly observed in the M-to-D and D-to-M plants.--Copyright 1974, Biological Abstracts, Inc.
W78-02465

INTERSTITIAL SALINITY AS A CAUSE OF ECOPHENIC VARIATION IN SPARTINA ALTERNIFLORA,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 2L.
W78-02594

2J. Erosion and Sedimentation

THE MOVEMENT OF SUSPENDED PARTICLES DUE TO SUDDEN RELEASE OF WATER FROM A LONG PRISMATIC FLUME,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 8B.
W78-02205

INVENTORY OF SEDIMENT SAMPLE COLLECTION STATIONS IN THE MISSISSIPPI RIVER BASIN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
M. P. Keown, E. A. Dardeau, Jr., and J. G. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 571, Price codes: A21 in paper copy, A01 in microfiche. Technical Report M-77-1, March 1977. 495 p, 163 fig, 3 tab, 108 ref, 1 append.

Descriptors: *Mississippi River Basin, *Sediments, *Sampling, Data collections, Data processing, Surveys, Sedimentation, Rivers, Potamology, Sediment transport, Sediment yield, Sediment discharge, Suspended solids, Sediment distribution, Sedimentology.

An inventory of the sediment sample collection stations in the Mississippi River Basin pertinent to the mission of the Corps of Engineers was conducted; 433 stations were located. Data for the 433 stations were presented in tables. For stations on the Arkansas, Atchafalaya, Kansas, Mississippi, Missouri, Ohio, Old, and Red river, the data included the river mile, water resource region, Corps of Engineers (CE) District, Office of Water Data Coordination (OWDC) station number, station name, geographic coordinates of the station location, type of water body on which the station is located, period of record of the station, frequency and types of data collected at the station, method used to collect sediment samples, and agency reporting to the OWDC regarding sediment collection activities at the station. For other streams in the basin on which stations are located, the data in the tables included the CE District, OWDC station number, station name, period of record, and agency reporting to the OWDC. In addition, narrative summaries were prepared for 74 key stations selected on the basis of location, period of record, and reliability of reported data. The summaries were presented in Appendix A and included information on the station site location, the collection and laboratory analysis of sediment samples taken at the station, and the reduction and reporting of the resulting data. (Sims-ISWS)
W78-02230

DEBRIS OF THE CHENA RIVER,
Cold Regions Research and Engineering Lab., Fairbanks, AK. Alaska Projects Office.
T. McFadden, and M. Stallion.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-029 357, Price codes: A02 in paper copy, A01 in microfiche. Report 76-26, July 76. 18 p, 17 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Rivers, *Alaska, *Trees, Surveys, Measurement, Hazards, Floods, Erosion, Soil erosion, Banks, Bank erosion, Forests, Streamflow, Dams, Damsites, *Chena River(Alaska), *River debris, Log jams, Logs.

Debris over a 44-mile stretch of the Chena River was studied. The study area extended from the first bridge on the Chena Hot Springs Road to the Chena River Flood Control damsite. The purpose of the study was to assess the potential danger to the Chena River Flood Control Dam outlet structure. Debris was cataloged, log jams were measured, and sources of debris were studied. The average size of logs was determined, as well as the number of logs present on the river. It was concluded that a serious debris problem existed and would remain serious for the foreseeable future. Recommendations for debris handling were made. (Sims-ISWS)
W78-02238

BEACH EROSION DURING MINOR STORM,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W78-02246

EFFECT OF SEDIMENT GRADATION ON CLEAR WATER SCOUR,
Auckland Univ. (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-02248

BEDLOAD TRANSPORT BY TRANSLATION WAVES,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Research.
For primary bibliographic entry see Field 8B.
W78-02249

STATISTICAL PROPERTIES OF SEDIMENT BED PROFILES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and H. F. Cheong.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY11, Proceedings Paper 13348, p 1303-1321, November 1977. 7 fig, 4 tab, 25 ref.

Descriptors: *Statistics, *Beds, *Profiles, Bed load, Channels, Alluvial fans, Flow resistance, Hydraulics, Sediments, Sediment transport, Rivers, Flow, Alluvial deposits, Bed forms, Statistical analysis, Propagating waveforms.

Approximate relationships were derived from the spatial and frequency spectra of a system of propagating waveforms based on the assumption that such a system is represented adequately by a Gaussian random function. Spectral similarity among the bed form data from the field and laboratory was examined, but the results cannot be construed to be conclusive in light of some uncertainties. A bed load transport relationship based on the mean velocity of the shifting waveforms was presented and compared favorably with measured results considering the expected variabilities in sediment transport studies. (Lee-ISWS)
W78-02251

SETTLEMENT OF SOLID PARTICLES IN OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-02252

SEDIMENT PREDICTION IN THE EASTERN UNITED STATES,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
H. R. Malcolm, Jr, and C. Smallwood, Jr.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 103, No. WR2, Proceedings Paper 13340, p 285-298, November 1977. 6 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Sedimentation, *Streams, *Lakes, *Model studies, Mathematical models, Equations, Urbanization, Drainage, Erosion, Forecasting, Planning, Channels, Lake sediments, Deposition(Sediments), Sediment discharge, Sediment transport, Watersheds(Basins), Erosion, Sedimentology, Lake capacity, Lake life.

Sediment discharge equations were derived for wooded, rural, urban, and severely exposed watersheds on the East Coast. The equations were used to model the impact of urbanization on sedimentation activity. The equations can be used in crude, but reasonably effective, modeling techniques to study some impacts of urbanization on streams and lakes. The equations confirmed and quantified the existence of a two-part urban sedimentation problem: one associated with erosion of denuded areas, and the other with the degradation of stream channels rendered unstable by extensive watershed changes. Two studies compared results with historical cases. (Sim-ISWS)
W78-02259

MULTICHANNEL SEISMIC REFLECTION PROFILES OF THE CONTINENTAL CRUST BENEATH THE NEWFOUNDLAND RIDGE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 2L.
W78-02260

EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND ITS HYDROLOGIC IMPLICATIONS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-02262

HYDROLOGIC CONSIDERATIONS ASSOCIATED WITH DREDGING SPRING PONDS IN WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-02421

METHODS FOR DETERMINATION OF RADIOACTIVE SUBSTANCES IN WATER AND FLUVIAL SEDIMENTS,
Geological Survey, Lakewood, CO. Water Resources Div.; and Colorado School of Mines, Golden.
For primary bibliographic entry see Field 5A.
W78-02429

WATER-QUALITY STUDY OF TULPEHOCKEN CREEK, BERKS COUNTY, PENNSYLVANIA, PRIOR TO IMPOUNDMENT OF BLUE MARSH LAKE,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-02433

IMPACTS OF MAN'S ACTIVITIES ON THE CHEMICAL COMPOSITION IN THE SEDIMENTS OF LAKES ONTARIO, ERIE AND HURON,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-02464

ANAEROBIC DECOMPOSITION OF OIL IN BOTTOM SEDIMENTS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
For primary bibliographic entry see Field 5B.
W78-02466

OXYGEN CONSUMPTION BY FRESHWATER SEDIMENTS,
Clemson Univ., SC. Dept. of Environment Systems Engineering.
For primary bibliographic entry see Field 5B.
W78-02481

CHEMICAL AND MINERALOGICAL COMPOSITION OF THE SEDIMENTS OF LAKES WITH LOW BIOLOGICAL PRODUCTIVITY, (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
For primary bibliographic entry see Field 5A.
W78-02504

NUTRIENTS IN ESTUARIES,
Marine Biological Lab., Woods Hole, MA. Ecosystems Center.
For primary bibliographic entry see Field 5B.
W78-02508

INSECTICIDE RESIDUES ON STREAM SEDIMENTS IN ONTARIO, CANADA,
Department of Agriculture, London (Ontario). Research Inst.
For primary bibliographic entry see Field 5A.
W78-02513

TIDAL PRISM OF EQUILIBRIUM INLETS,
Toups and Loiederman, Rockville, MD.
For primary bibliographic entry see Field 8B.
W78-02601

SHOALING RATES AND RELATED DATA FROM KNIK ARM NEAR ANCHORAGE, ALASKA,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-02608

COASTAL CHANGES, EASTERN LAKE MICHIGAN, 1970-73,
Western Michigan Univ., Kalamazoo.
R. A. Davis, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 297, Price codes: A04 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center, Ft. Belvoir, VA. Technical Paper No. 76-16, October 1976. 12 fig, 8 tab, 37 ref.

Descriptors: *Beach erosion, *Lake Michigan, *Coasts, Beaches, Lake shores, Lakes, Erosion, Coastal engineering, Graphical analysis, Profiles, Beach morphology, Beach sediments, Beach profile changes, Lake levels, Bluff erosion.

This study concerned erosion of the bluff or edge of the terrace marking the landward boundary of the beach at 17 sites along a 250-mile segment of the east coast of Lake Michigan. Data were collected every 4 weeks for 3 years beginning in August 1970, during a period when mean monthly lake levels in Lake Michigan rose about 1.5 feet to record levels in the spring and summer of 1973. Bluff or terrace erosion was intermittent during the first 2 years, but universal during the final year, suggesting a critical lake level of about 580.0 feet, International Great Lakes datum (IGLD), above which erosion on this coast generally occurs everywhere. For the 3-year period, net bluff erosion varied from 1 cubic yard per foot of beach front at two sites, one in the north and one in the south of the study area, to a maximum loss of 39 cubic yards per foot at the site on Big Sable Point. Erosion within the study area was intermittent over time periods equal to the survey interval (4 weeks), and local compared to distances between sites (about 15 miles). Erosion increased with increase in lake level, although it is evident that lake level is merely a passive factor that permits waves to attack closer to the shore. Most erosion occurred during the late fall storm season when mean monthly lake levels were actually declining. Local factors, including bluff composition, shoreline orientation, occurrence of longshore bars, and protection from shore ice, appear to be important in determining erosion rates. Most of the sites in this study were away from the influence of coastal engineering structures. An aerial photo study of these sites from 1938 to 1972 showed that long-term erosion is closely tied to lake level, and that sand terraces form rapidly in the backshore during periods of low water. Beach sediments appear to be locally derived, and sand size does not show a clear relationship to the slope of the beach face. (Lee-ISWS)
W78-02609

SHORELINE SURVEY: GREAT PECONIC, LITTLE PECONIC, GARDINERS, AND NAPEAGUE BAYS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-02648

SHORELINE AND BATHYMETRIC CHANGES IN AND AROUND UPPER SANDUSKY BAY SINCE 1905,
Ohio Dept. of Natural Resources, Sandusky. Div. of Geological Survey.
For primary bibliographic entry see Field 5C.
W78-02651

2K. Chemical Processes

GEOCHEMICAL INVESTIGATIONS OF ICE SHEETS IN MIZUHO PLATEAU AND WEST ENDERBY LAND,
Muroran Inst. of Technology, Hokkaido (Japan).
For primary bibliographic entry see Field 2C.
W78-02239

METHANE PRODUCTION IN THE WATERS OFF WALVIS BAY,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-02261

METHODS FOR DETERMINATION OF RADIOACTIVE SUBSTANCES IN WATER AND FLUVIAL SEDIMENTS,
Geological Survey, Lakewood, CO. Water Resources Div.; and Colorado School of Mines, Golden.
For primary bibliographic entry see Field 5A.
W78-02429

METHODS FOR COLLECTION AND ANALYSIS OF AQUATIC BIOLOGICAL AND MICROBIOLOGICAL SAMPLES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-02432

DETERMINATION OF ORGANIC MATTER IN WATER: A REVIEW, (IN SWEDISH),
National Swedish Environment Protection Board, Stockholm. Undersokhningslab.
For primary bibliographic entry see Field 5A.
W78-02526

INVESTIGATIONS OF THE DUNES GEOTHERMAL ANOMALY, IMPERIAL VALLEY,

CALIFORNIA: PART 1, GEOCHEMISTRY OF GEOTHERMAL FLUIDS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2F.
W78-02535

MIGRATION OF INSOLUBLE AND SOLUBLE IMPURITIES IN TEMPERATE ICE: STUDY OF A VERTICAL ICE PROFILE THROUGH THE GLACIER DU MONT DE LANS (FRENCH ALPS),
Grenoble-1 Univ. (France). Inst. de Geographie Alpine.
For primary bibliographic entry see Field 2C.
W78-02582

TECHNIQUE FOR STUDYING STRUCTURE OF SEA ICE,
National Research Council of Canada, Ottawa (Ontario), Div. of Building Research.
For primary bibliographic entry see Field 2C.
W78-02589

COMPRESSIBILITY OF DISTILLED WATER AND SEAWATER,
Woods Hole Oceanographic Institution, MA.
A. Bradshaw, and K. Schleicher.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 374, Price codes: A02 in paper copy, A01 in microfiche. Report No. WHOI-76-89, October 1976. 12 p, 4 fig, 3 tab, 27 ref. N00014-66-C-0241.

Descriptors: *Compressibility, *Water properties, *Salinity, *Sea water, *Physical properties, Volume, Equations, Water temperature, Water pressure, Properties, Saline water, Density, Pressure, Temperature, *Distilled water properties, *Sea water properties, Distilled water, Thermal expansion coefficient.

The compressions of distilled water and of seawater of approximately 31, 35, and 39 parts/thousand, salinity were measured at 10C for pressures up to 1000 bars. The data were summarized by a 'best' least-square fit polynomial in pressure and salinity. The summary formula was combined with Bryden's similar type fit to earlier thermal expansion data and Fofonoff and Bryden's recent empirical formula for sigma-0 of seawater to give an expression for the specific volume of seawater as a function of temperature, pressure, and salinity in the salinity range 31 to 39 parts/thousand. At 35 parts/thousand, specific volumes from this expression in the oceanographic range of temperature and pressure agree within 0.000015 cu cm/g with those computed using sound velocities. Mean compressibilities for distilled water at 10C also agree with those from sound velocities (to within 0.05%) but disagree with those of Kell and Whalley by about 0.3%. (Henley-ISWS)
W78-02613

ELECTRICAL DETECTION PROBLEMS IN WATER ANALYSIS BY SPARK SOURCE MASS SPECTROMETRY,
Virginia Univ., Charlottesville. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-02674

2L. Estuaries

EFFICIENCY IMPACTS OF COST SHARING ON SHORELINE MANAGEMENT,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 6C.
W78-02208

DIVIDING OCEAN RESOURCES: A DEVELOPMENT AND APPLICATION OF THE THEORY OF FACTOR TRANSFER,
University of Western Ontario, London.
For primary bibliographic entry see Field 6C.
W78-02212

PORT IMPROVEMENT DESIGN CRITERIA FOR TEXAS COAST,
Texas A and M Univ., College Station. Ocean Engineering Program.
For primary bibliographic entry see Field 8B.
W78-02245

BEACH EROSION DURING MINOR STORM,
South Carolina Univ., Columbia. Dept. of Geology.
T. W. Kana.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13335, p 505-518, November 1977. 8 fig, 4 tab, 30 ref, 1 append. Army DACW72-74-C-0018.

Descriptors: *Beach erosion, *Beaches, *Storms, *South Carolina, Winds, Waves(Water), Tides, Ocean waves, Berms, Islands, Erosion, Geomorphology, Sands, Seashores, Coasts, Surveys, Data processing, *Debidue Island(SC).

Over 12 cu m of sand per meter of beach was eroded at Debidue Island, South Carolina, during a minor northeast storm on September 23, 1974. Process measurements and beach surveys made before, during, and after the storm isolated the period of maximum erosion and suggested the threshold process values at the initiation of erosion. Storm processes on the 23rd included winds of 9.1 m/s from the northeast, 6.5 sec breakers 100 cm to 120 cm high, and average wave steepness (H sub o/L sub o) equal to 0.012. The beach was 50% steeper than normal and contained well-developed cusps before the erosion, facilitating formation of a berm scarp. The bulk of erosion resulted from the undermining and slumping of the scarp at high tide. Threshold process values for Debidue Island at the onset of erosion (for tan Beta = 0.055) were estimated to include: wind velocity 7 to 9 m/s; wave height greater than 100 cm; wave period less than 7.0 sec. These process values are exceeded up to 14% of the time, but significant erosion will only occur a few days each year due to influence of beach slope, beach morphology, and water level on the erosional efficiency of waves. (Sims-ISWS)
W78-02246

STORM TIDE FREQUENCIES FOR CAPE FEAR RIVER,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 8B.
W78-02247

OBSERVATIONS OF SHEAR IN NEAR-BED CURRENTS IN THE SOUTHERN NORTH SEA,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 8B.
W78-02256

MULTICHANNEL SEISMIC REFLECTION PROFILES OF THE CONTINENTAL CRUST BENEATH THE NEWFOUNDLAND RIDGE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
A. C. Grant.
Nature, Vol. 270, No. 5632, p 22-25, November 3, 1977. 3 fig, 11 ref.

Descriptors: *Remote sensing, *Sediments, *Continental shelf, *Atlantic Ocean, Oceans, Geology, Topography, Stratification, Geomorphology, Marine geology, Oceanography, *Seismic data, *Newfoundland Ridge.

Multichannel seismic reflection profiles extending south from the Grand Banks indicated that large 'basement' features underlying the Newfoundland Ridge are composed of sedimentary strata. The Newfoundland Ridge, therefore, is interpreted as an area of subsided continental crust rather than a ridge of oceanic crust. The J magnetic anomaly intersects the complex, and the physiographic ridge associated with the anomaly also may be continental in origin. (Sims-ISWS)
W78-02260

METHANE PRODUCTION IN THE WATERS OFF WALVIS BAY,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-02261

OCCURRENCE AND DISTRIBUTION OF BACTERIAL INDICATORS AND PATHOGENS IN CANAL COMMUNITIES ALONG THE TEXAS COAST,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5B.
W78-02391

AGAT SEWAGE TREATMENT PLANT: IMPACT OF SECONDARY TREATED EFFLUENT ON GUAM COASTAL WATERS,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-02398

FACTORS AFFECTING THE AVAILABILITY OF SEDIMENT-BOUND CADMIUM TO THE ESTUARINE, DEPOSIT-FEEDING CLAM, MACOMA BALTHICA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-02427

SALINE-WATER INTRUSION RELATED TO WELL CONSTRUCTION IN LEE COUNTY, FLORIDA,
For primary bibliographic entry see Field 5B.
W78-02434

INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL,
Tel-Aviv Univ., (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-02440

USE OF ECOLOGICAL PROFILES IN THE STUDY ON THE DYNAMICS OF COASTAL LANDSCAPES, (IN RUSSIAN),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
N. P. Nazarova.
Ekologiya 6(6), p 84-86, 1975.

Descriptors: *Salt marshes, Ecology, Aeluropus litoralis, Atropis distans, Bolboschoennus maritimus, Coastal waters, *Ecological distribution, Eleocharis palustris, Glycyrrhiza glabra, Halocnemum strobilacium, *Landscapes(Coastal), Phragmites communis, Recreation, Salicornia herbacea, Scirpus lacustris, Suaeda prostrata, USSR, Potable water.

Distribution of 5 plant communities in salt marshes on the Belosaraykaya and Berdyanskaya spits along the northern shore of the Sea of Azov (USSR) was studied in relation to changes in hydrogeological and geomorphological conditions. The dominant species, from the sea to the depth of

the spits, were Phragmites communis, Bolboschoenus maritimus, Scirpus lacustris, Eleocharis palustris; Salicornia herbacea, Suaeda prostrata; Salicornia herbacea, Halocnemum strobilaceum; Atropis distans, Aeluropus litoralis, Glycyrrhiza glabra; and Scirpus and Halocnumum, respectively. The observed sand thrust and soil burial are favorable from a recreational point of view, since they expand the area of eolian sands. Technical support of this natural process will promote free precipitation infiltration and moisture condensation and lead to accumulation of water suitable for drinking.--Copyright 1977, Biological Abstracts, Inc.
W78-02446

SHALLOW WAVE DIFFRACTION AROUND LARGE CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-02447

QUANTITATIVE STUDIES OF FAUNAL LIMITS IN THE NORTH ADRIATIC PHYTAL, USING POLYCHAETES AS AN EXAMPLE, (IN GERMAN),
Vienna Univ. (Austria). Zoologisches Inst.
B. Velimirov, and P. Sint.
Sitzungsber Oesterr Akad Wiss Math-Naturwiss Kl Vol 184, Nos. 8-10, p 341-368, 1975.

Descriptors: Aquatic animals, Aquatic algae, *Adriatic Sea, *Polychaetes, Yugoslavia, Water pollution, *Cytoseira.

The characteristic alga of the sublittoral hard bottom of the Adriatic and Mediterranean belongs to the genus Cytoseira. The polychaetes, common among Cytoseira were classified. A statistical effort was made to classify these organisms by localities with weak, medium and strong wave exposure. The samples were taken in 3 places in the Adriatic near the town of Rovinj, Yugoslavia. The distribution samples of polychaetes in brown algae is the same for all locations and is little affected by wave exposure. Pollution is rapidly distributed and removed by strong waves. A large number of polychaete species are listed for each sampling and for each of the 3 locations.--Copyright 1977, Biological Abstracts, Inc.
W78-02451

THE HYDROGRAPHY OF THE MURDERKILL ESTUARY, DELAWARE,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. Dewitt, and F. C. Daiber.
Chesapeake Sci. Vol. 15, No. 2, p 84-95, 1974.

Descriptors: *Delaware, Dyes, Estuaries, *Hydrography, *Murderkill Estuary(Del), Seasonal, Sewage, Tracers, Turbidity, Water temperature, Dissolved oxygen, Pollutant identification, Salinity.

Seasonal and tidal variations of salinity, water temperature, dissolved O2, pH and turbidity were measured. The Murderkill Estuary has characteristics of both a well-mixed and partially-mixed estuary. The prevailing hydrographic regime is maintained by tidal mixing and forced river flow which disrupt density-induced, internal circulation. Approximately 90% of the upstream salt flux is maintained by diffusion. During mean freshwater runoff the estuary discharges 1.7 x 10 to the 5th power m3 of freshwater seaward per tidal cycle and has a flushing time of 4.4 tidal cycles. The flushing time decreases from 18.4 tidal cycles during low runoff, 3.1 x 10 to the 4th power m3/tidal cycle, to 2.6 tidal cycles during high runoff, 3.1 x 10 to the 5th power m3/tidal cycle. The proposed daily discharge of 3.8 x 10 to the 4th power m3 of sewage effluent into the estuary will shorten the flushing time of the estuary at the discharge site from 4.4 to 3.9 tidal cycles during mean runoff. Salinity distributions in the estuary are highly variable. At high water, the lower reaches of the estuary are occupied by moderately saline water, 15.7-28.2%, from lower Delaware Bay. Vertical and longitudinal salinity gradients are small. In the central section of the estuary, salinity decreases from values characteristic of lower Delaware Bay to 1.0%. Mean vertical salinity differences are 2.0% and the mean longitudinal salinity gradient is 2.7% km. In tidal freshwater, salinity does not exceed 1.0% and salinity gradients, verical and longitudinal, are small. At low water, salinity in the lower reaches of the estuary is reduced substantially. The water column is well mixed and the mean longitudinal salinity gradient is 2.4%/km. Tidal freshwater occupies the upstream 30-70% of the estuary with increasing runoff. Dissolved O2 concentrations in the estuary range from 10-12 mg/l during the witer to 2 to 3 mg/l during the summer. A zone of O2 depletion appears in the central section of the estuary. This section will receive the effluent from the sewage-treatment facility. Oxygenated water presently enters the central section of the estuary from inland freshwater runoff and from lower Delaware Bay.--Copyright 1974, Biological Abstracts, Inc.
W78-02459

VEGETATION TYPES IN AN IRREGULARLY FLOODED SALT MARSH ON THE NORTH CAROLINA OUTER BANKS,
North Carolina State Univ. at Raleigh. Dept. of Botany.
A. W. Coopr, and E. D. Waits.
J Elisha Mitchell Sci Soc. 89(1/2), p 78-91, 1973.

Descriptors: *Vegetation, *Salt marshes, *Environmental gradient, *Speciation, Coastal marshes, Salinity, Sands, Peat, Distribution patterns, Wetlands, Water level fluctuations, Ecotypes, *North Carolina, Juncus roemerianus, Outer Banks, Spartina patens.

Vegetation types and environmental factors were studied in an irregularly flooded salt marsh on southern Bodie Island on the North Carolina Outer Banks. Vegetation data were obtained from a restricted random sample of 0.1 m2 plots. Depth of peat, texture of underlying sand, elevation of the surface, and water depth and salinity were also measured. Analysis of species associations indicated that 5 well-defined groups of species were present. These were grouped into 6 vegetation types, each associated with a distinct set of environmental factors. A Spartina patens type covered 32% of the area, generally between the ponds in the center of the marsh and the margin. Wetter areas in this zone and around the central ponds were occupied by a Mixed type, dominated by the species of the S. patens type, but in different proportions. Several annuals were important in this type during the early part of the study. A large, pure stand of Juncus roemerianus occurred around the head of the creek draining the marsh. Several ponds, one high in salinity and the rest low, occupied the center of the area. A Marginal type occurred around the edge of the marsh where it graded into the upland. Areas of sand spoil were dominated by an open sand type. The substratum under the marsh was a uniform fine sand. Peat was deepest under the Juncus type and became shallower toward the marsh margin. The ponds had the lowest elevation (1.39 ft.), followed by the Juncus (1.61 ft.), S. patens and Mixed (1.94 and 2.01 ft.), and Marginal types (2.08 ft.). The elevational pattern of species distribution agreed with similar data from studies of regularly flooded marshes and with the elevation pattern of the vegetation types. Water levels and salinities varied according to patterns of rainfall, tides and evaporation rates. Vegetation types in the study area resemble those described for Currituck Sound and Black Bay, Virginia, slightly to the north of the study area.--Copyright 1974, Biological Abstracts, Inc.
W78-02461

EFFECT OF SOME POLLUTANTS ON THE FILTRATION RATE OF MYTILUS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-02471

THE FATE OF STORM WATER AND STORM-WATER POLLUTION IN THE PARRAMATTA ESTUARY, SYDNEY,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 5B.
W78-02473

EFFECTS OF ATHENS POLLUTION OUTFALLS ON MARINE FAUNA OF THE SARONIKOS GULF,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-02479

RATES OF REMINERALIZATION AND ASSIMILATION OF UREA BY FRACTIONATED PLANKTON POPULATIONS IN COASTAL WATERS,
Queen's Univ., Belfast (Northern Ireland). Marine Biology Station.
For primary bibliographic entry see Field 5C.
W78-02484

TEMPORAL CHANGES IN PELAGIC BIOMASS OF PLEURONCODES PLANIPES STIMPSON (DECAPODA ANOMURA, GALATHEIDAE) OFF BAJA CALIFORNIA, MEXICO,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-02485

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park, Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-02487

A CYTOCHEMICAL AND BIOCHEMICAL INDEX OF STRESS IN MYTILUS EDULIS L.,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5C.
W78-02489

LEAD IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-02490

KEPONE BIOCONCENTRATION, ACCUMULATION, LOSS AND TRANSFER THROUGH ESTUARINE FOOD CHAINS.
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-02502

ENVIRONMENTAL REGULATION OF PHYTOPLANKTON PRODUCTIVITY IN THE LOWER HUDSON ESTUARY,
City Univ. of New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-02505

NUTRIENTS IN ESTUARIES,
Marine Biological Lab., Woods Hole, MA. Ecosystems Center.
For primary bibliographic entry see Field 5B.
W78-02508

POLLUTION HISTORY OF ESTUARINE SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-02509

THE INFLUENCE OF ORGANIC MATTER AND ATMOSPHERIC DEPOSITION ON THE PARTICULATE TRACE METAL CONCENTRATION OF NORTHWEST ATLANTIC SURFACE SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-02512

THE SEASONAL DISTRIBUTION OR ORGANIC CARBON IN A LOUISIANA ESTUARY,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5B.
W78-02593

INTERSTITIAL SALINITY AS A CAUSE OF ECOPHENIC VARIATION IN SPARTINA ALTERNIFLORA,
Georgia Univ., Athens. Inst. of Ecology.
J. Nestler.
Estuarine and Coastal Marine Science, Vol 5, No 6, p 707-714, November 1977. 3 fig, 28 ref. NFS DES72-01605-A02.

Descriptors: *Salt marshes, *Vegetation, *Salt tolerance, *Grasses, Salinity, Saline water intrusion, Saline water, Connate water, Nutrients, Plant growth, Plant growth regulators, Soils, Soil water, Coasts, Marshes, Marsh plants, Coastal marshes, Drainage, Tidal effects, On-site investigations, Biology, Salt marsh grasses.

This work supported the postulate that the height of Spartina alterniflora plants on salt marshes is a function of the total dissolved salt concentration of the underlying substrate. This hypothesis was tested by a combination of observations and perturbations. These activities led to the conclusion that the horizontal stability of the interstitial water allows the formation of interstitial salinity clines on the salt marsh. Pore water salinities are lowest near sources of estuarine or freshwater, and highest in areas further removed (elevationally) from sources of low saline water. The growth of Spartina alterniflora is inversely related to the interstitial salinity along these clines. Growth is robust in low saline areas and weak in areas of high pore water salinity. A case for a causal relationship between interstitial salinity and Spartina growth forms was presented. (Sims-ISWS)
W78-02594

INVESTIGATIONS ON DISSOLVED URANIUM, SILICON AND ON PARTICULATE TRACE ELEMENTS IN ESTUARIES,
Physical Research Lab., Ahmedabad (India).
For primary bibliographic entry see Field 5A.
W78-02595

HEAT BALANCE IN A SMALL COASTAL INLET PAUATAHANUI INLET, NORTH ISLAND, NEW ZEALAND,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
R. A. Heath.
Estuarine and Coastal Marine Science, Vol 5, No 6, p 783-792, November 1977. 6 fig, 1 tab, 7 ref.

Descriptors: *Heat balance, *Heat budget, *Estuaries, Inlets(Waterways), Solar radiation, Evaporation, Advection, Heat transfer, Tides, Mud flats, Coasts, Thermal conductivity, On-site data collections, Foreign countries, Foreign research, *New Zealand, Long-wave radiation, Sensible heat.

Examination of the heat budget in Pauatahanui Inlet, a small (3.5 sq km) New Zealand, coastal inlet, indicates that the balance is between solar and long wave radiation, evaporation, and advective heat exchange with the coastal waters. The role of the mudflat in the heat balance is only minor. The temperature at the entrance to the inlet exhibits strong tidal fluctuations resulting from exchange with the coastal waters and a diurnal inequality produced by interaction simulated temperature record for a month, calculated from a heat budget equation with 24 h and 12 h sinusoidal heat transfers approximating those observed on 16 March 1976, exhibits the effect of the tidal/solar interaction in producing a 14.75 day beat, variable diurnal inequality, and the generation of many high frequency components. (Visocky-ISWS)
W78-02596

WAVES GENERATED BY HORIZONTAL OSCILLATIONS IN BAYS,
Tetra Tech, Inc., Pasadena, CA. Engineering Div.
For primary bibliographic entry see Field 8B.
W78-02600

TIDAL PRISM OF EQUILIBRIUM INLETS,
Toups and Loiederman, Rockville, MD.
For primary bibliographic entry see Field 8B.
W78-02601

SHOALING RATES AND RELATED DATA FROM KNIK ARM NEAR ANCHORAGE, ALASKA,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-02608

SHORELINE SURVEY: GREAT PECONIC, LITTLE PECONIC, GARDINERS, AND NAPEAGUE BAYS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
M. T. Eisol.
Special Report No. 5, Reference 77-1, May 1977. 43 p, 23 fig, 9 tab, 33 ref.

Descriptors: *Beach erosion, *Waves(Water), *Tidal effects, *Baseline studies, Ocean waves, Storms, *New York, *Bays, Shoreline configuration, Land loss.

The beaches and bluffs along Great Peconic, Little Peconic, Gardiners and Hapeague Bays have attained their present form through a long erosional history. Changes in shoreline configuration have been determined by comparing nautical charts from the mid-1800's with those of today. This comparison has shown significant land loss especially for those areas east of Shelter Island. These areas, unprotected by a land mass in the path of wind and waves, receive the full impact of those erosional forces. A field survey of the shore area within the eastern forks of Long Island was completed in the fall of 1973. Particular attention was given to the natural earth processes (slides, subsidence and rain run-off) and their effect on shoreline characteristics as well as the influence of storms, wind and waves. Information pertaining to storms, ownership and population statistics have been updated through 1976. (NOAA)
W78-02648

MERCURY CONTENT OF MUSSELS FROM ST. LAWRENCE ESTUARY AND NORTHWESTERN GULF OF ST. LAWRENCE, CANADA,
For primary bibliographic entry see Field 5A.
W78-02671

RESIDUAL 2,4-D LEVELS IN THE ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5A.
W78-02679

RELATIONSHIP OF SCARLET PRAWNS (PLESIOPENAEUS EDWARDSIANUS) TO A BENTHIC OIL DEPOSIT OFF THE NORTHWEST COAST OF ARUBA, DUTCH WEST INDIES,
National Marine Fisheries Service, Miami, FL. Southeast Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-02699

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel Corp., San Francisco, CA.
L. Awerbuch, T. E. Lindemuth, S. C. May, and A. N. Rogers.
Desalination, Vol. 19, p 325-336, December, 1976. 4 fig, 1 tab, 2 ref.

Descriptors: *Thermal power, *Brines, *Desalination, Turbines, Corrosion, Thermal water, Distillation, *Geothermal studies, *Steam flashing systems.

A process for harnessing energy from geothermal brines is presented that is attractive in that it is potentially applicable to the production of both power and water. Corrosion and deposition of solids on power plant components have posed some difficult engineering problems for designers wishing to utilize thermal brines by the steam flashing method. A variant of this method is described by which components are isolated from corrosive soluble gases and scale-forming vapors by exposing them only to pure steam (generated by transferring heat from flashed geothermal vapor to distilled water). Multiple staging of both brine and turbine exhaust contributes to the thermal efficiency of this particular method. Cost analysis indicates that the process should be as economical as fossil-fuel production of electricity at present rates, and more so as the prices of fossil fuels rise. The value of water produced by the process would offset the power production costs as well. (Eberle-NWWA)
W78-02277

DESALTING GEOTHERMAL BRINES,
California Univ., Berkeley. Sea Water Conversion Lab.
A. D. K. Laird, and B. W. Tleimat.
Desalination, Vol. 19, p 309-316, December, 1976. 5 fig, 3 ref.

Descriptors: *Desalination, *Thermal power, *Brines, *Distillation, Steam, Thermal waters, Thermodynamics, Economics, Turbines, Flash distillation, *Geothermal brines, Geothermal studies.

Excellent opportunities exist to produce fresh water by desalination of geothermal brines heated by hot rock (found near volcanic instrusions in many parts of the earth's crust). Geothermal desalination methods are described how the differences between them and conventional desalination methods can be accommodated in process design is illustrated. Because geothermal feedwater is supplied hot, familiar desalination plant components can be used effectively but, generally, in different arrangements. Examples of multieffect distillation and multistage-flash distillation processes are presented schematically. The production of power and water that can be expected from a wide range of possible plant con-

figurations can be rapidly determined from three simple calculation diagrams given. Changes in thermodynamic conditions during desalting and power production processes can be read directly from these diagrams. (Eberle-NWWA)
W78-02293

OPTIMAL CAPACITY EXPANSION WITH OFF-DESIGN COSTS,
California Univ., Berkeley. Dept. of Civil Engineering.
C. R. Scherer, and R. Chiulli.
Journal of the Water Resources Planning and Management Division, Vol 103, No WR2, Proceedings of the American Society of Civil Engineers, Proceedings paper No 13327, p 213-226, November 1977. 5 fig, 4 tab, 18 ref.

Descriptors: *Desalination, *Optimization, *Operating costs, *Maintenance costs, *Salinity, *Desalination plants, Design, Water quality control, Planning, *Water treatment, Reverse osmosis, Brackish water, Equations, Mathematical models, Systems analysis, *Capacity reduction, *Mixed-integer programming, Economic analysis, Cost minimization.

The effect of 'off-design' operating costs on operating and capacity expansion policy is considered for the planning of a water treatment facility. A mixed-integer programming model is presented for minimizing discounted costs of dynamically expanding a reverse-osmosis process that is required to remove increasing levels of salt over time from a brackish stream. Several possible product effluent qualities are consisted as variables in the model. Results show the explicit consideration of off-design operating costs can influence capacity expansion planning and reduce actual system costs by a small percentage for desalting facilities. This (apparently small) percentage saving could amount to significant absolute savings in multimillion dollar projects. Analogous percentage savings in other process planning (e.g., municipal water and wastewater treatment, and power generation) could be more or less significant depending on the relationship of design to off-design generating costs. (Bell-Cornell)
W78-02450

CONCEPTUAL DESIGN OF COMMERCIAL 50 MWE (NET) GEOTHERMAL POWER PLANTS AT HEBER AND NILAND, CALIFORNIA.
Bechtel International Corp., San Francisco, CA.
For primary bibliographic entry see Field 8C.
W78-02550

3B. Water Yield Improvement

EVALUATION OF MILES CITY SWR-75 WEATHER RADAR,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 7A.
W78-02227

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2B.
W78-02228

TRACER AND DIFFUSION AND CLOUD MICROPHYSICAL STUDIES IN THE AMERICAN RIVER BASIN,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
A. L. Rangno, P. V. Hobbs, and L. F. Radke.
Final Report No 1, August 1977. 245 p. Submitted to Bureau of Reclamation, Denver, Colo., Div. of Atmospheric Water Resources Mgmt. Bur Reclam 6-07-DR-20140.

Descriptors: *American River Basin(Calif), California, *Tracers, Airflow, *Diffusion studies, *Cloud physics, *Weather modification, *Cloud seeding, Cloud modification, Sierra Project(Bur Reclam).

An airborne field study was conducted over the American River Basin (ARB) of the Sierra Nevadas to: (1) determine the transport and diffusion of materials released from the ground and the air during various types of storm situations; (2) compare the observed plumes with those predicted by stratified tank model simulations; (3) obtain cloud microphysical measurements; (4) obtain airborne precipitation particle measurements in support of an auxilliary study comparing radar reflectivities and precipitation rates on the ground; and (5) search for extraneous ice nucleus sources which could affect the Basin. Results showed: (1) negligible vertical dispersion for ground and airborne releases in a dry environment with a lapse rate equal to or less than pseudo-adiabatic; (2) adequate vertical dispersion, sufficient to result in cloud ingestion and precipitation fallout in the ARB, in post-frontal air masses characterized by steep (greater than pseudo-adiabatic) lapse rates, gusty surface winds with a westerly component, and an abundance of orographic cumulus and scattered small cumulonimbus; (3) stratified tank model simulations strongly resemble the observed plumes; (4) no viable relationship between measured ice particle concentrations and cloud top temperatures. The disrupting factor was that while cold (< -25C) clouds contained high (> 40 1/l) ice particle concentrations, warmer clouds (> or equal to -20C) exhibited both high (> 40 1/l) and comparatively low (< 3 1/l) ice particle concentrations; (5) a strong growth zone for post-frontal cumulus clouds between 30 and 65 km upwind of the Sierra Crest. This zone was usually characterized by high liquid water contents, more vigorous cumulus growth than elsewhere, and variable ice particle concentrations. This growth zone may be the best target for ice nuclei released for the purpose of increasing precipitation in the American River Basin. (Bur Reclam)
W78-02229

ATMOSPHERIC SIMULATION USING STRATIFIED LIQUID MODELS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
H. T. Falvey, and R. A. Dodge.
Report No REC-ERC-77-8, July 1977. 96 p, 51 fig, 1 tab, 12 ref, 3 append.

Descriptors: *Atmospheric research, *Model studies, *Field investigations, *Weather modification, Cloud seeding, Similitude, Simulation analysis, Project Skywater, Leadville-Climax Pilot Project, Sierra Cooperative Pilot Project, Colorado River Basin Pilot Project.

Analytical and laboratory studies were made to demonstrate the feasibility of using stratified liquids and distorted scale maps of an area to simulate mesoscale (2 to 20 kilometres) atmospheric phenomena. Techniques and instrumentation were developed for creating velocity gradients and density gradients, for visualization, and for making measurements. The effectiveness of both aerial and ground seeding station locations was investigated for various pilot study areas of Project Skywater. (Bur Reclam)
W78-02267

AN OVERVIEW OF THE SKYWATER IX CONFERENCE ON PRECIPITATION MANAGEMENT AND THE ENVIRONMENT, DISCUSSION AND SUMMARY REPORTS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Conference held in Vail, Colorado, in second week of November 1976. Report published September 1977. 223 p, 10 fig, 14 ref, 6 append.

Descriptors: *Weather modification, *Management, *Precipitation enhancement, *Cloud seeding, Environmental effects, Ecology, Ecosystems, Water resources management, Cloud seeding potential, *Conferences, Great Plains, High Plains, Rocky Mountains, Sierra Nevada, Great Basin, Western United States.

Called to assess results and solicit contributions for future planning in the Bureau of Reclamation's weather modification research, the Skywater IX Conference held six workshops, each assembled by an appointed convener. Abiotic processes were found best understood as to water yield and least so as to erosion and fluvial geomorphology. Alpine settings are most sensitive. Erosion and mass wasting are leading issues for summer programs, and snow duration for winter programs. Effects on vegetation in the High Plains are seen to come mostly from possible changes in land use and cultivation stemming from rain stimulation. In alpine areas, snow duration, especially in areas of drifting, would be the most important factor. Animal species selected as impact receptors include pronghorns affected by possible encouragement of encroaching civilization, and elk and mule deer affected by possible influence on range conditions, especially winter range. Anticipated societal benefits of more crops and clean power face barriers in the lack of adequate determination of ownership and pricing of water developed by precipitation augmentation, and the lack of appropriate institutions for carrying it on. Seeding agents are thought to have no significant effects. An environmental overview noted concern for possible initiation of long-term trends, linkage with conservation activities, and information transfer in the context of a regional concept. Implications for planning of Skywater environmental studies are discussed. (Bur Reclam)
W78-02272

THE ARIZONA WATER RESOURCES COMMITTEE: HISTORY AND POLITICS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-02400

SUMMARY REPORT, GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS.
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
Skywater Monograph No. 1, March 1977. 12 p, 5 fig.

Descriptors: *Cloud seeding, *Orographic clouds, *Weather modification, Precipitation augmentation, Cloud seeding criteria, Snow, Cloud physics, Snowpack augmentation, Winter orographic clouds, *Rocky Mountain Region, *Pacific Coast Region.

The Bureau of Reclamation is carrying out an analysis of data from past weather modification projects to identify criteria that define conditions when cloud seeding will increase winter snowfall in mountainous terrain and when it will have no effect or decrease precipitation. The study is seeking generalized seedability criteria based on physically meaningful and easily measurable variables. Seven projects that operated during the 1960's and 70's in the Rocky Mountains, the Sierra Nevada, and California's southern Coast Range are being used in this study, representing a wide range of meteorological and topographic conditions. (See also W78-02408)
W78-02407

GENERALIZED CRITERIA FOR SEEDING WINTER OROGRAPHIC CLOUDS,
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
L. Vardiman, and J. A. Moore.
Skywater Monograph No. 1, July 1977. 119 p, 30 fig, 8 tab, 6 ref, 2 append.

Descriptors: *Cloud seeding, *Orographic clouds, *Weather modification, Precipitation augmentation, Cloud seeding criteria, Snow, Cloud physics, Snowpack augmentation, Winter orographic clouds, *Rocky Mountain Region, *Pacific Coast Region.

An a posteriori analysis is being conducted utilizing precipitation, rawinsonde, and seeding generator data from seven randomized winter cloud-seeding research projects conducted in orographic settings in the Rocky Mountain West and on the Pacific Coast of the United States. Variables are being developed and investigated to establish generalized seedability criteria that are applicable under a variety of meteorological and topographic conditions. The variables are divided into four general categoreis: time available, water available, nuclei available, and mixing available. The analysis approach is to establish 'windows' under which positive (increases) or negative (decreases) seeding effects would be obtained. Thus far, the analysis shows that positive seeding effects occur at the crest under stable or unstable conditions when a 'crest trajectory' is present, moderate-to-high cloud moisture is present, and the cloud top temperature is between minus 10 and minus 30C. Decreases occur at the crest for unstable clouds with a 'blow-over' trajectory, with low cloud moisture and cloud top temperature colder than minus 30C. The precipitation for upwind and downwind regions of a barrier can also be increased or decreased depending on stability, trajectory, cloud moisture, and cloud top temperature. Other windows are discussed. (See also W78-02407)
W78-02408

WATER CONSERVATION IN CALIFORNIA.
California State Resources Agency, Sacramento. Dept. of Water Resources.
Bulletin No. 198, May 1976. (Reprinted March 1977.) 95 p, 18 fig, 29 tab, 18 ref, 2 append.

Descriptors: *Water conservation, *California(Drought), *Water utilization, Agricultural water, Municipal water, Industrial water, Planning, Rationing(Water), Management, *Alternative water use.

Approaches are presented to the current meaning of water conservation - methods that will help save water and energy and reduce waste. This bulletin describes current water use practices and possible methods of water savings and identifies where they might be most effectively used. It reviews water conservation programs already established in some parts of California and the United States. This bulletin also makes specific recommendations for immediate action. In addition a more detailed statewide water conservation program is being formulated.
W78-02409

THE CALIFORNIA DROUGHT - 1976.
California State Resources Agency, Sacramento. Dept. of Water Resources.
May 1976. 101 p, 10 fig, 6 tab, 3 append.

Descriptors: *California(Drought), *Droughts, *Drought tolerance, Climates, *Water conservation, *Water allocation(Policy), *Water distribution(Applied), Water policy, *Rationing(Water), Water utilization.

Information is summarized on water supply, current impacts, and expected impacts during the remainder of the year 1976. Discussed are some possible strategies which may be employed to ease 1976 impacts, as well as those which would occur in 1977, should the winter provide less than a normal supply. Of particular concern is the need to protect the Sacramento-San Joaquin Delta, through which vast quantities of water must pass and which is subject to specific protection under California law. This protection is presently being provided cooperatively by the state and federal governments. (See also W78-02411 and W78-02412)
W78-02410

THE CALIFORNIA DROUGHT - 1977, AN UPDATE.
California State Resources Agency, Sacramento. Dept. of Water Resources.
--February 15, 1977. 150 p, 18 fig, 11 tab, 9 append.

Descriptors: *California(Drought), *Droughts, *Drought tolerance, Climates, *Water conservation, *Water allocation(Policy), *Water distribution(Applied), Water policy, *Rationing(Water), Water utilization.

This report, prepared by the State Drought Information Center, in cooperation with federal, state, and local agencies, summarizes the impact of the drought in 1976 and brings up-to-date the status of drought conditions in 1977. (Data is current as of February 15, 1977.) Additional reports will be issued periodically as conditions change. Already significant rationing is under way in many parts of the State, and substantial deficiencies have been imposed by federal, state, and local water projects. Most hard hit are agricultural users. Many actions have been taken by the State in conjunction with federal, state, and local agencies to alleviate emergency situations. These include a transfer to Northern California of substantial quantities of Metropolitan Water District water entitlements from the State Water Project and an historic interconnection of East Bay water systems, including an arrangement to transport Metropolitan Water District exchange water to Marin County. (See also W78-02410 and W78-02412)
W78-02411

THE CONTINUING CALIFORNIA DROUGHT.
California State Resources Agency, Sacramento. Dept. of Water Resources.
August 1977. 138 p, 14 fig, 12 tab, 38 photos.

Descriptors: *California(Drought), *Droughts, *Drought tolerance, Climates, *Water conservation, *Water allocation(Policy), *Water distribution(Applied), Water policy, *Rationing(Water), Water utilization.

This is the third in a series of detailed reports on the continuing California drought, the worst in history. A great deal has been learned about individual and institutional capabilities and resources during this drought. Response to the need for better water management and reduced use has been forthcoming. Water is being used more wisely in most areas, innovative alternative sources of supply are being tried and the people are coping quite well. Economic impact is being minimized by federal and state programs of assistance. A spirit of cooperation and helpfulness has prevailed. One of the most important tasks ahead is planning for next year. There is no assurance that 1977-78 will not also be dry. Plans for the worst must be formed on an assumption that the dry conditions of 1976-77 will continue another year. If such is the case, impacts will be far more severe than these past two years. (See also W78-02410 and W78-02411)
W78-02412

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME I, EXPERIMENTAL RESULTS AND OVERALL SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
E. L. Crow, P. W. Summers, A. B. Long, C. A. Knight, and G. B. Foote.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 196, Price codes: A13 in paper copy, A01 in microfiche. Final Report, December 1976. 276 p, 32 fig, 46 tab, 105 ref.

Descriptors: *Cloud seeding, *Weather modification, *On-site tests, *Hail, *Colorado, Stochastic processes, Precipitation(Atmospheric), Data collections, On-site data collections, Sampling, Instrumentation, Data processing, Analytical techniques, Analysis, Meteorological data, Measurement, Monitoring, Statistical methods, Silver iodide, Summer, Hail suppression.

The National Hail Research Experiment conducted a randomized hail suppression test in northeast Colorado during the summers of 1972, 1973, and 1974. The experimental units were days on which storms were identified as 'threatening' a fixed target area, as determined by an objective radar criterion. The attempt was made to suppress hail in the target area on a randomized subset of these days by seeding storms with silver iodide. The effect of the seeding on hail and rain at the ground was studied by comparing the hailfall and rainfall on 'seed days' with that on control days, measured by networks of gages in the target area. The five volumes of this final report presented the procedures, the data, and the statistical analysis of seeding effects. At the onset, the total mass of hail at the ground in the target area was identified as the primary response variable for evaluating seeding effects on hailfall. The major conclusion of the experiment was that no statistically significant effect of seeding is detected. The result is true for the hail mass and all other response variables considered, regardless of the method of analyzing the data. The statistical significance level was chosen to be 10%, using a two-tailed test. The 90% confidence limits for the ratio of mean hail mass on seed to that on control days are 0.4 and 4.9. Those for rain are 0.8 and 7.4. Both of the test results assume lognormal distributions. In other words, it is unlikely that seeding clouds with silver iodide, with the technique used in this experiment, reduces hail by more than 60% in northeast Colorado. The results of the statistical experiment itself do not allow this result to be generalized to other areas, other climates, or other seeding strategies. (See W78-02604 thru W78-02607) (Humphreys-ISWS)
W78-02603

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME II, PRECIPITATION MEASUREMENTS,
National Center for Atmospheric Research, Boulder, CO.
J. E. Dye, A. J. Heymsfield, I. Paluch, and D. W. Breed.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-266 197, Price codes: A23 in paper copy, A01 in microfiche. Final Report, December 1976. 537 p, 79 fig, 13 tab, 7 ref.

Descriptors: *Cloud seeding, *Weather modification, *Hail, *On-site tests, *Colorado, *Precipitation(Atmospheric), Data collections, On-site data collections, Sampling, Instrumentation, Data processing, Analytical techniques, Analysis, Meteorological data, Measurement, Rainfall, Distribution patterns, Networks, Hail/Rain separator.

The hail and rainfall data collected in the National Hail Research Experiment (NHRE) during the randomized hail suppression experiment conducted in northeast Colorado during the hail

seasons of 1972, 1973, and 1974 were described and tabulated in this volume. The precipitation network data presented were used in Volume I of the NHRE final report to assess the effects of seeding on the hail and rainfall at the ground. The volume included: a description of the instruments used in the experiment--the hailpad, hail/rain separator, and weighing raingages; a description and map of the instrument network in the experimental area; a discussion of the extensive edit procedures employed to verify the data; a discussion of the limitations of the edited data set; and finally, the daily tabulations of the measurements of each instrument for each declared hail day. Although the weighing raingage and, for part of the experiment, the hail/rain separator provided time-resolved measurements of hail and rainfall, only daily rain and hail totals were presented. Time-resolved data, as well as all the data presented, are available from NHRE on seven-track magnetic tape on request. (See also W78-02603) (Humphreys-ISWS)
W78-02604

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME III, METEOROLOGICAL SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
J. C. Fankhauser, A. C. Modahl, C. G. Mohr, and M. E. Solak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 198, Price codes: A14 in paper copy, A01 in microfiche. Final Report, December 1976. 313 p, 58 fig, 58 tab, 18 ref.

Descriptors: *Weather modification, *Cloud seeding, *On-site tests, *Colorado, *Synoptic analysis, *Weather data, Meteorological data, Maps, Data collections, Hail, Precipitation(Atmospheric), Analysis, Data processing, Analytical techniques, Statistical methods, Networks, Meteorology, Climatic data, Radiosondes, Weather patterns, Dew point, Air temperature, Winds, Weather.

This volume presented a summary of meteorological information pertinent to each of the 57 hail days declared during the 1972, 1973, and 1974 field seasons in the National Hail Research Experiment (NHRE). An adequate description of synoptic scale atmospheric structure on hailstorm days is essential for: (1) investigation of possible predictors and/or covariates which might prove useful in the design, conduct, and evaluation of a suppression experiment, and (2) improving forecasts, both on the long and short time scale, as aids in operational planning and execution. Material supporting the meteorological summaries in all cases included a 500-mb chart, a surface sectional synoptic chart, and a thermodynamic diagram showing a plot of temperature, dew point, and wind vectors for each sounding selected to represent the larger scale meteorological conditions. A table listing thermodynamic and wind data at 10-mb intervals supplemented the graphical sounding plot in each instance. (See also W78-02603) (Humphreys-ISWS)
W78-02605

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME IV, RADAR SUMMARY,
National Center for Atmospheric Research, Boulder, CO.
G. B. Foote, R. C. Srivastava, J. C. Fankhauser, F. I. Harris, and T. J. Kelly.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 199, Price codes: A15 in paper copy, A01 in microfiche. Final Report, December 1976. 328 p, 60 fig, 60 tab, 20 ref.

Descriptors: *Cloud seeding, *Weather modification, *Remote sensing, *On-site tests, *Colorado, Precipitation(Atmospheric), Data collections, Radar, On-site data collections, Sampling, Stochastic processes, Hail, Analytical techniques, Meteorological data, Measurement, Monitoring, Weather patterns, Surveys, Statistical methods, Rainfall, Analysis, Data processing, Distribution patterns.

Radar observations played a central role in the conduct of the randomized seeding experiment carried out by the National Hail Research Experiment in the years 1972, 1973, and 1974. Criteria based on radar observations of storm intensity and movement were used to decide which days would be included as experimental units, and the actual conduct of the seeding operations relied heavily on real-time radar displays. The Radar Summary provided: (1) documentation of the characteristics of those storms that occurred in and around the experimental target area; (2) a basis for stratifying the surface hail data according to storm type and intensity; (3) data for an alternative evaluation of the randomized seeding experiment using some integrals of the S-band radar reflectivity factor as the response variable; (4) data for a post-analysis of how well the cloud seeding operation was actually conducted relative to what was intended; and (5) data which could be useful in the search for hailfall predictors and covariates. The radar observations presented were made by the S-band Grover radar, operated by the National Center for Atmospheric Research. A description of the radar system, the calibration techniques, and other data handling procedures were given. The data analysis methods were discussed, and several summary tables were presented, along with summaries of radar cell characteristics for each of the 57 sample days of the statistical experiment. (See also W78-02603) (Humphreys-ISWS)
W78-02606

FINAL REPORT-NATIONAL HAIL RESEARCH EXPERIMENT, RANDOMIZED SEEDING EXPERIMENT 1972-1974, VOLUME V, HAIL DECLARATION PROCEDURES AND SEEDING OPERATIONS,
National Center for Atmospheric Research, Boulder, CO.
R. W. Sanborn, J. C. Fankhauser, G. B. Foote, C. A. Knight, and G. Langer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 200, Price codes: A10 in paper copy, A01 in microfiche. Final Report, December 1976. 211 p, 16 fig, 13 tab, 13 ref.

Descriptors: *Cloud seeding, *On-site tests, *Colorado, *Weather modification, Testing procedures, Silver iodide, Aircraft, Application equipment, Decision making, Hail, Methodology, Instrumentation, Analytical techniques, Analysis, Weather data, On-site data collections, Precipitation(Atmospheric), Surveys, Remote sensing, Hail suppression.

Discussions of the Hail Day declaration procedures, operational seeding techniques, seeding materials used, and characteristics of the seeding agents for the hail suppression experiment carried out during 1972, 1973 and 1974 were included in this volume. The volume also presented analyses for each declared hail day, both 'seed' and 'no seed,' in order to determine how well the stated declaration procedures were met. Additional information was included that illustrates whether or not seeding operations were carried out for the proper period of time required by the criteria. From this an index of seeding coverage was developed. It was decided that a seeding method was required that would allow for the accurate placement of the nucleating material in the updraft near the -5 C isotherm, normally about 5 to 6 km MSL in Colorado during the summer months. The vertically-fired, airborne rocket was selected as the primary system, with cloud base flares to be used as the backup system. (See also W78-02603) (Humphreys-ISWS)
W78-02607

3C. Use Of Water Of Impaired Quality

PROBABILITY OF DROUGHT AND SECONDARY SALINIZATION OF SOILS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
V. A. Kovda, S. K. Onishchenko, and B. G. Rozanov.
Biol Nauki 19(2), p 7-20, 1976.

Descriptors: *Drought, *Saline soils, Crops, Grain, *Irrigation, *Probability, Reclamation.

The new high-yield grains are less drought-resistant than traditional varieties. Drought periods are predicted for 1983-86 and 1994-97. On the basis of historical, climatic, soil, botanical, hydrological and geogrphical factors plus repetitiveness and severity of droughts in the past, a map of the world is given with delineation of areas into 9 categories corresponding to increasing degrees of probability of drought. To address the problem of secondary salinization of the soil caused by irrigation, a table of complex reclamation measures is provided.--Copyright 1977, Biological Abstracts, Inc.
W78-02234

PROCESS DESIGN FOR GEOTHERMAL POWER,
California Univ., Berkeley.
For primary bibliographic entry see Field 8C.
W78-02278

WATER REUSE,
Irrigation Commission, Lucknow (India).
A. C. Chaturvedi.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 3, p 108-111, June, 1977.

Descriptors: *Return flow, *Water reuse, *Ozone, *Storm water, *Irrigation practices, Water resources development, Screens, Industrial water, Overflow, Combined sewers, Tertiary treatment, Waste water treatment, India.

Because water supplies in Uttar Pradesh, India, are limited and often contaminated, reuse of waste water, although an expensive process, becomes attractive because of the gain in water resources. The waste water treatment plant plans to reclaim 17 mgd of municipal waste water for industrial cooling purposes. Biological treatment methods are used to remove BOD, excess lime softening is used to remove phosphates, and recarbonation is used to lower hardness. Experiences with the reuse of waste water for irrigation are described. Reuse and conservation of water used in the textile industry is suggested to lessen the drain on water resources of the surrounding areas. Microscreening to remove suspended solids from combined sewer overflows and the use of ozone to remove color, taste, odor, and microorganisms from storm water are described. In a pilot plant coarse screens were used to remove large particles from waste water before microscreening. Screened effluent is then fed at a controlled rate to a continuous co-current contact chamber for ozonation. Analyses of treated effluent indicated that ozonation resulted in reductions in all of the contaminants except total phosphorus. The use of treated combined sewer overflows is suggested for irrigation, artificial recreational lakes, and other industrial purposes. (Schulz-FIRL)
W78-02297

3D. Conservation In Domestic and Municipal Use

WATER CONSERVATION IN CALIFORNIA.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.

W78-02409

THE CALIFORNIA DROUGHT - 1976.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02410

THE CALIFORNIA DROUGHT - 1977, AN UPDATE.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02411

THE CONTINUING CALIFORNIA DROUGHT.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02412

WATER SUPPLY, LAND USE, AND URBAN GROWTH,
Santa Clara Valley Water District, CA.
For primary bibliographic entry see Field 4A.
W78-02448

INFLUENCE OF METERING, PRICING, POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 6D.
W78-02572

3E. Conservation In Industry

COAL, ENERGY STUDY ISSUE, UPDATE, 1976,
Wyoming Univ., Laramie. Water Resources Research Inst.
J. Davidson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 645, Price codes: A06 in paper copy, A01 in microfiche. Amended Completion Report, 1976 101 p, 22 tab. OWRT C-6188(No 5220)(2).

Descriptors: *Resource development, *Coal, *Energy, *Research priorities, Wyoming, North Dakota, Montana, Great Plains, *Regional development, Energy resources development, *Research needs, *Northern Great Plains, Information transfer.

Results are presented of a follow-up to a study conducted in 1973 (See W74-07056) by the Water Resources Research Centers/Institutes of Wyoming, North Dakota, and Montana. The 1973 study investigated the issues and concerns relating to the expected development of coal/energy resources in the Northern Great Plains region. The areas of concern include: trace elements, atmospheric effects, coal resources mining techniques and waste disposal problems, surface resources (including reclamation of strip-mined areas), water resources (quality and quantity), economic and social issues, institutional issues, and general technology. The objective of the study reported here was to determine to what extent regional (state) study priorities had changed in the period between 1973 and 1976. A second objective was to provide a limited overview of the studies that had been conducted or were underway or planned in the region and the extent of funding. A third and final objective was to re-examine briefly the means and mechanisms for meeting state and regional study and information transfer needs. The report is organized by eleven principal issues, with the needs, priorities, and studies given for each. In general, the study needs spelled out in 1973 are still the primary concerns in 1976.
W78-02225

EXTRACTION OF GEOTHERMAL ENERGY BY TWO-LOOP SYSTEMS,
Krzhizhanovskii Energeticheskii Inst., Moscow (USSR).
For primary bibliographic entry see Field 8C.
W78-02276

PROCESS DESIGN FOR GEOTHERMAL POWER,
California Univ., Berkeley.
For primary bibliographic entry see Field 8C.
W78-02278

GEOTHERMAL HEAT: TO WHAT EXTENT CAN IT SATISFY OUR ENERGY HUNGER,
For primary bibliographic entry see Field 4B.
W78-02280

GEOTHERMAL DEVELOPMENT OF THE SALTON SEA,
DSS Engineers, Inc., Ft. Lauderdale, FL.
C. D. Hornburg.
Chemical Engineering Progress, Vol. 73, No. 7, p 89-94, July, 1977. 4 fig, 3 tab, 16 ref.

Descriptors: *Geothermal studies, *Brines, *Mineral industry, Energy, Thermal waters, Metals, Sodium chloride, Costs, California, *Salton Sea(Calif).

The development of a geothermal energy supply provides an opportunity for groups of related industries to be joined together for synergetic production in an optimum economic manner. For the most part, those industries that consume large amounts of thermal energy are not indigenous to geothermal resource areas. By concentrating plants which could make use of dissolved salts and metals in geothermal brine areas, availability of raw materials and inexpensive power would be assured. Sodium chloride processing is discussed in detail; because thermal energy would be at hand, it would be cost-effective to utilize the power necessary to convert low value NaCl to highly-marketable caustic and chlorine. Overall, the Salton Sea Known Geothermal Resource Area in California shows potential for this sort of energy-intensive mineral extraction activity. (Eberle-NWWA)
W78-02281

POWER FROM HOT GEOTHERMAL BRINES,
Rotoflow Corp., Los Angeles, CA.
For primary bibliographic entry see Field 8C.
W78-02282

ECONOMIC ANALYSIS OF GEOTHERMAL ENERGY,
Battelle-Pacific Northwest Labs., Richland, WA.
C. H. Bloomster.
Chemical Engineering Progress, Vol. 72, No. 7, p 89-95, July, 1976. 11 fig, 3 tab, 3 ref.

Descriptors: *Thermal power, *Cost analysis, Economics, *Computer models, Construction costs, Electric power costs, Operating costs, Income, Powerplants, Tax rate, *Geothermal energy, Binary cycle geothermal plants, Total flow geothermal plants.

In order to facilitate the complex undertaking of determining the costs of geothermal power for a given site, a computer program called GEOCOST has been developed by Battelle-Northwest Laboratories with funding from ERDA. GEOCOST combines both technical and economic factors in one systematic cost account framework. The program is composed of two parts: (1) a reservoir model, which calculates cash flows associated with exploration, drilling, fluid transmission and disposal, and reservoir operation. Annual operating expenses, including royalties, replacement well drilling, taxes, overhead, and maintenence are calculated for the life of the hypothetical power plant. (2) a power plant model, which includes submodels to simulate different power cycles (flashed steam, binary fluid, and total flow) and to estimate the resulting expenses and revenues for any given cycle. GEOCOST can simulate through varying rates of return on equity and debt, the debt-equity ratios, and tax rates. (Eberle-NWWA)
W78-02285

THE POTENTIAL FOR GEOTHERMAL STEAM,
Union Oil Co. of California, Los Angeles.
For primary bibliographic entry see Field 4B.
W78-02288

GEOTHERMAL ENERGY: ITS PROMISE FOR THE FUTURE.
Ground Water Age, Vol. 12, No. 2, p 20-29, October, 1977.

Descriptors: *Thermal power, *Thermal waters, *Geothermal studies, *Resource development, *Assessments, Costs, Electric power production, Utilities, Economics.

In contrast to the Geysers, a localized dry steam field that may total 2200 mw with equal hydrothermal potential nearby, the Imperial Valley of California is thought to have a development potential approximating 9000 mw. Such is the incentive for a geothermal resource assessment that has been systematized and expanded in recent years to include all 11 western states. The U.S. Geological Survey has estimated that the major available hydrothermal systems tabulated in this area represent about 8000 mw for 100 years, based on present-day electrical generating technology. Various private organizations have upgraded these estimates, extrapolating to account for the indicated presence of resources which have not yet been evaluated. Estimates of $600/kw to $950/kw for both power plant and geothermal reservoir development have been put forth for new installations. Electric utilities, energy firms and regulatory groups are all influential regarding the pace of geothermal exploitation. The uncertainties of the resource are more of a limitation at this point than is current technology, and only systematic assessment, demonstration, and development of hydrothermal power can dispel such questions. (Eberle-NWWA)
W78-02294

A CLOSED WATER REUSE SYSTEM FOR POWER PLANT COOLING AND DIGESTER HEATING,
Nihon Suido Consultants Co., Tokyo.
Y. Chiu, and W. Guey-Lee.
Water Resources Bulletin, Vol. 13, No. 6, p 1203-1214, December 1977. 2 fig, 1 tab, 5 ref.

Descriptors: *Water reuse, *Water quality, *Pollution abatement, *Powerplants, *Cooling, *Design, Municipal wastes, Water supply, Human population, Sewage, Treatment, Energy, Water resources, Mathematical models, Equations, Systems analysis, *Waste heat utilization, Digester heating, Energy generation, Maximum energy recovery.

Presented is a conceptual model consisting of closed water reuse and productive use of various types of wastes for energy generation. The sewage after treatment would be used as the cooling water for powerplants, and the resulting condenser discharge would be used as heating water for sludge digesters. The water would then be purified for municipal water supply for continuous use. The advantages of this system are that water resources and energy are conserved while various types of wastes, including waste heat, are controlled. With a preliminary system analysis, it appears that the design for the powerplant based on the total heating value of wastes and for the

digester capacity based on sewage sludge generation is feasible in terms of acquisition and full utilization of various types of wastes as generated in a single metropolitan area. The system as shown in this design is in balance among various factors, such as the generation rate of municipal refuse, municipal sewage, heat in the condenser discharge, and raw sewage sludge. (Bell-Cornell)
W78-02443

ECONOMIC AND FINANCIAL IMPACTS OF FEDERAL AIR AND WATER POLLUTION CONTROLS ON THE ELECTRIC UTILITY INDUSTRY.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W78-02518

THE COST OF CLEAN WATER IN AMMONIA, CHLORALKALI AND ETHYLENE PRODUCTION,
National Economic Models of Industrial Use and Waste Treatment Project, Houston, TX.
For primary bibliographic entry see Field 5G.
W78-02521

NEW SOURCES OF ENERGY: PROCEEDINGS OF THE CONFERENCE, VOLS. 2 AND 3, GEOTHERMAL ENERGY.
United Nations, New York.
For primary bibliographic entry see Field 4B.
W78-02541

TWO-DIMENSIONAL SIMULATION OF THE RAFT RIVER GEOTHERMAL RESERVOIR AND WELLS,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 4B.
W78-02552

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FISH MEAL, SALMON, BOTTOM FISH, CLAM, OYSTER, SARDINE, SCALLOP, HERRING, AND ABALONE SEGMENT OF THE CANNED AND PRESERVED FISH AND SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W78-02578

3F. Conservation In Agriculture

THE EFFECT OF SHEEP GRAZING POLICY ON THE WATER BALANCE IN DESERT RANGES, (IN RUSSIAN),
Zh. A. Zhambakin, E. B. Aibasov, and K. Moldabekova.
Probl Osvo Pustyn' 1, p 55-59, 1976.

Descriptors: Artemisia, *Desert ranges, Ephemerae, *Grazing(Sheep), Moisture, Productivity, Ranges, Soils, *Water balance.

Deferred grazing in overgrazed Artemisia-Ephemerae ranges resulted in a 40% increase of range productivity followed by resumption of the ratio between plant aggregations, a 50% rise of moisture rotation and accumulation of precipitated H2O in winter.--Copyright 1977, Biological Abstracts, Inc.
W78-02224

OPTIMAL ALLOCATION AND MANAGEMENT OF AGRICULTURAL WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
Z. Abate.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 575, Price codes: A07 in paper copy, A01 in microfiche. PhD Dissertation, August, 1975. 117 p, 16 fig, 14 tab, 33 ref, 4 append.

Descriptors: *Model studies, *Water allocation(Policy), *Optimization, *Corn(Field), *Grain sorghum, *Wheat, Crop response, Crop production, Mathematical models, Dynamic programming, Linear programming, Soil moisture, Soil water, Water supply, Agricultural water, Optimal production, Yield coefficients, Crop yield.

This study analyzes a mathematical model to determine optimum values of the controllable factors influencing agricultrual production. The research is developed from a need to model situations in which the hydrologic and input resources are limited. This study focuses on irrigated and dryland farming systems with three crops; corn, sorghum and wheat. This methodology may easily be extended to other crops. A deterministic mathematical model is developed to describe the events that occur in applying irrigation water to the plant's root system. The available data for the model are classified into six stages based on the plant growth cycle. A nonlinear multiplicative production function for water is adopted. The total product of yield coefficients for all the stages times the adopted maximum yield for that particular crop explicitly determines the actual yield of the crop. Similarly, the potential yield at each stage is estimated. Dynamic programming is used to determine the amount of resources available for each crop. This analysis incorporates the following steps: (1) Starting with an estimate of the quantity of water allocated to each crop at each time period, dynamic programming is used to compute the total water used at each stage. (2) The particular quantity of water allocated to each crop becomes fixed based upon empirical data. Dynamic programming then determines the optimal allocations of the fixed supply of water by stages. The results of this study indicate that the yield coefficients are directly linked to the moisture deficit indices. A computer program is presented to handle the dynamic programming formulation of the problem. (Skogerboe-Colorado State)
W78-02226

SOLAR IRRIGATION SYSTEM BEGINS OPERATION IN NEBRASKA.
Irrigation Journal, Vol. 27, No. 5, p 37, September-October, 1977.

Descriptors: *Irrigation systems, *Pumping, *Solar radiation, Irrigation engineering, Costs, *Nebraska, *Solar energy, Irrigation wells, Water wells.

One of the country's first crop irrigation systems to be powered by solar energy began operating in July, 1977 in Mead, Nebraska. The solar unit, designed by the Masachusetts Institute of Technology's Lincoln Laboratory, will use approximately 120,000 solar cells to generate electricity. Builders of the system expect it to be an effective demonstration of an alternate energy source for irrigation, which surveys indicate consumes half the total energy used in Nebraska's agricultural production. There are an estimated 52,000 irrigation wells in the state which consume about $81 million worth of energy per year. The system operates 12 hours a day, pumping 1000 gallons of water per minute into irrigation pipes servicing an 80 acre field. In addition to irrigation, the solar power will be used for crop drying during the fall and winter. The experiment is being conducted by the MIT Lincoln Laboratory in conjunction with the University of Nebraska-Lincoln, and is sponsored by the Photovoltaic Conversion Program of ERDA's Division of Solar Energy. (Eberle-NWWA)
W78-02279

SOLAR ENERGY TO POWER IRRIGATION PUMPS.
For primary bibliographic entry see Field 8C.
W78-02291

IRRIGATION OF THE ARID LAND OF THE WORLD, (IN RUSSIAN),
I. S. Zonn.
Probl Osvo Pustyn' 2, p 13-17, 1976.

Descriptors: *Arid lands, Farming, *Irrigation systems, Land management, Technology, Irrigated land.

The area of irrigated lands in arid zones is presently about 85 million ha, or 3% of the world's irrigated lands. Prospects of large-scale irrigational farming in the area under investigation will be quaranteed by: designing and constructing technically improved irrigational systems at the lowest water losses, steady operation of all units of the irrigational system envisaged by the project and involvement of new technological methods in the land use policy.--Copyright 1976, Biological Abstracts, Inc.
W78-02382

CHANGES IN THE ECOLOGY OF AREAS ADJACENT TO IRRIGATION SYSTEMS, (IN RUSSIAN),
Kuban Agricultural Inst., Krasnodar (USSR).
N. A. Volkonskii.
Pochvovedenie 4, p 152-155, 1976.

Descriptors: *Ecology, *Irrigation systems, Kazakh-SSR, *Phytocenosis, Productivity, *USSR.

The action of reclamation on ecological conditions of adjacent areas and the decrease in productivity of the latter are considered. Exogenous changes of phytocenoses leading to a decrease in productivity of these areas was observed. Absence of ecological investigations of edaphogenic changes makes the evaluation of water economy designs with respect to ecological efficiency impossible.--Copyright 1977, Biological Abstracts, Inc.
W78-02388

COMPUTER MODELING TO MAXIMIZE WATER USE EFFICIENCY AND REDUCE ENERGY IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
J. R. Gilley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 776, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Research Institute, Lincoln, Completion Report, October 1, 1977. 30 p, 10 fig, 9 ref. OWRT A-038-NEB(2), 14-34-0001-7058.

Descriptors: *Corn growth model, *Irrigation scheduling, Soil-water-plant relationships, Energy, Soil moisture, *Computer models, Mathematical models, *Water utilization, *Crop production, Irrigation water, *Plant growth, *Irrigation efficiency.

A simplified irrigation scheduling model, IRRIGATE, has been developed as an educational tool for use by University personnel and in extension programs. Irrigations are scheduled using the basic premise of maximizing yields with a minimum of applied irrigation water. Use of IRRIGATE has grown rapidly in Nebraska; in addition to being used as an educational tool it was used by private individuals, private irrigation scheduling companies, irrigation districts and others to schedule irrigations for approximately 25,000 acres during the 1977 season. A mathematical model, CORNGRO, has been developed to predict daily crop water use, plant growth and crop yield for corn. CORNGRO has the capability

of predicting corn yield as a result of different irrigation timing and amounts. The model can be useful in evaluating irrigation scheduling procedures in terms of yield, water conservation, energy conservation, producing costs, and analyzing alternate levels of water applied. The tests of the model using data available from Mead, Nebraska indicate the model has considerable predictive power, although not all of the dynamics of crop growth are modeled in precise detail.
W78-02404

WATER CONSERVATION IN CALIFORNIA.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02409

THE CALIFORNIA DROUGHT - 1976.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02410

THE CALIFORNIA DROUGHT - 1977, AN UPDATE.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02411

THE CONTINUING CALIFORNIA DROUGHT.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02412

MODERATE-TERM WATER STRESSES AND ASSOCIATED CHANGES IN SOME PHOTOSYNTHETIC PARAMETERS IN COTTON,
Agricultural Research Council, Trumpington (England).
For primary bibliographic entry see Field 2I.
W78-02462

AN ANALYTICAL STUDY ON THE ECOPHYSIOLOGICAL ADAPTATION OF SOYBEAN PLANTS TO LIMITED WATER SUPPLY,
Tokyo Univ. (Japan). Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-02465

ESTUARY IRRIGATION EFFECT ON SOIL-FORMING PROCESS IN CENTRAL KAZAKH SSR, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Inst. of Soil Science.
M. A. Bikmukhametov, and V. A. Zhukova.
Probl Osvoeniya Pustyn'. 4, p 41-47, 1973.

Descriptors: *Irrigation effects, *Soil formation, *Grasslands, *Fertility, Estuaries, Soil properties, Grazing, Forages, Deserts, Sierozems, Crop response, Kazakh-SSR, USSR.

Estuary irrigation in northern regions of the desert favors the formation of soils, of hydromorphic series. Estuary-meadow soils possess valuable agrochemical and hydrophysical properties. Estuary irrigation reduces the developement of valueless fodder crops improving that of meadow grasses and increasing yield capacity of estuary grazing lands.--Copyright 1974, Biological Abstracts, Inc.
W78-02597

IRRIGATION NUMBER: A NEW TECHNIQUE TO EVALUATE IRRIGATION ADVANCE DISTANCE,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
G. Sastry, and S. C. Agarwal.
J Agric Eng Res. 18(3), p 189-195, 1973.

Descriptors: *Irrigation systems, *Forecasting, *Dimensional analysis, *Curves, Evaluation, Inflow, Infiltration, Hydraulic conductivity, Surface irrigation, Analytical techniques, Mathematical studies, *Irrigation advance distance.

Prediction of irrigation advance distance for a given set of initial conditions such as slope of land surface, inflow stream per unit top width of flow, infiltration characteristics and hydraulic conductivity of soil bed, is important in order to design efficient surface irrigation systems. A dimensional analysis of variables involved in water advance phenomenon was made to derive a satisfactory equation. The data available at this Research Station was analyzed and fitted by least square method of curve fitting to yield an equation of the type M = A(N)B (where M = gx K2, N = gt K, A = coefficient and B = index, X = advance distance, t = advance time K = hydraulic conductivity of the soil bed.) for a given irrigation number, V3Non gv. (The equation derived can be used to predict advance distance for a given normal velocity, VNO, infiltration index, n and kinematic viscosity of fluid used.) The slope of each curve B is observed to be fairly constant and coefficient A was related with irrigation number. An irrigation advance function relating these dimensionless parameters is proposed.--Copyright 1974, Biological Abstracts, Inc.
W78-02625

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS (PHASE II),
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W78-02206

AN ANALYSIS OF THE EFFECTIVENESS OF LAND USE REGULATIONS REQUIRED FOR FLOOD INSURANCE ELIGIBILITY,
Mississippi State Univ., Mississippi State. Div. of Business Research.
For primary bibliographic entry see Field 6F.
W78-02207

EFFICIENCY IMPACTS OF COST SHARING ON SHORELINE MANAGEMENT,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 6C.
W78-02208

A CRITIQUE OF THE NATIONAL WATER COMMISSION ANALYSIS OF COST SHARING,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-02214

A COMPARISON BETWEEN CONVENTIONAL AND LANDSAT-BASED HYDROLOGIC MODELING: THE FOUR MILE RUN CASE STUDY,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-02232

DEBRIS OF THE CHENA RIVER,
Cold Regions Research and Engineering Lab., Fairbanks, AK. Alaska Projects Office.
For primary bibliographic entry see Field 2J.
W78-02238

PORT IMPROVEMENT DESIGN CRITERIA FOR TEXAS COAST,
Texas A and M Univ., College Station. Ocean Engineering Program.
For primary bibliographic entry see Field 8B.
W78-02245

STORM TIDE FREQUENCIES FOR CAPE FEAR RIVER,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 8B.
W78-02247

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
W. J. Randolph, and C. R. Gamble.
Tennessee Department of Transportation, (Nashville), 1976. 52 p, 9 fig, 4 tab, 11 ref.

Descriptors: *Flood frequency, *Peak discharge, *Estimating, *Analytical techniques, *Tennessee, Regression analysis, Data collection, Gaging stations, Flow rates, Flood forecasting, Frequency analysis, Flood recurrence interval, Regional analysis, *Maximum known floods(Tenn).

Methods for estimating the magnitude and frequency of floods on natural streams in Tennessee are described. Flood-frequency characteristics are defined for 281 gaging stations in Tennessee and adjoining states having 10 or more years of record not significantly affected by man-made changes. The frequency characteristics were related to basin characteristics by miltiple regression techniques and the equations derived can be used to estimate the magnitude of future floods with reccurrence intervals of as much as 100 years on ungaged streams if contributing drainage area of the site is known. At or near gaged sites, the use of a weighted average of the regression results and the gaging station data is recommended. (Woodard-USGS)
W78-02416

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1976.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02417

WATER RESOURCES DATA FOR WISCONSIN WATER YEAR 1976.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02418

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1976.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02419

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02420

WATER RESOURCES IN WESTERN CORTLAND COUNTY, NEW YORK: HYDROLOGIC DATA FOR 1972-75 AND PROGRESS REPORT,
Geological Survey, Ithaca, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02422

PRELIMINARY FLOOD-FREQUENCY RELATIONS FOR URBAN STREAMS, METROPOLITAN ATLANTA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
H. G. Golden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 504, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 77-57, August 1977. 16 p, 6 fig, 2 tab, 15 ref.

Descriptors: *Flood frequency, *Peak discharge, *Urban hydrology, *Flood forecasting, *Analytical techniques, Hydrologic data, Equations, Storm runoff, Cities, Georgia, *Atlanta(Ga), Urban flood frequency, Urban streams.

A method is presented for estimating the magnitude and frequency of floods for urban streams in metropolitan Atlanta. The method is based on adjustments to the natural stream flood-frequency and rainfall-frequency characteristics of the local area as defined by urban flood studies in other areas. The effects of urbanization on flood-peak runoff are estimated from the percentage of drainage basin that is impervious and the percentage of drainage area served by storm sewers. Equation are presented for estimating the 2-, 5-, 10-, 25-, 50-, and 100-year flood peak discharges for basin sizes from 0.5 to 100 square miles in the Atlanta metro area. Data from 12 urban streams in the Atlanta area were used to obtain a qualitative verification of the 2- and 100-year estimating equations. Hydrologic data are presently being collected for a study that will provide a data base for use in hydrologic models to develop more reliable urban flood-frequency relations. (Woodard-USGS)
W78-02423

HYDROLOGIC RECONNAISSANCE OF THE EASTERN NORTH SLOPE, ALASKA, 1975,
Geological Survey, Anchorage, AK. Water Resources Div.
J. M. Childers, C. E. Sloan, J. P. Meckel, and J. W. Nauman.
Available from Branch of Distribution, USGS, Box 25425, Federal Ctr. Denver, CO 80225. Open-file report 77-492, 1977. 65 p, 35 fig, 5 tab, 10 ref.

Descriptors: *Hydrologic data, *Streamflow, *Springs, *Floods, *Alaska, Data collections, Flow rates, Channel morphology, Ice, Water resources, Lakes, Aquatic life, Invertebrates, Arctic, *North slope(Alas).

The part of the Arctic coast of Alaska between the Colville River and the Canadian boundary was visited in April, August, and November 1975. The study area is characterized by its cold climate and is largely uninhabited, but oil and gas discoveries have spurred development of parts of the area. Sensible, coordinated development requires information about water resources. The purpose of the April reconnaissance was to locate winter streamflow and describe its quantity and quality. A followup summer trip was made in August to determine the flood characteristics of selected streams by measuring channel geometry in relation to bankfull discharge and the maximum evident flood and by estimating channel roughness. In addition, one lake was sampled, the discharge of a few springs was measured, and samples of spring water were taken. Because streamflow in August was assumed to be representative of normal summer flow, water quality was examined in streams for which flood surveys had been made. Samples of aquatic invertebrate populations were taken from most sites on the April and August trips. Another reconnaissance trip from Prudhoe Bay east to Canada was made in November to measure discharge in selected streams and springs, to measure ice thickness and water depth in selected lakes, and to collect water samples for water-quality analyses. Tables of data, photographs, and maps are included. (Woodard-USGS)
W78-02424

TIME OF TRAVEL OF SOLUTES IN MISSISSIPPI RIVER FROM BELLE CHASSE TO THE VICINITY OF HEAD OF PASSES, LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-02426

MAP SHOWING DRAINAGE BASINS AND LOCATION OF STREAMFLOW-MEASURING SITES, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02431

TECHNIQUES FOR ESTIMATING FLOOD DISCHARGES FOR OKLAHOMA STREAMS,
Geological Survey, Reston, VA; and Oklahoma City, OK. Water Resources Div.
W. O. Thomas, Jr, and R. K. Corley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 402, Price codes: A09 in paper copy, A01 in microfiche. Water-Resources Investigations 77-54, June 1977. 170 p, 20 fig, 5 tab, 13 ref, 3 append.

Descriptors: *Flood forecasting, *Peak discharge, *Frequency analysis, *Statistical models, *Oklahoma, Streams, Flow rates, Small watersheds, Large watersheds, Regression analysis, Flood frequency, Rainfall-runoff relationships, Model studies, Urbanization, Effects, Streamflow.

Statewide(Oklahoma) regression equations are defined for estimating peak discharges of floods having recurrence intervals ranging from 2 to 500 years. Contributing drainage area, main-channel slope and mean annual precipitation are the independent variables required for estimating flood discharges for rural streams. For urban streams the percentage of the basin that is impervious and served by storm sewers also is required. The regression equations are applicable for watersheds draining less than 2,500 sq mi that are not significantly affected by regulation. For rural streams, the regression equations are presented in graphical form for easy application. Annual peak data, basin and climatic characteristics, log-Pearson Type III statistics, and the flood-frequency relations are presented for 188 gaging stations. (Woodard-USGS)
W78-02436

VALUE OF INFORMATION IN RESERVOIR OPTIMIZATION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
V. Klemes.
Water Resources Research, Vol 13, No 5, p 837-850, October 1977. 8 fig, 3 tab, 21 ref.

Descriptors: *Reservoir operation, *Optimization, Hydrology, Economics, *Dynamic programming, Reservoir storage, *Reservoir releases, Probability, *Risks, Stochastic processes, Algorithms, Size, Equations, Mathematical models, Operations research, *Operating policy, Sensitivity, Loss minimization, Quadratic loss function.

Numerical experiments with operation policy optimization for a reservoir with a random log normal input demonstrated: a negligible sensitivity of results to the assumed form of input distribution; a near optimality of the policy 'draft equals input mean' for any reservoir size and any size of input sample used for the policy development; and a similarity between the effects of hydrologic and economic uncertainties. In particular, it was shown that the so-called standard policy, 'draft equals target,' arises from any optimal policy as either hydrologic or economic uncertainties grow beyond limits. While there was a clear hierarchy of optimal policies governed by the amount of information underlying the optimization if operation results were assessed vis-a-vis expected values and the true input population, the hierarchy was highly distorted when it was judged from the performance of individual policies on a 10-year sample from the true input population, representing an actual future operation period. It was also found that the degree of optimality of a given policy did not depend on the degree to which the underlying input model and its parameters agreed with the true input population, but rather on the similarity of the features of the 'historic' sample underlying a given policy and the 'future' 10-year sample on which the policy performance was tested. (Bell-Cornell)
W78-02445

WATER SUPPLY, LAND USE, AND URBAN GROWTH,
Santa Clara Valley Water District, CA.
J. K. Romm.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR2, p 271-284, November 1977. 4 fig, 4 tab, 2 ref.

Descriptors: *Land use, *Water supply, *Planning, *Population, *Social needs, Water distribution(Applied), Water consumption(Except consumptive use), Water demand, Water utilization, Design, Water allocation(Policy), *Land usage planning, Residential use.

The availability of a water supply does not determine the population growth or land use that will be supported by that supply. Water needs vary between uses, and water may be reallocated from one use to another. The same amount of water needed to serve a low population at low densities will support a larger population at a higher density due to reduced outdoor use. A reallocation of water from agricultural to domestic and industrial use permits a greater population. Therefore, it is not the availability of water supply or lack thereof that permits or constrains growth but rather the political decisions by cities and counties related to economics, social factors, and land use. Analysis shows that land-use projections represent a more reliable basis than population for the determination of future supplemental water requirements and the design of water distribution systems. (Bell-Cornell)
W78-02448

CONTROLLING AQUATIC WEEDS,
New York Sea Grant Advisory Service, Albany.
For primary bibliographic entry see Field 5G.
W78-02500

LABORATORY TRIALS OF A NEW TRIAZINE HERBICIDE (DPX 3674) ON VARIOUS

AQUATIC SPECIES OF MACROPHYTES ALGAE,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
For primary bibliographic entry see Field 5G.
W78-02516

STATUS, PROBLEMS, ADVANCES AND ECONOMICS OF EUCHEUMA FARMS,
M. S. Doty, and V. B. Alvarez.
Marine Technology Society Journal- Vol. 9, No. 4, p. 30-36, April-May, 1975. 7 fig, 3 tab, 4 ref. 04-3-158-29.

Descriptors: *Algae, *Harvesting of algae, Rhodophyta, Farms, Aquatic plants, Seasonal, Growth rates, Reproduction, Cultivation, Aquiculture, Economics, *Eucheuma, Philippines, Senescence, Carrageenan, Ice-ice.

Eucheuma, a tropical red algal seaweed which is a source of the galactan colloid, carrageenan, is farmed successfully only in the Philippines. Carrageenan is important in the food and dairy industries. Farming consists of lashing vegetative cuttings to polymer filament nets or lines on bottom areas of reef flat. Problems of cultivation center around senescence and seasonality. Senescence has been encountered when efforts have been made to improve the growth rate through use of a more fertile environment, and is thought to be due to an imbalance of light, temperature, water quality, and water movement. Senescence does not occur under normal conditions, and growth may continue indefinitely. Farming procedures take advantage of this indefinite growth: (1) small plants are harvested from a crop for marketing; (2) vacant sites are planted with pieces from the largest plants, thereby improving the crop genetically; (3) full-grown plants are trimmed to half size and sold; (4) when pieces grow to full size, the process is repeated. The seasonal problem, known as ice-ice, involves loss of pigment on segments of the thalli, which then dissolve away if the fertilizer regime is not immediately improved. A new strain of Eucheuma has recently been found which is apparently resistent to ice-ice, and exhibits a very high growth rate (4.77-5.64% weight increase per day in tests). (Lynch-Wisconsin)
W78-02571

FLOOD PLAIN INFORMATION: LITTLE CREEK, PRINCE WILLIAM COUNTY, VA,
Army Engineer District, Baltimore, MD.
Prepared for Prince William County, VA, April 1975, 20 p, 13 fig, 9 plates, 8 tab.

Descriptors: *Virginia, *Flood forecasting, *Flood data, *Flood recurrence interval, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Design flood, Storms, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Land use, Planning, *Little Creek(VA), Prince William County(VA), Triangle(VA), Intermediate Regional Flood.

The study area includes approximately four miles of the main stream and flood plain on either side of Little Creek in Prince William County, VA. A large portion of the drainage basin is within Quantico Marine Base. The upper portions of the flood plain are moderately developed, but the lower portion is undeveloped except for the Quantico golf course. The county is one of the fastest growing in the country; increasing land development pressures on the flood plain are expected. There are no stream gages on Little Creek. Flood data were obtained from topographic maps, field studies, aerial photographs, and flood records from other nearby watersheds. Flooding may occur at any time of year, and results from heavy general rain or intense local thunderstorms. Six bridges and four buildings spanning the stream channel are obstructive to the Intermediate Regional Flood. The worst known flood, a result of Tropical Storm Agnes, occurred in June 1972. No official record of past flooding is available. Close to the mouth of Little Creek, the Intermediate Regional Flood is expected to crest at 17.6 feet mean sea level (msl), and discharge 4,000 cubic feet per second (cfs), while the Standard Project Flood will crest at 18.3 feet msl, and discharge 5,500 cfs. These floods would affect some residential and commercial properties. The data contained in this report are intended for use in making land use planning and managment decisions concerning flood plain utilization. (Nessa-NC)
W78-02623

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
Prepared for Blair County Planning Commission, January 1974, 26 p, 2 fig, 16 plates, 5 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood forecasting, *Flood profiles, *Flood data, *Flood protection, Floods, Regional flood, Flood flow, Streamflow forecasting, Historic floods, Flood frequency, Flood stages, Peak discharge, Flow characteristics, Stage-discharge relations, Flood plains, Standard Project Flood, Non-structural alternatives, Planning, Zoning, Control structures, *Mill Run(PA), Blair County(PA), Altoona(PA), Intermediate Regional Flood.

The study area involves the City of Altoona and portions of Blair County, Pennsylvania that are subject to flooding by Mill Run. The flood plain is mostly developed within Altoona. Flooding along the upper reaches of Mill Run within the city is obtained from topographic maps, historical sources, field studies, and analysis of similar watersheds in the same geographic region. Stream gage records are not available. The worst known flood occurred on March 18, 1936. Spring is the main flood season, although flooding does occur at other times. At the mouth of Mill Run the estimated peak discharge of the Intermediate Regional Flood (IRF) is 5,500 cubic feet per second (cfs), while the Standard Project Flood (SPF) would discharge 13,200 cfs. The SPF profile ranges from one to six feet higher than the IRF. The estimates of the IRF and SPF magnitudes are based on storms and floods on watersheds in the region whose topography, land cover, and physical characteristics are similar to those of Mill Run. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02624

FLOOD PLAIN INFORMATION: LUZERNE COUNTY, PENNSYLVANIA, SUSQUEHANNA AND LACKAWANNA RIVERS.
Army Engineer District, Baltimore, MD.
Prepared for Luzerne County Planning Commission, June 1974, 109 p, 9 fig, 29 plates, 9 tab.

Descriptors: *Pennsylvania, *Historic floods, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood profiles, Storms, Flood stages, Flood peak, Flow duration, Stage-discharge relations, Flood plains, Flood damage, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Zoning, Control structures, Levee, Dams, Reservoirs, Luzerne County(PA), *Susquehanna River(PA), *Lackawanna River(PA), Wilkes-Barre(PA), Intermediate Regional Flood.

The study area involves the area subject to flooding by the Susquehanna and Lackawanna Rivers in Luzerne County, Pennsylvania, covering 44 miles of the Susquehanna River and 2.5 miles of the Lackawanna River. The major city in the county is Wilkes-Barre, located on a broad flood plain. In non-urban areas, the flood plain is mostly undeveloped. Small urban areas have moderate flood plain development, while the flood plain in Wilkes-Barre is mostly developed. There are 6 flood control reservoirs upstream of Luzerne County which help to reduce flood flows. Two other reservoirs are planned. There is a system of levees in part of the study area, designed to protect the most highly developed areas from all but extremely severe floods. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season is late winter and early spring, and results from heavy rainfall and snowmelt. Intense rainfall at other times of year has caused some of the worst known floods. The largest flood recorded at the Wilkes-Barre gage resulted from tropical storm Agnes and occurred on June 24, 1972, cresting at 552.7 feet mean sea level (msl) and discharging 345,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood would crest at 545.7 feet msl and would discharge 240,000 cfs, while the Standard Project Flood would crest at 558.6 feet msl and would discharge 440,000 cfs. On the Lackawanna River at Duryea, the greatest flood occurred in August 1955, cresting at 566.2 feet msl and discharging 31,000 cfs. Historic and future flood profiles are presented for the entire study area. This report is intended for use in making land use planning and management decisions regarding flood plain utilization. (Nessa-NC)
W78-02627

FLOOD HAZARD INFORMATION: CHAMBERS CREEK, EVERMAN, TEXAS.
Army Engineer District, Fort Worth, TX.
Prepared for City of Everman, TX, October 1973, 16 p, 1 fig, 6 plates.

Descriptors: *Texas, *Flood forecasting, *Flood data, *Flood recurrence interval, *Non-structural alternatives, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Zoning, Everman(TX), *Chambers Creek(TX), Flood plain management, 100-year flood.

The study area includes those portions of Everman, Texas affected by flooding from Chambers Creek. Some residential and industrial developments exist on the flood plain. Flood data were obtained from topographic maps, precipitation records, and similar nearby watersheds. No stream gage data exist for Everman Creek. Recent damaging floods occurred in 1952 and 1969. Flooding may occur at any time of year and results from heavy general rains or intense local thunderstorms. At the creek's mouth, the 100-year flood is expected to discharge 11,100 cubic feet per second (cfs) while the Standard Project Flood (SPF) will discharge 14,000 cfs. These flood waters will not cause significant damage until reaching the developed portions of Everman. The report discusses flood plain management techniques and describes alternative nonstructural control measures, such as flood plain zoning, subdivision regulations, flood insurance, and full or partial purchase of development rights. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. A channel modification plan for portions of Chambers Creek and the North and South Forks of Chambers Creek has been formulated as a result of this study, although the project had not been undertaken at the time the report was prepared. (Nessa-NC)
W78-02628

FLOOD PLAIN INFORMATION: CIENEGAS CREEK AND CANTU BRANCH, DEL RIO, TEXAS.
Army Engineer District, Fort Worth, TX.

Prepared for City of Del Rio, TX, May 1975, 30 p, 6 fig, 10 plates, 6 tab.

Descriptors: *Texas, *Floods, *Flood forecasting, *Flood data, *Flood recurrence interval, *Peak discharge, *Flood protection, *Non-structural alternatives, Flood flow, Indirect flood measurement, Streamflow forecasting, Storms, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Flood damage, Standard Project Flood, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, Floodproofing, Del Rio(TX), *Cienegas Creek(TX), Cantu Branch(TX), Intermediate Regional Flood, Flood plain management.

The study area encompasses about 12.5 miles of channel and includes the flood plains of Cienegas Creek and Cantu Branch in the vicinity of Del Rio, Texas. Most of the watershed is undeveloped outside of the lower reaches of Cantu Branch. Flood data were obtained from intermittent stream gage records on Cienegas Creek, topographic maps and field studies. Most flooding occurs in the spring and fall and results from heavy general rain or intense local thunderstorms. Because of the short period the stream gage was operational, only two large floods are recorded. The worst flood of record on Cienegas Creek occurred in 1935 and produced a peak discharge of 11,300 cubic feet per second (cfs). On Cienegas Creek, the Intermediate Regional Flood (IRF) is expected to discharge 20,400 cfs, cresting 11.2 feet above flood stage, while the Standard Project Flood (SPF) will discharge 36,500 cfs and will crest 13.6 feet above flood stage. On Cantu Branch, the IRF will discharge 9,100 cfs, cresting 6.0 feet above flood stage, while the SPF will discharge 14,900 cfs and will crest 6.5 feet above flood stage. Guidelines for flood plain management, and flood plain management tools are discussed. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02629

FLOOD PLAIN INFORMATION: MARYS AND SOUTH MARYS CREEKS, FORT WORTH, TEXAS.
Army Engineer District, Fort Worth, TX.
Prepared for City of Fort Worth, TX, May 1975, 34 p, 6 tab.

Descriptors: *Texas, *Floods, *Flood forecasting, *Flood data, *Flood recurrence interval, *Flood protection, *Non-structural alternatives, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Floodproofing, Standard Project Flood, *Marys Creek(TX), *South Marys Creek(TX), Fort Worth(TX), Intermediate Regional Flood, Parker County(TX), Tarrant County(TX), Flood plain management.

The study area encompasses about 18.3 miles of channel and includes the portions of Parker and Tarrant Counties, Texas, and the city of Fort Worth that are affected by flooding from Marys and South Marys Creeks. The lower portions of Marys Creek contain residential and commercial areas, and the South Marys Creek flood plain contains scattered development. There are a number of manmade obstructions to flood flows in the study area. Flood data were obtained from topographic maps, field surveys, and stream gage data from similar nearby streams. No stream gage records are available for the study area streams. Most flooding occurs in the spring or fall and results from heavy general rainfall or intense local thunderstorms. The worst known floods occurred in 1949 and 1961. On Marys Creek, the Intermediate Regional Flood (IRF) is expected to discharge 36,500 cubic feet per second (cfs), cresting 6.2 feet above flood stage, while the Standard Project Flood (SPF) will discharge 62,200 cfs and crest 9.5 feet above flood stage. On South Marys Creek, the peak IRF discharge will be 11,100 cfs, cresting 4.3 feet above flood stage, while the SPF will discharge 17,000 cfs and crest 6.2 feet above flood stage. Guidelines for flood plain management, including flood plain management tools, are presented. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02630

FLOOD PLAIN INFORMATION: MONAHANS DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
Prepared for City of Odessa, TX, December 1975, 35 p, 8 fig, 17 plates, 6 tab.

Descriptors: *Texas, *Streamflow forecasting, *Flood data, *Flood recurrence interval, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Storms, Historic floods, Flood stages, Peak discharge, Flow duration, Stage-discharge relations, Flood damage, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Odessa(TX), *Monahans Draw(TX), 100-year flood, 500-year flood.

The study area encompasses about 13.8 miles of channel and includes the portions of Monahans Draw in the vicinity of Odessa, Texas. The flood plain is mostly rural, sparsely populated, and contains large areas of open space. Flood data were obtained from topographic maps, field studies, precipitation records, and stream gage data from a similar nearby stream. There are no gaging stations on Monahans Draw. Most flooding occurs in the spring and early summer, and results from heavy general rain or intense local thunderstorms. The worst flood of record occurred in July 1936. No historical stream gage data exists for Monahans Draw. The peak 100-year flood discharge under averaged maximum conditions at river mile 44.43 is expected to be 17,500 cubic feet per second (cfs) and will crest 11.0 feet above flood stage, while the 500-year flood will discharge 31,000 cfs and crest 14.0 feet above flood stage. Most flood damages in the past have been to railroad and highway bridges. Large future floods may also affect residential, commercial and industrial structures. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02631

SPECIAL FLOOD HAZARD INFORMATION: WALNUT BRANCH, SEGUIN, TEXAS.
Army Engineer District, Fort Worth, TX.
Prepared for City of Seguin, TX, December 1975, 17 p, 1 fig, 2 plates, 2 tab.

Descriptors: *Texas, *Indirect flood measurement, *Flood forecasting, *Flood data, *Flood recurrence interval, *Non-structural alternatives, Floods, Flood flow, Streamflow forecasting, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Flood protection, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Control structures, *Walnut Branch(TX), Seguin(TX), Guadalupe County(TX), Flood plain management, Intermediate Regional Flood.

The study area includes the portions of the town of Seguin and Guadalupe Co., Texas, affected by flooding from Walnut Branch. Flood data were obtained from topographic maps, field studies and U.S. Geological Survey stream gage records. Flooding may occur at any time of year and results from heavy general rains or intense thunderstorms. Little historical flood information is available. The worst recent flood occurred in May 1972. At the Interstate Highway 10 bridge, the Intermediate Regional Flood is expected to discharge 6,300 cubic feet per second (cfs), cresting at 545.9 feet, mean sea level (msl). A flood of this magnitude will not damage the undeveloped upper portion of the flood plain, but will be a hazard to the more developed downstream flood plain. Guidelines for flood plain management are discussed, including structural and non-structural flood control measures. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02632

FLOOD PLAIN INFORMATION: CRUMP CREEK, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
Prepared for Hanover County, Virginia, March 1976, 23 p, 6 fig, 14 plates, 6 tab.

Descriptors: *Virginia, *Flood data, *Flood recurrence interval, *Non-structural alternatives, *Flood forecasting, Floods, Flood flow, Streamflow forecasting, Storms, Historic floods, Flood stages, Peak discharge, Flood peak, Flow duration, Stage-discharge relations, Flood damage, Flood plains, Flood protection, Land use, Planning, *Crump Creek(VA), Hanover County(VA), 100-year flood, 500-year flood.

The study area includes the main stream and flood plain on either side of Crump Creek in Hanover County, Virginia. The flood plain is undeveloped and mostly wooded. The projected county population growth rate of 4.5 percent will generate increasing land development pressures on the flood plain. Flood data were obtained from topographic maps, field studies, precipitation records and stream gage data from a similar nearby stream. There are no stream gaging stations on Crump Creek. Flooding may occur at any time of year, and results from heavy general rainfall or intense local thunderstorms. The worst known flood occurred in August 1955. On this date, flood waters of a similar nearby creek crested 8.62 feet above flood stage and discharged 748 cubic feet per second (cfs). At the mouth of Crump Creek, the 100-year flood is expected to discharge 10,100 cfs and crest 6.1 feet above flood stage, while the 500-year flood will discharge 16,600 cfs and crest 7.5 feet above flood stage. These floods would affect some residential properties, roads, and utilities. Considerable damage to these facilites is anticipated. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02633

FLOOD PLAIN INFORMATION: JAMES RIVER AT RICHMOND, VA.
Army Engineer District, Norfolk, VA.
Prepared for Richmond, VA, September 1965, 12 p, 1 plate.

Descriptors: *Virginia, *Flood data, *Flood recurrence interval, *Flood protection, *Non-structural alternatives, Floods, Flooding, Flood flow, Historic floods, Flood frequency, Flood stages, Standard Project Flood, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Levee, Dikes, Floodproofing, *James River(VA), Richmond(VA).

The study are includes the portion of the James River within the city limits of Richmond, Virginia. The flood plain is completely developed. The information contained in this report is based on data found in the supplementary Technical Appendix dated September 1965. Flooding results from heavy general rainfall. Eight bridges cause obstructions to flood flows. Five would be inundated during the Standard Project Flood. The worst flood of record occured in March 1936. The main

flood problem is associated with residential flooding. The most seious flood threat is to the water treatment plant. Non-structural flood control measures also exist. Since the flood plain is already developed, these measures will limit or control future use of flood plain lands. Information is presented regarding methods to reduce future flood damages. These include flood proofing and regulatory measures such as zoning, building codes, and filling restriction. This report is designed to provide information necessary to reduce future flood damages on the heavily developed flood plain. (Nessa-NC)
W78-02634

FLOOD PLAIN INFORMATION: MECHUMPS CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
Prepared for Hanover County, VA, May 1976, 25 p, 5 fig, 14 plates, 6 tab.

Descriptors: *Floods, *Flood forecasting, *Flood data, *Flood recurrence interval, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood profiles, Storms, Historic floods, Flood stages, Peak discharge, Flood damage, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, *Virginia, Flood frequency, Hanover County(VA), *Mechumps Creek(VA), 500-year flood, 100-year flood.

The study area includes the main stream and flood plain on either side of Mechumps Creek in Hanover County, VA. The watershed is approximately 7.2 miles long and 3.4 miles wide at its broadest point. The flood plain is undeveloped and mostly wooded. The projected county population growth rate of 4.5 percent will generate increased land development pressure on the flood plain. There are no stream gaging stations on Mechumps Creek; however, flood data were obtained from a gaging station on Totopotomy Creek (a similar nearby stream), precipitation records, topographic maps, and field studies. Flooding may occur at any time of year, and results from heavy general rainfall or intense local thunderstorms. One railroad crossing creates obstruction to flood flow in the study area. There are no existing flood control structures. The worst known flood occurred in August 1955. On this date, at the Totopotomy Creek gage, flood waters crested at 8.62 feet above flood stage and discharged 748 cubic feet per second (cfs). At the mouth of Mechumps Creek, the 100 year flood is expected to discharge 10,800 cfs and crest 9.7 feet above flood stage, while the 500 year flood will discharge 18,000 cfs and crest 10.7 feet above flood stage. These floods would affect some residential properties, roads, and utilities. Considerable damage to these facilities is anticipated. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02635

FLOOD PLAIN INFORMATION: SWIFT CREEK, CHESTERFIELD COUNTY, VA.
Army Engineer District, Norfolk, VA.
Prepared for Chesterfield County, VA, July 1974, 27 p, 25 fig, 22 plates, 8 tab.

Descriptors: *Floods, *Flood forecasting, *Flood data, *Flood recurrence interval, *Peak discharge, Flood flow, Indirect flood measurement, Streamflow forecasting, Storms, Hurricanes, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Land use, Planning, *Virginia, *Swift Creek(VA), Chesterfield County(VA), Colonial Heights(VA), Intermediate Regional Flood.

The study are includes the main stream and flood plain on either side of Swift Creek in Chesterfield County, Va. The flood plain consists mostly of wooded or open land. The study area consists of 30 miles along Swift Creek. Most development is located in and around the town of Colonial Heights. The projected county population growth rate of 5.9 percent will generate increasing land development pressures on the flood plain. Flood data were obtained from topographic maps, field studies, precipitation records and stream gage data from similar nearby streams and from a gage on Swift Creek maintained from 1944-49. Flooding may occur at any time of year and results from heavy general rainfall or intense local thunderstorms. The worst known flood occurred in July 1945. On this data, flood waters at the Swift Creek gage crested 29.0 feet above flood stage and discharged 13,200 cubic feet per second (cfs). Other large floods have occurred seven times between then and 1972. At the Bradley Bridge station, the Intermediate Regional Flood will crest 6.6 feet above flood stage and discharge 27,400 cfs, while the Standard Project Flood will crest 12.6 feet above flood stage and discharge 49,400 cfs. These floods would affect commercial and residential properties, roads, utilities, and all bridges except one. Considerable damage to these facilities is anticipated. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02636

FLOOD PLAIN INFORMATION: TOTOPOTOMOY CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
Prepared for Hanover County, VA, July 1976, 28 p, 8 fig, 17 plates, 6 tab.

Descriptors: *Floods, *Flood forecasting, *Flood data, *Flood recurrence interval, Flood flow, Indirect flood measurement, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, *Virginia, Streamflow forecasting, *Totopotomoy Creek(VA), Hanover County(VA), Intermediate Regional Flood.

The study area includes the mainstream and flood plain on either side of Totopotomoy Creek in Hanover County, VA, from Pamunkey River upstream to State Route 656, a distance of 15.9 miles. The flood plain is undeveloped and mostly wooded. The projected county population growth rate of 4.5 percent will generate increasing land development pressures on the flood plain. Flood data were obtained from the State Water Control Board stream gage, topographic maps, field studies and precipitation records. Flooding may occur at any time of year and results from heavy general rainfall or intense local thunderstorms. Several bridges and culverts obstruct floodflow in the study area. There are not existing flood control sturctures. The worst known flood occurred in August 1955. On this date, flood waters at the stream gage crested 8.62 feet above flood state and discharged 748 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood is expected to crest 11.8 feet above flood stage, discharging 6,607 cfs. These floods would affect some residential properties, roads, and utilities. Considerable damage to these facilities is anticipated. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02637

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CARROLL TOWNSHIP, DONORA, AND FALLOWFIELD TOWNSHIP, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Washington County Planning Commission, PA, November 1970, 37 p, 2 fig, 10 plates, 6 tab.

Descriptors: *Pennsylvania, *Flood profiles, *Peak discharge, *Flood data, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Storms, Historic floods, Flood stages, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Locks, Dams, Reservoirs, *Monongahela River(PA), Donora(PA), Fallowfield Township(PA), Carroll Township(PA), Washington County(PA), Intermediate Regional Flood.

The study area includes the Monongahela River and its adjacent flood plain in Carroll and Fallowfield Townships and Donora Borough, Washington County, Pennsylvania. The flood plain is mostly developed with residential, commercial, and industrial land uses, although some land remains open. The Tygart Dam and Reservoir, WV, provides major reductions to flood flows on the Monongahela River. Locks and Dam 3, located below the study area and operated only for navigation purposes, controls all the pool in the report reach. Flood data were obtained from topographic maps, historical sources, stream gage records and field studies. The main flood season occurs from December through March and results from heavy rain and snowmelt. Heavy local rainfall may cause flooding at other times. The worst flood of record measured at Donora occurred on March 7, 1967, cresting at 753.4 feet mean sea level (msl) and discharging 158,000 cubic feet per second (cfs). The Intermediate Regional Flood (IRF) would crest at 756.0 feet msl and would discharge 182,500 cfs, while the Standard Project Flood (SPF) would crest at 759.4 feet msl and discrhage 214,000 cfs. These floods are expected to cause relatively light damage. This report is intended for use in making land use planning and management decisions concerning flood plain utilizaton. (Nessa-NC)
W78-02638

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CENTERVILLE BOROUGH AND EAST BETHLEHEM TOWNSHIP, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
Prepared for Washington County Planning Commission, PA, November 1970, 39 p, 6 fig, 13 plates, 6 tab.

Descriptors: *Pennsylvania, *Flood profiles, *Flood data, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Storms, Historic floods, Flood stages, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Locks, Dams, Reservoirs, *Monongahela River(PA), Centerville(PA), East Bethlehem Township(PA), Washington County(PA), Intermediate Regional Flood.

The study area involves those areas subject to flooding by the Monongahela River in Centerville Borough and East Bethlehem Township, Washington County, Pennsylvania. The flood plain is partially developed with residential and commercial land uses, and partially undeveloped. Tygart Dam and Reservoir, WV, operated by the U.S. Corps of Engineers, effectively reduce major flood crests by an average of 4 feet in the study reach. Two other flood control dams have been authorized for construction. Flood data were obtained from topographic maps, historical sources, precipitation and stream gage records, and field studies. The main flood season occurs from December through March and results from heavy rain and snowmelt. Heavy local rainfall may cause flooding at other times. The worst flood of record measured at the Maxwell Locks and Dam occurred on March 7, 1967, cresting at 38.2 feet and discharging 158,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest about 2.5 to 3.5 feet higher than the March 1967

flood and would discharge 181,000 cfs, while the Standard Project Flood (SPF) would crest about 6.7 feet higher than the March 1967 flood and would discharge 213,000 cfs. Future floods are expected to have lower crests in spite of higher volumes due to structurally modified replacement dams. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02639

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, FAYETTE COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Fayette County Planning Commission, August 1973, 39 p, 13 fig, 14 plates, 8 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood data, *Stage-discharge relations, Floods, Flood flow, Flood forecasting, Flood profiles, Storms, Historic floods, Flood stages, Peak discharge, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Locks, Dams, Reservoirs, Fayette County(PA), *Monongahela River(PA), Belle Vernon(PA), Fayette City(PA), Newell(PA), Point Marion(PA), Intermediate Regional Flood.

The study area includes the land subject to flooding by the Monongahela River in Fayette County, Pennsylvania, including the Boroughs of Belle Vernon, Fayette City, Newell, and Point Marion--a 48 mile reach of the river. The flood plain is mostly undeveloped, except in the urban places where is contains some institutional, residential, and industrial structures. Four locks and dams regulate normal flows for navigation. Tygart Lake, WV, is a flood control dam and reservoir which is effective in reducing flood crests at Brownsville by 2-4 feet. Two additional flood control dams have been authorized. When completed, they will help reduce major floods by an additional 6 feet or more. The main flood season is from December through March and results from heavy rain and snowmelt. Intense rainfall at othe times of year has caused some of the area's worst known floods. Flood data were obtained from topographic maps, historical sources, field studies and stream gage records. The worst flood recorded at the Maxwell Locks and Dam occurred on March 7, 1967, cresting at 772.7 feet mean sea level (msl) and discharging 158,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 775.5 feet msl and would discharge 181,000 cfs, while the Standard Project Flood (SPF) would crest at 779.0 feet msl and would discharge 213,500 cfs. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02640

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, MONESSEN AND ROSTRAVER TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Westmoreland County Planning Commission, June 1971, 43 p, 6 fig, 10 plates, 6 tab.

Descriptors: *Pennsylvania, *Regional flood, *Flood data, *Peak discharge, *Stage-discharge relations, *Flood plains, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood profiles, Storms, Historic floods, Flood frequency, Flood stages, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Planning, Zoning, Control structures, Locks, Dams, Reservoirs, Monessen(PA), Rostraver Township(PA), Westmoreland County(PA), *Monongahela River(PA), Intermediate Regional Flood.

The study area includes the portions of the City of Monessen and Rostraver Township in Westmoreland County, Pennsylvania that are subject to flooding from the Monongahela River. Most of the flood plan is developed with residential, commercial, transportation and industrial land uses. Locks and dams on the river are operated for navigational purposes only. Tygart Lake, near Grafton, WV, is operated by the Corps of Engineers: flood impoundment reduces major flood peaks by an average of 2-4 feet. Two additional flood control structures have been authorized for construction and should enable flood peaks to be reduced an additional 4-6 feet. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs from December through March and results from heavy rain and snowmelt. Intense rainfall at other times of year has caused some of the area's worst known floods. The largest flood recorded at Lock and Dam 4 occurred on March 7, 1967, discharging 158,000 cubic feet per second (cfs) and cresting at 756.6 feet mean sea level (msl, while the Standard Project Flood (SPF) would discharge 214,000 cfs and would crest at 763 feet msl. The modification of Dam 4 in 1967 has increased the flood containing capacity of the River. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02641

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, UNION TOWNSHIP, NEW EAGLE, AND MONONGAHELA, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
Prepared for Washington County Planning Commission, November 1970, 37 p, 5 fig, 12 plates, 6 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood profiles, *Flood data, *Flood protection, Floods, Flood flow, Storms, Streamflow forecasting, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Locks, Dams, Reservoirs, *Monongahela River(PA), Union Township(PA), New Eagle(PA), Monongahela(PA), Washington County(PA).

The study area includes the Monongahela River and its adjacent flood plain in Union Township, New Eagle Borough and the City of Monongahela in Washington County, Pennsylvania. This report covers 8.3 miles from Union Township to Monongahela. The flood plain is mostly developed with residential, commercial, and industrial land uses, althougjh some land remains open. One dam is located in the study area, and is used for navigation purposes only. Tygart Dam and Reservoir, WV, operated by the Corps of Engineers since 1936, effectively reduces flood peaks in the study area by an average of 4 feet. Flood data were obtained from topographic maps, historical sources, precipitation and stream gage records, and field studies. The main flood season occurs from December through March and results from heavy rain and snowmelt. Intense rainfall at other times of year has caused some of the area's worst known floods. The largest flood of record since completion of the Tygart River Dam, measured at Lock and Dam 3, occurred on October 16, 1954, cresting at 746.4 feet mean sea level (msl) and discharging 141,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 747.6 feet msl and would discharge 182,500 cfs, while the Standard Project Flood (SPF) would crest at 752.4 feet msl and would discharge 214,000 cfs. Damages resulting from a recurrence of major known floods, the SPF, or the IRF would be substantial. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02642

FLOOD PLAIN INFORMATION: NESHANNOCK CREEK BASIN, LAWRENCE COUNTY, PENNSYLVANIA--MAIN REPORT AND TECHNICAL APPENDIX.
Army Engineer District, Pittsburgh, PA.
Prepared for Lawrence Regional Planning Commission, April 1964, 44 p, 24 plates, 5 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood data, *Peak discharge, Floods, Flood flow, Streamflow forecasting, River forecasting, Flood profiles, Historic floods, Flood stages, Flow characteristics, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Flood plain zoning, Land use, Planning, Zoning, Control structures, Dikes, Floodwalls, Dams, Reservoirs, Channel improvement, Lawrence County(PA), *Neshannock Creek(PA), New Castle(PA), Flood plain management.

The study area involves the portions of Lawrence County, Pennsylvania that are subject to flooding from Neshannock Creek. Included are the Borough of Volant, the Townships of Hickory, Neshannock and Wilmington, and the City of New Castle. The flood plain in New Castle is entirely developed, while the rest of the flood plain is sparsely developed. Flood data were obtained from topographic maps, field studies, historical sources and precipitation. No continuous stream gage records are available prior to 1961. The main flood season occurs from December through April and results from heavy general rainfall combined with snowmelt or intense local thunderstorms. The worst known flood, as measured in New Castle, occurred on January 22, 1959, cresting at 808.4 feet mean sea level (msl). At the same location, the Standard Project Flood would crest approximately 6.5 feet higher than the 1959 flood and would discharge approximately 33,500 cubic feet per second (cfs). Guidelines for reducing future flood damages are presented, including structural and non-structural flood control measures and a discussion of flood plain management. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02643

FLOOD PLAIN INFORMATION: OHIO AND BEAVER RIVERS, BEAVER COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Beaver County Planning Commission, March 1973, 48 p, 11 fig, 20 plates, 11 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Historic floods, *Flood data, *Flood stages, *Flood protection, *Control structures, Floods, Regional flood, Flood flow, Flood forecasting, Flood profiles, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Non-structural alternatives, Planning, Zoning, Locks, Dams, Reservoirs, Beaver County(PA), *Ohio River(PA), *Beaver River(PA), Intermediate Regional Flood.

The study area involves the portions of Beaver County, Pennsylvania that are subject to flooding from the Ohio and Beaver Rivers. Developments in the flood plains consist mostly of industrial and transportation land uses. There are 10 flood control projects on the Ohio River above its confluence with the Beaver River, and an additional 4 flood control projects on Beaver River, operated by the Corps of Engineers, that are effective in reducing flood levels by an average of 5-8 feet on the Ohio River above the Beaver River, and an additional 1-2 feet on the Ohio River below its confluence with the Beaver River. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs from December through April and results from heavy rainfall combined with snowmelt. Intense rainfall at other times of year has caused floods of considerable

magnitude. The worst known flood measured at the Montgomery Locks and Dam on the Ohio River occurred on March 19, 1936, cresting at 707.6 feet mean sea level (msl) and discharging 565,000 cubic feet per second (cfs). This flood's crest would have been reduced 10.4 feeet if existing flood control structures had been in place. At the same location, the Intermediate Regional Flood (IRF) would crest at 698.6 feet msl and would discharge 408,000 cfs. On Beaver River the worst recent flood occurred in January 1959, cresting at 741.90 feet msl, and discharging 70,100 cfs. The IRF is expected to have a peak discharge of 97,000 cfs and the SPF a discharge of 137,000 cfs, cresting at 744.4 and 747.3 feet msl, respectively. Historic and future flood profiles are presented for the entire study area. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-02644

AQUATIC VASCULAR PLANTS OF THE SANDUSKY RIVER BASIN,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-02650

PLANNING FOR URBAN STORMWATER CONTROL, (PART III),
Fell, Brusso, Bruton and Knowles, Inc., Tulsa, OK.
For primary bibliographic entry see Field 5G.
W78-02660

RELATIONSHIP OF REGROWTH OF AQUATIC MACROPHYTES AFTER TREATMENT WITH HERBICIDES TO WATER QUALITY AND PHYTOPLANKTON POPULATIONS,
Florida State Game and Fresh Water Fish Commission, Eustis.
For primary bibliographic entry see Field 5G.
W78-02676

AQUATIC HERBICIDE CHRONICITY,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-02677

4B. Groundwater Management

EXTRACTION OF GEOTHERMAL ENERGY BY TWO-LOOP SYSTEMS,
Krzhizhanovskii Energeticheskii Inst., Moscow (USSR).
For primary bibliographic entry see Field 8C.
W78-02276

SOLAR IRRIGATION SYSTEM BEGINS OPERATION IN NEBRASKA.
For primary bibliographic entry see Field 3F.
W78-02279

GEOTHERMAL HEAT: TO WHAT EXTENT CAN IT SATISFY OUR ENERGY HUNGER,
H. C. H. Armstead.
Chartered Mechanical Engineer, Vol. 24, No. 6, p 66-69, June, 1977.

Descriptors: *Energy, *Geothermal studies, *Natural resources, *Conservation, Heat transfer, Fuels, Hydroelectric power, Thermal waters, Fractures(Geology), Drilling, *Energy consumption, Hydraulic fracturing, Impact-fracturing, Hot dry rock, *Geothermal heat.

In spite of the growth of nuclear and hydroelectric power in the past few years, the world is still very dependent upon fossil fuels to satisfy energy needs. Estimates vary on the extent of the earth's untapped fossil fuels, but even at the highest estimate the life of ultimate fossil fuel reserves will be very short if growth of energy consumption per capita increases at the rate it has in the recent past. Geothermal energy now contributes only a very small portion of the world's energy, but potential for further development is great. Compared with hyperthermal fields (capable of yielding high heat suitable for power generation) and semi-thermal fields (providing warm water suitable for space heating), 'hot dry rock' areas are fairly widely scattered across the world; advances in drilling techniques which would permit penetration to 13 or 14 km into the earth's crust would provide even greater access to subterranean heat sources. Research on new deep drilling methods, especially rock melting, is essential in order that existing heat extraction technology can be applied to energy production. (Eberle-NWWA)
W78-02280

GEOTHERMAL DEVELOPMENT OF THE SALTON SEA,
DSS Engineers, Inc., Ft. Lauderdale, FL.
For primary bibliographic entry see Field 3E.
W78-02281

POWER FROM HOT GEOTHERMAL BRINES,
Rotoflow Corp., Los Angeles, CA.
For primary bibliographic entry see Field 8C.
W78-02282

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART I,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W78-02286

THE POTENTIAL FOR GEOTHERMAL STEAM,
Union Oil Co. of California, Los Angeles.
C. Otte.
Chemical Engineering Progress, Vol. 72, No. 7, p 80-82, July, 1976. 2 fig, 1 tab.

Descriptors: *Geothermal studies, *Thermal power plants, Thermal power, Electric power, Heated water, Steam, Geysers, Hot springs, Heated water, Water temperature, Corrosion, Fatigue, Brines, Drilling, The Geysers, Dry rock technology, Geopressured systems, Tectonic margins.

Molten magma near the surface produces high temperature zones at shallow depths along tectonic plate margins. Nearby ground water or water of crystallization will flash into steam when drilled wells release the overlying pressure. Steam or hot water can be converted to electricity or used in industrial process applications. The Geysers north of San Fransico has the world's largest installed capacity: 520,000 kW. Hard rocks typical of potential sites make drilling difficult. Corrosive hot saline brines and gases make well completion and development difficult. Geothermal wells cost 50% more than comparable oil wells. The low quality heat produced must be used locally or converted to electricity. Although not necessarily cheaper than fossil fuels, geothermal energy can be effective from smaller units. Geothermal potential may exist for 20 million kW with utilization of low-temperature deposits and development of geopressured systems and dry rock technology, thus reducing utilities' demand and foreign imports of fossil fuels. (Palmer-NWWA)
W78-02288

ALTERNATE MATERIALS OF CONSTRUCTION FOR GEOTHERMAL APPLICATIONS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 8G.
W78-02290

GEOTHERMAL ENERGY: ITS PROMISE FOR THE FUTURE.
For primary bibliographic entry see Field 3E.
W78-02294

NEBRASKA STUDIES WAYS TO RECHARGE AQUIFER STORAGE,
Universal Oil Products, St. Paul, MN. Johnson Div.
A. Smith.
Johnson Drillers Journal, Vol. 49, No. 5, p 1-3, September-October, 1977. 1 fig.

Descriptors: *Irrigation wells, *Artificial recharge, *Water table, Pumping, Well screens, Drawdown, Water wells, Logging(Recording), *Old West Regional Commission, *Nebraska.

The importance of recharge studies to the national ground water situation is being demonstrated by current research in Nebraska. The problem of declining water levels in that state is so severe that the future of continued ground water use for irrigation in some regions depends largely on the results of injection well studies now being made in Hamilton County between Aurora and Grand Island. This project is being sponsored by the Old West Regional Commission and conducted by the Nebraska Water Resources Center and the USGS. The experimental system consists of a withdrawal well located three miles west of an injection well; observation wells continuously monitor changes in aquifer levels as injection proceeds. In both the injection and the withdrawal wells, electric logs were valuable in accurately locating aquifer zones of best producing and recharge potential. The Nebraska study is only a part of a wide-ranging Old West Regional Commission artificial recharge project which includes Montana, North and South Dakota, and Wyoming as well. (Eberle-NWWA)
W78-02295

GROUND WATER QUALITY MODEL OF THE CHIPUXET AQUIFER IN THE UPPER PAWCATUCK RIVER BASIN,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-02402

NITROGEN SOURCE DIFFERENTIATION THROUGH CARBON ISOTOPES,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5B.
W78-02406

GROUND WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE PORTLAND AREA, MAINE,
Geological Survey, Augusta, ME. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02413

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1976.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02417

WATER RESOURCES DATA FOR WISCONSIN WATER YEAR 1976.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02418

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1976.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02419

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02420

WATER RESOURCES IN WESTERN CORTLAND COUNTY, NEW YORK: HYDROLOGIC DATA FOR 1972-75 AND PROGRESS REPORT,
Geological Survey, Ithaca, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02422

SOLUTION OF THREE-DIMENSIONAL GROUND-WATER FLOW EQUATIONS USING THE STRONGLY IMPLICIT PROCEDURE,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-02428

GROUND-WATER DATA FOR THE DREWSEY RESOURCE AREA, HARNEY AND MALHEUR COUNTIES, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02430

SALINE-WATER INTRUSION RELATED TO WELL CONSTRUCTION IN LEE COUNTY, FLORIDA,
For primary bibliographic entry see Field 5B.
W78-02434

PARTIALLY-SATURATED TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Montana Univ., Missoula. Dept. of Water and Land Resources.
For primary bibliographic entry see Field 2G.
W78-02453

INVESTIGATIONS OF THE DUNES GEOTHERMAL ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART 1, GEOCHEMISTRY OF GEOTHERMAL FLUIDS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2F.
W78-02535

INVESTIGATIONS OF THE DUNES ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART II, PETROLOGICAL STUDIES,
California Univ., Riverside. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W78-02536

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5E.
W78-02537

DEEP WELL INJECTION OF INDUSTRIAL WASTES: GOVERNMENT CONTROLS AND LEGAL CONSTRAINTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W78-02538

SIMILARITY SOLUTIONS FOR CONVECTION OF GROUNDWATER ADJACENT TO HORIZONTAL IMPERMEABLE SURFACES WITH AXISYMMETRIC TEMPERATURE DISTRIBUTION
Hawaii Univ., Honolulu. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W78-02539

HYDRAULIC FRACTURE EXPERIMENTS IN GT-1 AND GT-2,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 8E.
W78-02540

NEW SOURCES OF ENERGY: PROCEEDINGS OF THE CONFERENCE, VOLS. 2 AND 3, GEOTHERMAL ENERGY.
United Nations, New York.
Proceedings of the United Nations Conference on New Sources of Energy, August 21-30, 1961, Rome, Italy. UN Publication No. E/CONF. 35/3 and E/CONF. 35/4. 936 p, 362 fig, 125 tab, 327 ref, 3 append.

Descriptors: *Thermal power, *Geothermal studies, Thermal powerplants, Electric power production, Subsurface investigations, Surveys, Geophysics, Geochemistry, Thermal waters, Steam, Drilling, Wells, Drill holes, Equipment, Well casings, Generators, Japan, Italy, New Zealand, Mexico, Central America, Iceland, United States.

The Proceedings of the United Nations Conference on New Sources of Energy comprise seven volumes, two volumes of which are entirely devoted to reports on geothermal resources and technology. Geological assessments are presented for many potential power sites throughout the world. A great deal of material is also devoted to techniques and equipment for the drilling and power production phases of geothermal development. Volume I of the collected geothermal papers (Vol. II of the Proceedings) concentrates on geothermal prospecting while Volume II (Volume III of the Proceedings) deals with the mechanics of thermal energy utilization. The Conference Rapporteur's general report and his summation of the proceedings in connection with the agenda item are given in full in both English and French, as are those papers that were submitted to the Conference in both languages. With a few exceptions, all the papers are summarized in both English and French. (Eberle-NWWA)
W78-02541

GOVERNING EQUATIONS FOR GEOTHERMAL RESERVOIRS,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 2F.
W78-02542

LABORATORY TESTS OF RELIEF WELL FILTERS: REPORT 1, WELLS ALONG THE MISSISSIPPI RIVER LEVEES, ALTON TO GALE, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02545

MONITORING GROUNDWATER QUALITY,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-02547

COMBINED BIOLOGICAL TREATMENT AND UNDERGROUND INJECTION OF REFINERY WASTE WATER,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W78-02548

RESERVOIR EVALUATION TESTS ON RRGE 1 AND RRGE 2, RAFT RIVER GEOTHERMAL PROJECT, IDAHO,
California Univ., Berkeley. Lawrence Berkeley Lab.
T. N. Narasimhan, and P. A. Witherspoon.
Available from the National Technical Information Service, Springfield, VA 22161 as LBL 5958, Price codes: A04 in paper copy, A01 in microfiche. Publication No. LBL-5958, May, 1977. 50 p, 18 fig, 3 tab, 3 ref, 3 append.

Descriptors: *Geothermal studies, *Wells, Thermal water, Reservoirs, Sedimentary rocks, Water pressure, Pressure head, Pressure measuring instruments, Artesian wells, On-site investigations, Water yield, Boundaries(Surfaces), Gravity, Drawdown, Idaho, *Raft River Valley(Idaho), Well interference, Earth tides.

The successful geothermal wells RRGE 1 and RRGE 2, have indicated that a geothermal reservoir exists in the Raft River Valley with a producing horizon 1000 feet thick and a temperature of 146 degrees C. Three hydraulic tests were conducted to estimate the production parameters of the reservoir. The primary task of these tests was the careful and accurate measurement of water pressure changes in the wells, facilitated by the use of a highly sensitive quartz pressure gauge. Results indicate that the reservoir is extensive and significantly permeable. It therefore merits further exploration. It also appears that the reservoir is bounded in some direction, although the data from two wells was insufficient to precisely locate the boundary. The Raft River Valley reservoir was found to respond systematically to the small changes in the earth's gravitational field induced by the paths of the sun and the moon; appropriate corrections had to be made for these earth tide effects before one could interpret the pressure transient data for the reservoir production parameters. (Eberle-NWWA)
W78-02549

CONCEPTUAL DESIGN OF COMMERCIAL 50 MWE (NET) GEOTHERMAL POWER PLANTS AT HEBER AND NILAND, CALIFORNIA.
Bechtel International Corp., San Francisco, CA.
For primary bibliographic entry see Field 8C.
W78-02550

ESTIMATING AQUIFER PERMEABILITY BY SURFACE ELECTRICAL RESISTIVITY MEASUREMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W78-02551

TWO-DIMENSIONAL SIMULATION OF THE RAFT RIVER GEOTHERMAL RESERVOIR AND WELLS,
EG and G Idaho, Inc., Idaho Falls.
W. C. Kettenacker.
Available from the National Technical Information Service, Springfield, VA 22161 as TREE 1085, Price codes: A06 in paper copy, A01 in

microfiche. ERDA Report No. TREE-1085, March, 1977. 96 p, 13 fig, 4 tab, 29 ref, 4 append.

Descriptors: *Geothermal studies, *Computer models, *Thermal water, *Wells, Reservoirs, Heat transfer, Pressure, Temperature, Model studies, Thermal power, Idaho, *Raft River Geothermal Project (Idaho), Finite-difference models.

The objective of the work was to develop the tools necessary for long-term predictions of the response of the Raft River Valley geothermal reservoir and the wells drilled there in conjunction with the Raft River Valley Geothermal Project. A finite-difference computer code was the tool chosen. This code was based on the SINDA-36 computer program, an n-dimensional thermal analyzer which uses an electrical network (capacitor-conductor) analogy and a lumped parameter (node) representation of the physical system to solve steady-state and transient problems. Models describing both the transient reservoir pressure behavior and the time dependent temperature response of the wells have been developed. Vertical, two-dimensional, finite-difference, axisymmetric models for each of the three existing wells at Raft River were also constructed to describe the transient temperature and hydraulic behavior in the vicinity of the wells. The models are solved simultaneously with one input deck so that reservoir-well interaction may occur. Predicted results agree favorably with the test data obtained. (Eberle-NWWA)
W78-02552

GEOTHERMAL RESOURCES, EXPLORATION AND EXPLOITATION: A BIBLIOGRAPHY.
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 8B.
W78-02553

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART II,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 32, No. 1, p 85-87, January, 1978. 2 fig.

Descriptors: *Drilling, Water wells, Irrigation wells, Equipment, Aquifers, Labor, Costs, *Bangladesh, *Manual well drilling methods, Manual percussion drilling, Manual jetting, Hollow rod drilling.

Twenty wells recently constructed in Bangladesh under the auspices of the Joint Christian Catholic Irrigation Project were drilled using three manual methods. The manual percussion method consists of standing heavy-wall, flush-jointed casing on end and then bailing out the earth inside it by using a sludger with a flap valve at the bottom. Drilling action is accomplished by a number of men bouncing their weight on a taut cable. A second technique, the manual jetting method, utilizes direct circulation of drilling mud through standard 3-inch galvanized pipe. Rotation of the bit is achieved by attaching chain tongs to the drill pipes and having men walk around in a circle, pushing the tong handles. A third method, known as hollow rod drilling can be used for very small holes in favorable formations. Although these manual methods involve low capital cost and employ much unskilled labor, cost per foot of drilling is high and transportation of heavy materials can sometimes be a problem. These methods should still continue to have a place in Bangladesh, however, as utilization of power rigs is nearly impossible in many parts of that country. (Eberle-NWWA)
W78-02554

GROUND-WATER CONTAMINATION: PROBLEMS AND REMEDIAL ACTIONS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W78-02675

4C. Effects On Water Of Man's Non-Water Activities

RUNOFF FROM SOFTWOOD PLOTS THAT HAVE BEEN THINNED AND CLEARCUT,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
K. J. Banaszak.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 598, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, October 1977. 21 p, 5 fig, 3 tab, 14 ref. OWRT A-102-MISS(1), 14-34-0001-7052.

Descriptors: *Forest management, Storm runoff, Water quality, *Clear-cutting, *Nutrients, Loblolly pine trees, *Mississippi, Water pollution sources, *Dissolved solids, Phosphates, Nitrates, Sodium, Potassium, Calcium, Ammonia, Silicates, Tannens, Lignins.

Loblolly pine plantings on three east-west trending redges in north-central Mississippi were used to study the output of dissolved constituents (PO4, NO3, NH4, Na, K, Ca, SiO2, and tannins plus lignins) from control, thinned, and clearcut plots. Each treatment was performed on the north-facing and south-facing slope. The data from each of the three treatments of north-facing slopes were compared first with matching treatments of south-facing slopes, and no significant difference in the quantity of dissolved output was noted. The runoff from control plots did show significant differences in quality, with total PO4 and Ca higher from north-facing slopes at the 99.9% confidence level (C.L. = 99.9). The concentrations of total PO4 and dissolved SiO2 in runoff were different for the three treatments (C.L.=99.)), with the highest values from the clearcuts. The concentration of K in runoff, highest from control plots, also was significantly different (C.L.=99.9) for all ridges. Analysis of the quantity of output of constituents indicated that only PO4 had a difference above the 95% confidence level. This study indicates that (1) phosphate is the nutrient that should be of most concern to forestry practice in the Southeastern United States and (2) measurements of quantity and quality of nutrient loss may give different results with regard to statistical significance.
W78-02204

SOME ECONOMIC AND ENVIRONMENTAL EFFECTS OF HIGHWAYS IN JAPAN AND THE UNITED STATES,
Federal Highway Administration, Washington, D.C. Transportation Economics Div.
For primary bibliographic entry see Field 5C.
W78-02221

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 1, COMPUTER ANALYSIS OF RUNOFF FROM URBAN HIGHWAY WATERSHEDS UNDER TIME-AND SPACE-VARYING RAINSTORMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02240

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 2, LABORATORY STUDIES OF THE RESISTANCE COEFFICIENT FOR SHEET FLOWS OVER NATURAL TURF SURFACES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02241

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 3, HYDROLOGIC DATA FOR TWO URBAN HIGHWAY WATERSHEDS IN THE SALT LAKE CITY AREA, UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02242

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 5, SOIL-COVER-MOISTURE COMPLEX: ANALYSIS OF PARAMETRIC INFILTRATION MODELS FOR HIGHWAY SIDESLOPES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02244

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972 - SUPPLEMENT,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-02437

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA. PHASE II.
Mathematical Sciences Northwest, Inc., Bellevue, WA.
For primary bibliographic entry see Field 5G.
W78-02517

AIR AND WATER CONTAMINATION BY 3,4-BENZPYRENE FROM ROAD ABRASION, (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Hygiene und Arbeitsphysiologie.
For primary bibliographic entry see Field 5A.
W78-02562

4D. Watershed Protection

INVENTORY OF SEDIMENT SAMPLE COLLECTION STATIONS IN THE MISSISSIPPI RIVER BASIN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 2J.
W78-02230

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 1, COMPUTER ANALYSIS OF RUNOFF FROM URBAN HIGHWAY WATERSHEDS UNDER TIME-AND SPACE-VARYING RAINSTORMS,
Utah Water Research Lab., Logan.
C. L. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 985, Price codes: A12 in paper copy, A01 in microfiche. Report FHWA-RD-76-116, March 1976. 269 p, 37 fig, 4 tab, 123 ref, 4 append. DOT-FH-11-7806.

Descriptors: *Urban runoff, *Highways, *Utah, *Model studies, Mathematical models, Computer models, Runoff, Rainfall, Storms, Storm runoff, Storm water, Cities, Watersheds(Basins), Hydrographs, Flood routing, Analytical techniques, Hydrology, *Salt Lake City(Utah).

The main objective of this study was to develop an accurate design method for computing inlet hydrographs of surface runoff, with average recurrence intervals of 10, 25, and 50 years, from typical urban highway by flood routing technique. The most comprehensive mathematical model based on the method of characteristics was developed

for computing the runoff inlet hydrograph. All flood routing methods were reviewed extensively, and the most efficient and accurate technique was adopted for the formulation of a numerical (computer) model, including all the rainfall-runoff processes on a highway watershed. Accuracy of the computer model was examined by comparing the computed inlet hydrographs with field data obtained both from the Corps of Engineers airfield experiments and from typical highway cross sections in the Salt Lake City area. A few exploratory computer experiments indicated that the development of a unified dimensionless inlet hydrograph or a family of such hydrographs for typical highway cross sections seems possible. An appendix contained the computer program listing for the model. (See W78-02241 thru W78-02244) (Sims-ISWS)
W78-02240

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 2, LABORATORY STUDIES OF THE RESISTANCE COEFFICIENT FOR SHEET FLOWS OVER NATURAL TURF SURFACES,
Utah Water Research Lab., Logan.
C. L. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 986, Price codes: A06 in paper copy, A01 in microfiche. Report FHWA-RD-76-117, March 1976. 104 p, 29 fig, 17 tab, 48 ref, 1 append. DOT-FH-11-7806.

Descriptors: *Sheet flow, *Turf grasses, *Laboratory tests, Rainfall simulators, Flow resistance, Friction, Fluid friction, Flow friction, Roughness(Hydraulic), Surface runoff, Research facilities, Flow, Vegetation, Hydraulics, Hydrology.

The main objective of this study was to develop an accurate design method for computing inlet hydrographs of surface runoff, with average recurrence intervals of 10, 25, and 50 years, from typical urban highway by flood routing technique. Resistance to sheet flows over natural turf surfaces was investigated experimentally. The formulation of a functional relationship between the resistance coefficient and controlling parameters for shallow flows over various turf surfaces is essential to the mathematical modeling of surface runoff from urban highway sideslopes covered with different species of turf. An analysis of results obtained from laboratory experiments for laminar flow on Kentucky Blue grass and Bermuda grass revealed that a relationship exists between the Darcy-Weisbach friction coefficient, Reynolds number, and bed slope. Time did not permit tests to be performed on all species of turf other than Kentucky Blue grass and Bermuda grass which can be sodded. However, a general trend of the resistance relationship for shallow flows over such dense turf surfaces as affected by raindrop impact and roughness was determined qualitatively. (See also W78-02240) (Sims-ISWS)
W78-02241

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 3, HYDROLOGIC DATA FOR TWO URBAN HIGHWAY WATERSHEDS IN THE SALT LAKE CITY AREA, UTAH,
Utah Water Research Lab., Logan.
J. E. Fletcher, and C. L. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 987, Price codes: A06 in paper copy, A01 in microfiche. Report FHWA-RD-76-118, March 1976. 113 p, 40 fig, 16 tab, 3 ref. DOT-FH-11-7806.

Descriptors: *Urban runoff, *Highways, *On-site data collections, *Utah, Rainfall, Precipitation(Atmospheric), Storms, Storm runoff, Runoff, Weirs, Temperature, Air temperature, Winds, Watersheds(Basins), Soil moisture, Infiltration, Hyetographs, Hydrographs, On-site investigations, Hydrology, *Salt Lake City(Utah).

The main objective of this study was to develop an accurate design method for computing inlet hydrographs of surface runoff, with average recurrence intervals of 10, 25, and 50 years, from typical urban highway by flood routing technique. Hydrologic data, such as the rainfall intensity, runoff flow rate, air temperature, wind velocity, and soil moisture content, were collected during rainfall seasons in 1972 and 1973 on two urban highway watersheds in the Salt Lake City area, Utah. The data were used in the verfication of a mathematical model simulating the surface runoff from such highway watersheds. The difficulties and inherent problems associated with field data collection from urban highway cross section were discussed, and possible remedies were recommended. Hyetographs and the corresponding hydrographs of major storms which occurred in 1972 and 1973 at both sites were presented. Watershed infiltration capacities of sideslopes at both sites were evaluated empirically. (See also W78-02240) (Sims-ISWS)
W78-02242

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 4, SYNTHETIC STORMS FOR DESIGN OF URBAN HIGHWAY DRAINAGE FACILITIES,
Utah Water Research Lab., Logan.
C. L. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 988, Price codes: A08 in paper copy, A01 in microfiche. Report FHWA-RD-76-119, March 1976. 170 p, 20 fig, 183 tab, 55 ref, 5 append. DOT-FH-11-7806.

Descriptors: *Rainfall, *Runoff, *Design storm, Model studies, Mathematical models, Storms, Cities, Highways, Frequency, Equations, Drainage, Design, Rainfall intensity, Hyetographs, Hydrology, Climatology, Intensity-duration curves.

The main objective of this study was to develop an accurate design method for computing inlet hydrographs of surface runoff, with average recurrence intervals of 10, 25, and 50 years, from typical urban highway by flood routing technique. Knowledge of the time distribution of rainfall in heavy storms constitutes a basis for the design of an urban storm sewer system. A unified time-coordinate system and the rainfall intensity-duration-frequency relationships were used to develop the generalized synthetic (design) hyetograph equations for all types of storms. The hyetograph equations were normalized further for identifying the dimensionless parameters that play predominant roles in the formulation of a design storm pattern. The method of least squares and an optimization technique were applied to the evaluation of the storm parameters through the use of the rainfall intensity-duration-frequency maps in the U.S. Weather Bureau Technical Paper No. 40. It was found that the parameter evaluation method can be simplified greatly by establishing relationships among the storm parameters. However, an analysis of available actual hyetographs failed to establish any relationships between the storm skewness and the other storm parameters. (See also W78-02240) (Sims-ISWS)
W78-02243

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 5, SOIL-COVER-MOISTURE COMPLEX: ANALYSIS OF PARAMETRIC INFILTRATION MODELS FOR HIGHWAY SIDESLOPES,
Utah Water Research Lab., Logan.
C. L. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 989, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-RD-76-120, March 1976. 182 p, 33 fig, 20 tab, 165 ref, 2 append. DOT-FH-11-7806.

Descriptors: *Infiltration, *Highways, *Runoff, *Utah, *Model studies, Mathematical models, Equations, Soil groups, Soil classification, Soil properties, Soils, Soil moisture, Grasses, Turf, Slopes, Cities, Laboratory tests, Storm runoff, Rainfall, Hydrology, Highway sideslopes.

The main objective of this study was to develop an accurate design method for computing inlet hydrographs of surface runoff, with average recurrence intervals of 10, 25, and 50 years, from typical urban highway by flood routing technique. The boundary-value problem of one-dimensional infiltration resulting from rainfall was formulated and solved numerically on a digital computer. The numerical solution of this idealized mathematical model was used as a basic testing tool in the subsequent analysis of various parametric infiltration models, including the Green-Ampt, Kostiakov, Philip, Horton, and Holtan equations. The time of ponding was shown to be the most important parameter in a parametric infiltration model and can be expressed in terms of other parameters in the model as well as the rainfall intensity. The values of all the model parameters were determined to be fairly constant for a soil having the same initial and upper boundary (soil surface) conditions. Use of the Green-Ampt, Kostiakov, and Philip type models for the prediction of the infiltration rate before and after ponding was proved to be satisfactory. For engineering practice, the standard infiltration-capacity curves for soil-cover-moisture complexes representing urban highway sideslopes were developed empirically based on the unique selection of the Soil Conservation Service Runoff curve number. Validity of typical standard curves so developed was examined experimentally in the Utah Water Research Laboratory stormflow experiment facility. (See also W78-02240) (Sims-ISWS)
W78-02244

EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND ITS HYDROLOGIC IMPLICATIONS,
Colorado State Univ., Fort Collins.
R. S. Parker.
Colorado State University Hydrology Paper No. 90, June 1977. 57 p, 54 fig, 23 tab, 88 ref, 2 append.

Descriptors: *Drainage density, *Model studies, *Geomorphology, *Land forming, *Erosion, Hydrographs, Rainfall intensity, Peak discharge, Topography, Hydrology, Sediment yield, Overland flow, *Drainage basin evolution, Nonlinear response, Erosional evolution.

An experimental study was conducted to document the evolution of the drainage system on an initially flat, gently sloping surface under 4 intensities of rainfall on a 9 by 15 m facility. The relief and initial surface slope were varied from one experiment to the other. Basin evolution can be studied from a plot of drainage density through time, which shows an increase to a maximum at maximum extension followed by a decline during abstraction. Sediment yields from the basin undergoing erosional evolution show an exponential decline with time. The overall trend is characterized by high variability. Hydrographs generated on various geomorphic surfaces as evolution progressed suggested that runoff produced by lower precipitation intensities is most influenced by the geomorphology of the basin. The basin produced an increasingly nonlinear response as drainage density decreased. This may result from greater overland flow as drainage density decreases. The efficiency of the hydrologic response, as indexed by the peak of the instantaneous unit hydrograph, appears to increase to a maximum as drainage density and/or relief increases. (Singh-ISWS)
W78-02262

HYDROLOGIC CONSIDERATIONS ASSOCIATED WITH DREDGING SPRING PONDS IN WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.

W. J. Rose.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 508, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-18, June 1977. 35 p, 14 fig, 1 plate, 3 tab, 5 ref.

Descriptors: *Dredging, Effects, *Inflow, *Ponds, *Wisconsin, Groundwater movement, Springs, Water level fluctuations, Lake sediments, Hydrogeology, *Lake restoration.

Spring ponds (small spring-fed bodies of water) are natural features of some glaciated areas. The purpose of this study was to determine the hydrology of three spring ponds in northeastern Wisconsin and the effects that dredging has had on the ponds. Sediments were dredged from Sunshine and Krause Ponds. Maxwell Pond, which was not dredged, was used as a hydrologic control. Sediment accumulation since glaciation caused a 2-fold reduction in the surface area of Sunshine Pond and a 4-fold reduction in the area of Krause Pond. Volume reduction caused by sediment accumulation was 9-fold in Sunshine Pond and 28-fold in Krause Pond. Dredging 4.2 acre-feet of sediment from Sunshine Pond caused a 41-percent increase in ground-water inflow. Dredging 4.0 acre-feet of sediments from Krause Pond caused only a 2-percent increase in ground-water inflow. (Woodard-USGS)
W78-02421

THE WELFARE EFFECTS OF EROSION CONTROLS, BANNING PESTICIDES, AND LIMITING FERTILIZER APPLICATION IN THE CORN BELT,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 5G.
W78-02527

CONTROLLING NONPOINT SEDIMENT SOURCES WITH CROPLAND MANAGEMENT: A NATIONAL ECONOMIC ASSESSMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-02568

THE SOIL MOISTURE COMPONENT OF MATHEMATICAL CATCHMENT SIMULATION MODELS,
Seven-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2G.
W78-02598

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ALPHA- AND GAMMA-BHC IN TAMAGAWA RIVER WATER, JAPAN (SEPTEMBER 1968 TO SEPTEMBER 1969),
Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
M. Ochiai, and T. Hanya.
Environmental Pollution, Vol 11, No 3, p. 161-166, November 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Pesticides, *Insecticides, *Pesticide residues, Water pollution sources, Rivers, Chlorine, Pollutants, Water sampling, Gas chromatography, Analytical techniques, *Tamagawa River(Japan), *BHC, Organochlorine pesticides.

Residue concentrations of the organochloride pesticide BHC, which has been used in Japan for about 30 years and reached a peak of 46,830 tons in 1968, were measured in the Tamagawa River near Tokyo. Sampling was done at Hino, Noborito, and Maruko from September 1968 to September 1969. Pesticide determination was made with a Shimadzu model GC-2C gas chromatograph equipped with a H-3 foil electron capture detector. Distinguishing of alpha- from gamma-BHC was based on relative retention times to aldrin of two different columns of the gas chromatograph and the Rf values of an alumina thin layer chromatograph. Concentrations of BHC residues at Maruko ranged from 14-577 ng/l alpha-BHC; and 24-179 ng/l gamma-BHC; at Noborito 16-487 ng/l gamma-BHC. The highest concentration was at Maruko on 11 July 1969. The high for Noborito was also in July, but for Hino the high was in May. It is thought that high BHC residues in the river in summer reflect the high summer use of the pesticide. (Lynch-Wisconsin)
W78-02218

RADIUM-226, URANIUM, AND OTHER RADIOLOGICAL DATA COLLECTED FROM WATER QUALITY SURVEILLANCE STATIONS LOCATED IN THE COLORADO RIVER BASIN OF COLORADO, UTAH, NEW MEXICO, AND ARIZONA- JANUARY, 1961 THROUGH JUNE, 1972.
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 920, Price codes: A12 in paper copy, A01 in microfiche. Report 8SA/TIB-24, July 1973. 272 p, 29 fig, 33 tab, 1 append.

Descriptors: *Water quality, *Radioactive wastes, *Colorado River, *Colorado River Basin, Sampling, Data collections, On-site data collections, Monitoring, Pollutants, Rivers, Mining, Mine wastes, Water pollution, *Uranium, *Radium-226.

The RMN ('Radiological' or 'Radium Monitoring Network') System was established in 1961. This report presented all of the available data supplied by the RMN System to date. The report also examined certain of the data in terms of their long- and short-term trends. In excess of 3,000 measurements of radium-226 and uranium in the dissolved state were presented as are many measurements of other radioactivity parameters. The report concentrated on total uranium and radium-226 data for surface waters and compared the mean 'background' concentration with concentrations downstream of uranium mills and uranium tailings piles. Due in part to a decrease in the number of uranium mills and in part to an improvement in the caretaking of uranium tailings piles, concentrations of radium-226 and uranium total have decreased generally throughout the Basin with the notable exceptions being within the Dolores-San Miguel Rivers System clearly showed the water quality degradation caused by uranium extraction activities. This straightforward statistical analysis also serves as a basis for evaluating the radium content of other river systems. (Sims-ISWS)
W78-02231

DESIGN CONSIDERATIONS FOR SAMPLING PROGRAMS IN REMOTE AREAS,
Alaska Univ. College.
For primary bibliographic entry see Field 7A.
W78-02235

WORKSHOP REPORT ON ACID PRECIPITATION AND THE FOREST ECOSYSTEM,
Northeastern Forest Experiment Station, Delaware, OH.
L. S. Dochinger, and T. A. Seliga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 813, Price codes: A02 in paper copy, A01 in microfiche. Technical Report NE-26, Northeastern Forest Experiment Station, Upper Darby, Pennsylvania, December 1976. 21 p. NSF DES75-13749.

Descriptors: *Precipitation(Atmospheric), *Air pollution, *Acids, *Forests, Powerplants, Energy, Effects, Pollutants, Sulfur compounds, Nitrogen compounds, Rainfall, Snowfall, Vegetation, Soils, Forest soils, Water pollution, Path of pollutants, *Acid precipitation.

The first International Symposium on Acid Precipitation and the Forest Ecosystem provided the first worldwide forum devoted to consideration of acid precipitation and forestry problems. The symposium brought together experts from diverse fields of the physical and biological sciences to discuss their research and their concerns about a potentially serious environmental problem. A Workshop, organized as a follow-up to the Symposium, benefited greatly from participation by more than 60 international scientists. A report on the Workshop was presented. Five discussion panels were formed to consider: (1) Atmospheric Emissions, Transport, Transformation, and Removal; (2) Effects on Aquatic Systems; (3) Effects on Forest Soils; (4) Effects on Forest Vegetation; and (5) Energy-Related Issues. The report identified the nature, extent, and dimensions of the problems associated with acid precipitation. The recommendations contained in the report should serve as a guide for research by scientists and for program planning by academic, industrial, government, and public-interest groups. (Sims-ISWS)
W78-02236

EXAMINATION OF THE ELUTRIATE TEST, A SCREENING PROCEDURE FOR DREDGING REGULATORY CRITERIA,
Canada Centre for Inland Waters, Burlington (Ontario).
V. Cheam, A. Mudroch, P. G. Sly, and K. Lum-Shue-Chan.
Journal of Great Lakes Research, Vol 2, No 2, p 272-282, December 1976. 4 fig, 2 tab, 20 ref.

Descriptors: *Dredging, *Water pollution, *Chemical analysis, Surveys, Monitoring, Spoil banks, Water pollution sources, Laboratory tests, Sediments, Pollutants, Heavy metals, Zinc, Mercury, Lead, Cadmium, Chemicals, Water quality, *Dredging regulatory criteria, Standard Elutriate Test.

Water quality parameters were considered in a series of tests, including the Standard Elutriate Test designed to appraise the elutriate techniques. Both the conditional stability constant and the complexing capacity of the elutriate were greater than those of background waters. Although the concentration of the Standard Elutriate can be greater than 1.5 times the original concentration for the four heavy metals considered (Zn, Hg, Pb, Cd), it may be still less than the standards for drinking water and freshwater or marine aquatic life. Thus, such releases themselves should not significantly affect the water quality. It appears that improvement of the existing dredging regulatory criteria concerning Hg, Pb and Zn is desirable. On the other hand, tests indicated that the release of phosphorus can be large and might significantly affect the water quality in actual open water disposal. It was suggested, therefore, that further research be performed to elucidate the behaviour of phosphorus release from dredged spoils, and that the concentrations of phosphorus and other constituents in the elutriates be compared to the standards. Finally, it was suggested that an acceptable test should realistically reflect the occurrence at the disposal site and, consequently, should at least incorporate an estimated resulting sediment-water ratio and a mixing process representative of the dump site. (Sims-ISWS)
W78-02253

PERSISTENCE OF SOME PHENYLAMIDE PESTICIDES IN THE AQUATIC ENVIRON-

MENT -- II. ADSORPTION ON CLAY MINERALS,
National Research Centre, Cairo (Egypt). Water Pollution Control.
For primary bibliographic entry see Field 5B.
W78-02264

REDUCTION OF SALMONELLA, E. COLI, COLIFORMS AND FECAL STREPTOCOCCI BY CHLORINATION OF SEWAGE TREATMENT PLANT EFFLUENTS,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. voor Stralingsonderzoek.
For primary bibliographic entry see Field 5D.
W78-02325

COMPOUNDS RESISTANT TO CARBON ADSORPTION IN MUNICIPAL WASTEWATER TREATMENT,
Weyerhauser Co., Tacoma, WA.
D. K. Chow, and M. M. David.
Journal of the American Water Works Association, Vol. 69, No. 10, p 555-561, October 1977. 5 fig, 8 tab, 64 ref.

Descriptors: *Pollutant identification, *Activated carbon, *Analytical techniques, *Adsorption, Water analysis, Phenols, Heavy metals, Nitrogen compounds, Effluents, Coagulation, Molecular structure, Organic wastes, Chemical analysis, Aromatic compounds, Chlorination, Salts, Municipal wastes, Elements, Waste water treatment, Carbon adsorption resistance.

Since waste water designated for reuse may undergo tertiary treatment consisting only of activated carbon adsorption, studies were conducted to identify compounds in municipal waste water which are resistant to carbon adsorption. Primary effluents were chemically pretreated by flocculation with FeCL or alum and the clarified liquor was passed through a sand filter and a 0.45-micron membrane filter. The chemically treated primary and biologically treated secondary effluents were passed through columns of granular activated carbon, concentrated by evaporation, filtered, and recycled through the system to simulate water reuse. Resistant compounds were analyzed with TOC content measurements, ultrafiltration for molecular size distribution, neutron-activation analysis for elemental distributions, atomic adsorption for metallic elements, UV spectroscopy for organic compounds, and thermogravimetric analysis for inorganic compounds. The elemental composition indicated that Na, N, and Cl were most resistant, followed by C, K, Fe, Ca, Zn, and Mg. Molecular size distributions indicated that molecules with relatively small sizes (less than 240 nm) accounted for 45-60% of the resistant compounds while large molecules (larger than 640 nm) accounted for only 5-18% of the total carbon content. Organic compounds identified include chlorinated hydrocarbons, aliphatic acids, aromatic amines, phenolic compounds, and calcium salts of orgaic acids. The major inorganic compounds which were identified included sodium and calcium salts of chlorides, nitrates, sulfates, and phosphates. Concentrations of free cyanides and metallic elements were negligible. (Schulz-FIRL)
W78-02344

SPECTROPHOTOMETRIC DETERMINATION OF RESIDUAL HYDROGEN PEROXIDE,
Brussels Intercommunal Water Co., (Belgium).
W. Massachelein, M. Denis, and R. Ledent.
Water and Sewage Works, Vol 124, No 8, p 69-72, August, 1977. 2 fig, 34 ref.

Descriptors: *Pollutant identification, *Cobalt, *Oxidation, *Colorimetry, *Spectrophotometry, *Bicarbonates, *Analytical techniques, Chemical reactions, Water treatment, Disinfection, Chemical wastes, Waste water treatment, *Hydrogen peroxide, Analytical interference.

Hydrogen peroxide (H2O2) a strong oxidizing agent, decomposes by reactions in water and leaves residual oxygen. Applications of hydrogen peroxide in waste water treatment include oxidation of sulfhydric acid and mercaptans, indirect oxidation of phenols, aeration, disinfection in reservoirs, and elimination of taste or odor caused by chlorine or chloramines in drinking water. Various analytical methods for determining residual H2O2 concentrations are described. Existing methods include colorimetric determination with titanium(IV) salt (chloride or sulfate), with phenolphthalein in the presence of Cu(+2), or with oxygen-sensitive electrodes which have been adapted for use with H2O2 by incorporating a suitable catalyst (MnO2, Co2O3, or Ru2O3) in the electrode membranes. The cobalt-bicarbonate-H2O2 method for determination of H2O2 is described. Standard solutions containing H2O2 are titrated with ammonium molybdate and neutral potassium iodide. Sodium hexametaphosphate, Co(+2), and a saturated sodium bicarbonate solution are added to samples, producing an intense bicarbonate green color which is probably caused by the presence of a Co(+3) carbonate complex. Absorption is measured with a spectrophotometer at 260 nm. The reported detection limit is about 0.01 mg/liter H2O2 with possible interference caused by turbidity or suspended particles. A graph for optical density (absorption) as a function of H2O2 concentration is provided. (Schulz-FIRL)
W78-02367

EVALUATION OF A NITRATE-SPECIFIC ION ELECTRODE,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Yu, and P. M. Berthouex.
Journal Water Pollution Control Federation, Vol 49, No 8, p 1869-1901, August, 1977. 1 fig, 9 tab, 7 ref.

Descriptors: *Pollutant identification, *Electrodes, *Analytical techniques, *Permselective membranes, *Nitrates, *Electrochemistry, Water chemistry, Aqueous solutions, Chemical properties, Chemical potential, Electric equipment, Model studies, Chemical analysis, Waste water treatment, Nitrate-specific ion electrodes, Brucine method.

The Simple Electrode and the Standard-Addition Electrode methods are used to evaluate nitrate determinations with a nitrate-specific ion electrode and the Brucine method using effluent samples from biological treatment units. The nitrate electrode measures nitrate activity in terms of potential across a layer of water-immiscible ion exchanger held in place by an inert porous membrane. Electrode behavior follows a Nernst relation within the working range. Ionic interference is usually counteracted by the addition of a buffer to maintain constant ionic strength. The Standard-Addition or Known-Increment method involves the addition of a known amount of nitrate to a solution containing an unknown amount. The quantity of nitrate present in the initial solution is determined by measuring the change in potential produced by the additional nitrate. Grab samples of waste water effluent with nitrate concentrations ranging from 2-20 mg/liter were collected from nitrification pilot plants. Higher readings obtained with the Simple Electrode method than with Standard-Addition were attributed to greater influence of high hardness and alkalinity in the waste water on simple electrode determinations. Standard errors for nitrate determinations with the Brucine method were higher than for either electrode method, and procedures were more time-consuming, requiring reagent preparation. The specific-nitrate ion electrode is recommended as a relatively inexpensive, fast, portable means of nitrate determination in waste water for concentrations as low as 1 mg/liter nitrate-N. (Schulz-FIRL)
W78-02368

OBSERVATIONS ON PRE-ENRICHMENT FOR ISOLATING SALMONELLAS FROM SEWAGE POLLUTED NATURAL WATER USING MULLER-KAUFFMANN TETRATHIONATE BROTH PREPARED WITH FRESH AND DESSICATED OX BILE,
Central Public Health Lab., Cardiff (England).
R. W. S. Harvey, and T. H. Price.
Journal of Applied Bacteriology, Vol 43, No 1, p 145-148, August, 1977. 2 tab, 13 ref.

Descriptors: *Salmonella, *Pollutant identification, *Analytical techniques, *Microbiology, *Bioassay, *Cultures, Sewage bacteria, Pollutant identification, Path of pollutants, Bacteria, Microorganisms, Water treatment, Waste water treatment, Ox bile, Muller-Kauffmann Tetrathionate Broth.

Dessicated ox bile was evaluated as a substitute for fresh bile in the preparation of Muller-Kauffmann Tetrathionate Broth for the isolation of salmonellas from sewage-polluted waters. Salmonellas in water samples collected from the Taff River in Wales were isolated in media which had been prepared with fresh bile, dessicated bile, or a combination of the two. The media had also been directly enriched or had undergone pre-enrichment followed by enrichment. Studies on enriched samples indicated that fresh bile was more efficient for isolating salmonella than dessicated bile. With pre-enrichment, both forms were equally satisfactory. (Schulz-FIRL)
W78-02370

COMPUTERS AND INSTRUMENTATION--PARTNERS IN TREATMENT PLANT OPERATION,
For primary bibliographic entry see Field 7C.
W78-02373

LEVEL INSTRUMENTATION IN EFFLUENT TREATMENT PLANTS.
Water and Pollution Control, Vol. 115, No. 9, p 29-34, September, 1977. 6 fig.

Descriptors: *Monitoring, *Analytical techniques, *Flow measurement, *Ultrasonics, *Pollutant identification, Electronic equipment, Flow control, Pumping, Waste water treatment, Tuning forks, Capacitance systems.

Analytical instrumentation and flow monitoring devices available for use in waste water treatment plants are discussed. General detection methods employed in flow measurement and control include sonic, ultrasonic, capacitance probe, vibrating probe, windlass, nuclear, microwave, and radar. Sonic and ultrasonic systems are used to provide non-contact level measurements based on reflected pulses whose echos are received by an emitting transducer located above the water surface. Sonic and ultrasonic systems such as the E + H Aquatot system can be used at various points in a sewage plant, including the in-flow points, between primary and secondary treatment facilities, and at outflow points. They can also be used for automatic bar screen control, screw pump control, and slide valve control in an activated sludge tank. Large-scale application of sonic controllers to monitor groundwater levels and control pump start-up in Richmond, British Columbia, Canada, is described. The E + H Aquatot system has also been used for open channel measurement by the city of Thompson in Manitoba, Canada. The change in electrical capacitance between a probe and the wall of a tank is used to operate capacitance systems for operation and automatic sequencing of a pumping system. The E + H tuning fork, or Vibratrol instrument, contains a piezoelectric element which is used for underwater detection. Additional applications of monitoring instruments produced by Endress and Hauser of West Germany are discussed for mechanical windlass instruments, nuclear and microwave measurement, gamma radiation,

microwave control, and other instrument types. (Schulz-FIRL)
W78-02375

APPLICATION OF THE RAPID LYSINE DECARBOXYLASE TEST FOR EARLY ISOLATION AND DETECTION OF SALMONELLAE IN SEWAGE AND OTHER WASTEWATERS,
National Environmental Engineering Research Inst., Nagpur (India). Life Sciences Div.
P. M. Phirke.
Applied and Environmental Microbiology, Vol. 34, No. 4, p 453-455, October, 1977. 1 tab, 18 ref.

Descriptors: *Salmonella, *Enteric bacteria, *Analytical techniques, *Testing procedures, *Microbiology, Bioassay, Water analysis, Sewage bacteria, Food processing industry, Municipal wastes, Waste water treatment, *Pollutant identification, *Lysine decarboxylase test, Salmonella detection, Bacteriology.

The lysine decarboxylase (LD) test has been among several test schemes advocated for identification of Enterobacteriacea and has been used in conjuction with hydrogen sulfide production to verify the presence of Salmonellae. The applicaton of the rapid lysine decarboxylase test for isolation and detection of Salmonella was evaluated in experiments with 39 waste water samples, including raw sewage, settled sewage, treated effluent from facilities at the National Environmental Engineering Research Institute in India, and raw and filtered slaughterhouse wastes. The test involved inoculation of samples into Kauffman tetrathionate broth, incubation at 41.5C for 24 or 48 hr, streaking of the enriched culture on BGA plates, and incubation of the BGA plates for 18 hr at 37C. Colonies exhibiting a pink or magenta hue were then inoculated into tubes which contained lysine broth, and sterile 0.5% plain agar was added. The tubes were incubated in a dry-air, water-jacketed unit at 37C and read at 1-, 2-, 3-, and 4-hr intervals. The development of a green blue color was considered as a positive indication of LD activity. Tests with the LD method which revealed Salmonellae presence in 129 of 205 colonies were verified with the modified Kohn method and with slide agglutination tests of 6-hr growth obtained on nutrient agar slopes. The LD test was capable of identifying and isolating Salmonellae within 2-3 days, as compared to 5-6 days with conventional methods. (Schulz-FIRL)
W78-02379

SONICATION OF ACTIVATED SLUDGE FLOCS AND THE RECOVERY OF THEIR BACTERIA ON SOLID MEDIA,
York Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5D.
W78-02384

THE DELINEATION OF A POINT SOURCE PLUME BY THE STUDY OF BACTERIAL POPULATIONS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-02392

GROUND WATER QUALITY MODEL OF THE CHIPUXET AQUIFER IN THE UPPER PAWCATUCK RIVER BASIN,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-02402

DETECTION OF A POTENTIAL HEALTH HAZARD IN RECREATIONAL AND OTHER SURFACE WATERS,
Nebraska Univ. at Omaha. Dept. of Biology.
W. D. O'Dell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 769, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Research Institute, Lincoln, Completion Report, September 1977. 19 p, 4 fig, 4 tab, 13 ref. OWRT A-037-NEB(1), 14-34-0001-7058.

Descriptors: *Naegleria, *Acanthamoeba, Hartmannella, Vahlkampfia, Primary amebic meningoencephalitis, *Amebas, Soils, Muds, *Pollutant identification, Biomass, Analytical techniques, Public health, Soil analysis, Water analysis, Nebraska, Protozoa, Pathogens.

A plating-method for the detection and quantification of free-living amebas from soils and water was developed and tested. This method allows reliable estimates of the populations of amebas present in environmental samples. Application of this method to sample the population of amebas from a selected lake demonstrated some seasonal variation in the populations of these organisms. One genus, Acanthamoeba, was the dominant member of the ameba community which also included the genera Naegleria, Hartmannella and Vahlkampfia. In the study, only small free-living amebas were isolated and identified. However, this method could be used in the detection of closely related pathogenic amebas with only slight modifications to determine the pathogenicity of the isolates.
W78-02405

NITROGEN SOURCE DIFFERENTIATION THROUGH CARBON ISOTOPES,
Nebraska Univ., Lincoln. Conservation and Survey Div.
For primary bibliographic entry see Field 5B.
W78-02406

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1976.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02417

WATER RESOURCES DATA FOR WISCONSIN WATER YEAR 1976.
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02418

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1976.
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02419

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02420

WATER RESOURCES IN WESTERN CORTLAND COUNTY, NEW YORK: HYDROLOGIC DATA FOR 1972-75 AND PROGRESS REPORT,
Geological Survey, Ithaca, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02422

HYDROLOGIC RECONNAISSANCE OF THE EASTERN NORTH SLOPE, ALASKA, 1975,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02424

TIME OF TRAVEL OF SOLUTES IN MISSISSIPPI RIVER FROM BELLE CHASSE TO THE VICINITY OF HEAD OF PASSES, LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-02426

METHODS FOR DETERMINATION OF RADIOACTIVE SUBSTANCES IN WATER AND FLUVIAL SEDIMENTS,
Geological Survey, Lakewood, CO. Water Resources Div.; and Colorado School of Mines, Golden.
L. L. Thatcher, V. J. Janzer, and K. W. Edwards.
Available from Supt. of Documents, GPO, Washington, DC 20402. Techniques of Water-Resources Investigations, Book 5, Chapter A5, 1977. 95 p, 11 fig, 2 tab, 88 ref.

Descriptors: *Radiochemical analysis, *Analytical techniques, *Water analysis, *Fluvial sediments, *Radioactive waste disposal, Radioisotopes, Chemical analysis, Water pollution, Uranium radioisotopes, Tritium, Laboratory equipment, Lead-210, Radium-226, Radium-228, Carbon-14, Cesium-137, Strontium-90, Ruthenium-106.

Analytical methods for the determination of some of the more important components of fission or neutron activation product radioactivity and of natural radioactivity found in water and fluvial sediments are reported. The report for each analytical method includes conditions for application of the method, a summary of the method, interferences, required apparatus and reagents, analytical procedures, calculations, reporting of results, and estimation of precision. The fission product isotopes considered are cesium-137, strontium-90, and ruthenium-106. The natural radioelements and isotopes considered are uranium, lead-210, radium-226, radium-228, tritium, and carbon-14. A gross radioactivity survey method and a uranium isotope ratio method are given. When two analytical methods are in routine use for individual isotope, both methods are reported with identification of the specific areas of application of each. Techniques for the collection and preservation of water samples to be analyzed for radioactivity are discussed. (Woodard-USGS)
W78-02429

GROUND-WATER DATA FOR THE DREWSEY RESOURCE AREA, HARNEY AND MALHEUR COUNTIES, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-02430

METHODS FOR COLLECTION AND ANALYSIS OF AQUATIC BIOLOGICAL AND MICROBIOLOGICAL SAMPLES,
Geological Survey, Reston, VA. Water Resources Div.
P. E. Greeson, T. A. Ehlke, G. A. Irwin, B. W. Lium, and K. V. Slack.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $20.00. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A4, 1977. 332 p, 60 fig, 11 tab.

Descriptors: *Analytical techniques, *Aquatic populations, *Methodology, *Sampling, *Statistical methods, Enteric bacteria, Aquatic microbiology, Benthic fauna, Biomass, Chlorophyll, Preservation, Diatoms, Fish, Periphyton, Phytoplankton, Zooplankton, *Biological sampling, *Water samples, Glossary.

Book 5, chapter A4 of Techniques of Water Resources Investigations contains methods used by the U.S. Geological Survey to collect, preserve, and analyze waters to determine their biological and microbiological properties. Part 1 discusses biological sampling and sampling statistics. The statistical procedures are accompanied by examples. Part 2 consists of detailed descriptions of more than 45 individual methods, including those for bacteria, phytoplankton, zooplankton, seston, periphyton, macrophytes, benthic invertebrates, fish and other vertebrates, cellular contents, productivity, and bioassays. Each method is summarized, and the application, interferences, apparatus, reagents, collection, analysis, calculations, reporting of results, precision, and references are given. Part 3 consists of a glossary. Part 4 is a list of taxonomic references. (Woodard-USGS)
W78-02432

WATER-QUALITY STUDY OF TULPEHOCKEN CREEK, BERKS COUNTY, PENNSYLVANIA, PRIOR TO IMPOUNDMENT OF BLUE MARSH LAKE,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-02433

EVALUATION OF CHEMICAL, BIOLOGICAL, AND PHYSICAL CONDITIONS IN THE WINTER HAVEN CHAIN OF LAKES, FLORIDA, MARCH-JUNE 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. C. Reichenbaugh, and G. H. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 027, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-52, July 1977. 34 p, 14 fig, 2 tab, 8 ref.

Descriptors: *Lakes, *Florida, *Water quality, *Biological properties, *Physical properties, Eutrophication, Water pollution sources, Inflow, Urban runoff, Agricultural runoff, Industrial wastes, Sewage disposal, Turbidity, Hydrogeology, Groundwater, Withdrawal, Water level fluctuations, *Winter Haven lakes(Fla), Chain of lakes.

Reconnaissance of water-quality conditions of 14 interconnected navigable lakes, in and around Winter Haven, Fla., revealed that in March and May, 1976 most were eutrophic, on the basis of high nutrient (nitrogen and phosphorus) concentrations. Lakes Lulu and Shipp were the most enriched as a result of surface runoff from residential, agricultural, and highly urbanized areas, and many years of municipal and industrial waste effluent input. Phytoplankton counts were greater than a million cells per milliliter in some lakes sampled; algal blooms have ocurred, and water clarity was low. The level of Lake Howard fell to the lowest stage recorded in 31 years during May 1976. The record low was likely due to rainfall deficiency. Leakage of water through the lake beds to the ground-water system is also possible, but determination of the escaping water volume would require additional study. (Woodard-USGS)
W78-02435

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972 - SUPPLEMENT,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-02437

ENVIRONMENTAL PHOSPHORUS HANDBOOK.
For primary bibliographic entry see Field 5B.
W78-02457

A STOCHASTIC MODEL FOR BOD AND DO IN STREAM WHEN POLLUTANTS ARE DISCHARGED OVER CONTINUOUS STRETCH,
South Carolina Univ., Columbia. Dept. of Mathematics and Computer Science.
For primary bibliographic entry see Field 5B.
W78-02458

THE HYDROGRAPHY OF THE MURDERKILL ESTUARY, DELAWARE,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-02459

THE ACUTE TOXICITY OF 47 INDUSTRIAL CHEMICALS TO FRESH AND SALTWATER FISHES,
Battelle Pacific Northwest Labs., Richland, WA. Water and Waste Management Section.
For primary bibliographic entry see Field 5C.
W78-02463

A METHOD OF STUDYING PHOTOSYNTHETIC CAPACITIES IN UNICELLULAR ALGAE BASED ON IN VIVO CHLOROPHYLL FLUORESCENCE,
Umea Univ. (Sweden). Dept. of Plant Physiology.
G. Samuelsson, and G. Oquist.
Physiologia Plantarum, Vol 40, No 4, p 315-319, 1977. 6 fig, 23 ref.

Descriptors: *Photosynthesis, *Fluorescence, *Algae, *Chlorophyll, Chlorophyta, *Pollutant identification, Analytical techniques, Methodology, *DCMU-induced fluorescence.

The correlation between photosynthesis and DCMU-induced fluorescence increase is studied in four species of unicellular green algae from inoculation of the cultures to the stationary growth phase. It is concluded that compared to currently available methods for measurement of photosynthetic productivity in aquatic systems, the fluorescence method would be a rapid and comparably-accurate method for obtaining information on both chlorophyll content and photosynthetic capacities for estimation of primary production capacities of algal populations. The fluorescence increase induced by DCMU was high in exponentially growing cultures but decreased when the cultures approached the stationary phase of growth. Because of good correlation between photosynthesis and DCMU-induced fluorescence increase, the fluorescence technique is considered promising. The fluorescence method has the advantage of being used for chlorophyll determination in algal samples or in natural aquatic systems without enrichment of the algal concentration through filtration. (Coyle-Wisconsin)
W78-02467

THE PROBLEM OF THE SANITARY PROGNOSIS OF THE WATER QUALITY OF THE NIZHNEKAMSK RESERVOIR, (IN RUSSIAN),
Kazan Inst. of Porsgraduate Medicine (USSR).
For primary bibliographic entry see Field 5C.
W78-02468

BASELINE LEVELS OF BENZO(A)PYRENE IN SOUTHERN CALIFORNIA MUSSELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-02472

RATES OF DIRECT PHOTOLYSIS IN AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
R. G. Zepp, and D. M. Cline.
Environmental Science and Technology Vol. 11, No. 4, April, 1977, p 359-366. 12 fig, 2 tab, 34 ref.

Descriptors: *Photoactivation, *Pollutants, *Water pollution, *Solar radiation, *Light, Equations, Seasonal, Depth, Ozone, Insecticides, Pesticides, Herbicides, Methodology, *Photolysis, *Photochemical processes, Carbaryl, Trifluralin, Direct photolysis.

A simple technique is described for computing direct photolysis rates under sunlight of aquatic pollutants. Direct photolysis, a photochemical process, involves direct absorption of light by the pollutant followed by chemical reaction. Photolysis rate refers to conversion per unit time. All photochemical process rates in a water body are affected by solar spectral irradiance at the water surface, radiative transfer from air into water, and the transmission of sunlight into the water. Computations were performed on a minicomputer. Required data inputs are: (1) molar extinction coefficients of the pollutant at wavelengths >297.5 nm; (2) attenuation coefficients and refractive index of the reaction medium; (3) quantum yields for reaction of the pollutant; (4) solar declination, solar right ascension, and sidereal time; (5) latitude and longitude; and (6) average ozone layer thickness. Equations are derived that describe the direct photolysis rates of pollutants, and translate laboratory data into photolysis half-lives. As an illustration, photolysis rates are computed for carbaryl, a carbamate insecticide, and trifluralin, a pre-emergent herbicide. Limitations of the computations include: (1) full sunlight and sea level are assumed; (2) rates are computed on average ozone amounts; (3) natural organics in a water body are assumed to be photo-chemically inert; (4) light scattering is ignored; and (5) the pollutant is assumed to be isotropically distributed. (Lynch-Wisconsin)
W78-02474

FLUORINE CONTENTS AND MINERALIZATION LEVEL OF DRINKING WATERS IN THE PROVINCE OF MACERATA, (IN ITALIAN),
Camerino Univ. (Italy). Ist. di Igiene.
M. Cocchioni, M. G. Pellegrini, and F. Tarantini.
Ig Mod 69(6), p 448-460, 1976.

Descriptors: *Fluorine, *Potable water, Italy, *Pollutant identification, Mineralogy.

The F content and the level of mineralization of the drinking waters (man, animals) in the province of Macerata (Italy) were given. In all the samples examined, a notable lack of F was discovered which became more marked further away from the coast line.--Copyright 1978, Biological Abstracts, Inc.
W78-02480

A CYTOCHEMICAL AND BIOCHEMICAL INDEX OF STRESS IN MYTILUS EDULIS L.,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5C.
W78-02489

LEAD IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia). Dept. of Inorganic and Analytical Chemistry.
V. Talbot, R. J. Magee, and M. Hussain.
Marine Pollution Bulletin, Vol. 7, No. 12, p. 234-237, December 1976. 2 fig, 3 tab, 22 ref.

Descriptors: *Mussels, *Bioindicators, *Lead, *Cadmium, Human pathology, Water pollution sources, Bays, Oysters, Intertidal areas, Estuaries, Toxicity, *Australia, *Port Phillip Bay(Australia), *Ostrae angasi, *Corio Bay(Australia), Melbourne(Australia).

The mussel Mytilus edulis and the oyster Ostrae angasi were colledted at 22 locations in Port Phillip and Corio Bays, Australia for use as bioindicators to determine the LD50 values for lead. According to the results of the experiment, oysters concentrate lead to a lesser extent than mussels do. In addition, mussels collected from the intertidal zones of piers have a lower lead content. Lead concentrations in the bays are the highest in the vicinity of built-up areas. The highest concentrations of lead are accumulated in the mussel shell, followed by gills, stomach, and muscle tissue. The LD50 experiment also indicates that cadmium, mercury, copper and zinc are more lethal than lead to this organism. 1.5 ppm of cadmium has the same lethal effect as 30 ppm of lead. Metallothionein, the protein which absorbs toxic trace metals and render them inert, showed association with cadmium and zinc, but not with lead when isolated from mussels collected in the Corio Bay cadmium polluted areas. Since in many cases 2 ppm of cadmium in the seawater is lethal to mussels, and some Corio Bay mussels were found to have 200 ppm of cadmium, it appears that the rate of metallothionein synthesis is the key factor in determining the survival of individual mussels. (Harris-Wisconsin)
W78-02490

BIOACCUMULATION FACTORS OF CHLORINATED HYDROCARBONS BETWEEN MUSSELS AND SEAWATER,
California Univ., Bodega Bay. Bodega Marine Lab.
R. W. Risebrough, B. W. De Lappe, and T. T. Schmidt.
Marine Pollution Bulletin, Vol 7, No 12, p 225-228, December 1976. 3 fig, 1 tab, 20 ref. NSF GX-32885 and IDO72-06412A02.

Descriptors: *Mussels, *Bioindicators, *Chlorinated hydrocarbon pesticides, DDT, DDE, Polychlorinated biphenyls, Sea water, California, Pacific Ocean, *Bioaccumulation factors(Partition coefficients), Marseille, France, Mediterranean Sea, Mytilus spp., Mytilus californianus.

To determine usefulness of the mussel Mytilus spp. as a bioindicator of coastal contamination by chlorinated hydrocarbons, a study was made to measure bioaccumulation factors (partition coefficients) of PCB and DDT between the mussels and ambient seawater. Bioaccumulation factors were determined by measuring concentrations of the substances at four sites on the Mediterranean coast of France and two sites in California. Factors for PCB in mussels and seawater ranged between 69,000 in San Francisco Bay samples to 690,000 in samples from near Marsille. Corresponding ratios of concentrations of p,p'-DDE or p,p'-DDT ranged from 40,000 in the San Francisco sample to 690,000 for the Marseille sample. Bioaccumulation of electron-capturing substances, common in the ambient seawater, by mussels was much lower than the bioaccumulation of DDT and PCB compounds containing five or more chlorine atoms. Differences in the relative heights of PCB peaks in seawater and mussel chromatographs were interpreted in terms of differences in value of bioaccumlation factors of individual chlorobiphenyls. It is concluded that although mussels can be appropriate and convenient bioindicators for local hydrocarbon contamination levels, factors contributing to the variance in partition coefficients must be determined before the animals can be widely used in global monitoring programs. (Harris-Wisconsin)
W78-02491

THE RELATIONSHIP BETWEEN PHOTOSYNTHESIS AND LIGHT FOR NATURAL ASSEMBLAGES OF COASTAL MARINE PHYTOPLANKTON,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W78-02495

CHRONOLOGY OF ORGANOCHLORINE COMPOUNDS IN LAKE MICHIGAN FISH, 1929-66,
Wisconsin Univ.-Madison. Dept. of Wildlife Ecology.
W. J. Neidermyer, and J. J. Hickey.
Pesticides Monitoring Journal, Vol 10, No 3, p 92-95, December 1976. 1 fig, 1 tab, 10 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Lake Michigan, *Pesticide residues, *Fish, Water pollution effects, Organic pesticides, *Residue levels.

Museum specimens of six species of fish taken from Lake Michigan from 1929 through 1966 were analyzed for dieldrin, polychlorinated biphenyls and DDT analogs. The specimens, obtained from the Universities of Wisconsin and Michigan, were preserved in glass jars filled with ethyl alcohol. Dieldrin first appeared in two samples from 1955. No trends in residue levels during subsequent years could be determined, and levels were usually low, ranging from 0.20 to 2.39 ppm. No PCB's were detected in museum samples until 1949 and the PCB level shows a progressive increase from 1949 through 1966. It is suggested that concentrations of PCB's in Lake Michigan fish remain high deposite sales restrictions to closed system users in 1971 by the sole producer of PCB's in the United States. Among the specimens, PCB's were never detected in the absence of DDE. DDT and its analogs were first detected in 1949 and appeared in the same specimens in which PCB's were found. DDT increased progressively through 1965, peaking in that year. The data and results from the Great Lakes Fishery Laboratory suggest that DDT residues have been decreasing since the late 1960's. (Coyle-Wisconsin)
W78-02497

EFFECTS PRODUCED BY EXTRACTS OF MACROSCOPIC MARINE ALGAE ON BACTERIAL GROWTH, (IN SPANISH),
Universidad Central de Venezuela, Caracas. School of Biology.
For primary bibliographic entry see Field 5C.
W78-02498

EFFECT OF CHEMICAL AMELIORATION ON BIOLOGICAL PROCESSES IN SOLONETZ SOIL AT DIFFERENT IRRIGATION LEVELS, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR). Div. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-02499

WATERFOWL AS INDICATOR FOR THE ECOLOGICAL QUALITY OF LAKES, (IN GERMAN),
H. Utschick.
Verh Ornithol Ges Bayern 22(3/4), p 395-438, 1976.

Descriptors: *Bioindicators, *Waterfowl, Water quality, Lakes, Eutrophication, Productivity, Pollutant identification, Bavaria, Biomass, Cygnus-olor, Eutrophication, Grebe, Kochelsee, Loisach, Mute, Podiceps-cristatus, Rivers, Swan, West Germany.

Data of the international waterfowl census in S Bavaria (West Germany) were used to test for correlations between wintering waterfowl and the degree of lake eutrophication. The lakes were categorized in oligo-, meso-, eu- and polytrophic ones. Biomass and density of waterfowl are positively correlated with increasing eutrophication. This is based on the increasing productivity due to pollution of the lakes, by which the food biomass, which can be utilized by waterfowl, becomes greater. Species diversity declines when eutrophication increases. Possibly a weak optimum exists in the case of mesotrophic lakes. The rate of increase in wintering waterfowl population is growing with the degree of eutrophication. If further pollution is stopped, the numbers of waterfowl will decline. This has happened at 2 Bavarian lakes due to ring canalization. On Kochelsee, an eutrophic lake, waterfowl are feeding on polytrophic ones. This may be caused by the daily mixing of the lake by water discharge of a power plant and the input of nutrients by the heavily polluted river Loisach. Species usable as indicators for the degree of eutrophication are the great crested grebe Podiceps cristatus and the mute swan Cygnus olor, if numbers of the swan are not influenced much by additional feeding by people. The shore region of 4 large Bavarian lakes are ranked in order of their waterfowl count and conclusions regarding their water pollution are given.--Copyright 1978, Biological Abstracts, Inc.
W78-02501

KEPONE BIOCONCENTRATION, ACCUMULATION, LOSS AND TRANSFER THROUGH ESTUARINE FOOD CHAINS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-02502

UTILIZATION OF EXOGENOUS PURINE AND PYRIMIDINE COMPOUNDS BY BACTERIA ISOLATED FROM WATER BASINS, (IN RUSSIAN),
Latvian State Univ., Riga.
A. Ya. Lishmane, and M. Ya. Vitols.
Prikl Biokhim Mikrobiol 13(2), p 225-230, 1977.

Descriptors: *Bacteria, *Organic compounds, Purine compounds, Pyrimidine compounds, Isolation, Latvian-SSR, Nitrogen, Pseudomonas-Spp, Sarcina-Spp, USSR.

Bacteria (including Pseudomonas and Sarcina spp.) isolated from Latvian SSR (USSR) water basins were cultivated on media that contained purine and pyrimidine bases as the sole N source. Some bacteria were able to grow in these media.--Copyright 1978, Biological Abstracts, Inc.
W78-02503

CHEMICAL AND MINERALOGICAL COMPOSITION OF THE SEDIMENTS OF LAKES WITH LOW BIOLOGICAL PRODUCTIVITY, (IN ESTONIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
A. Lindpere.
Eesti Nsv Tead Akad Toim Biol 26(1), p 49-55, 1977.

Descriptors: *Lake sediments, Mineralogy, Pollutant identification, Chemical analysis, Lakes, *Estonian-SSR, USSR.

The sediments from 10 lakes of the Estonian SSR (USSR) were studied. The lakes are situated on a sandy catchment area and have only a few insignificant influxes or lack them completely. The samples were taken at or near the maximum depth of each lake, from an upper layer (0-20 cm) of sediment. In the analyses for Ca, Fe, Al, P and K, the sediment material was ashed at 500 degrees C and the ash was dissolved in HCl. Si with undissolved residue was determined gravimetrically. An Elemental analyzer was used to determine the total C and N content. The mineralogical composition of the sediments investigated was determined by means of X-ray analysis. All results are expressed in percentages on the basis of the oven-dry (105 degrees C) weight of the sediment. The organic matter content of sediments did not drop below 62.7%, except for the samples from L. (lake) Piigandi and L. Vaikjarv. The total C and N content of sediments in many cases exceeds 40 and 3%, respectively. The mean concentration of P was 0.42% PzO5. The richest in P was the sediment from L. Viitna Linajary which is polluted by human activity. The P content of sediments from

L. Uljaste, L. Kirikumae, L. Pahi and L. Pullijary was small (0.24-0.28% P O). The lakes have inflows from raised bogs. The content of P is not correlated with the content of other elements. Significant correlations between S, Al, Fe and K indicate that these 4 elements derive mostly from silicates. The major minerals of thelake sediments are quartz (60-85%), feldspar (10-25%) and plagioclase (0-20%). The Ca content of sediments varied from 0.53-1.29%, on the average 0.89% CaO. The sediments revealed insignificant variation in their Ca content. The sediment of the most oligotrophic lakes in Estonia, L. Valgejarv and L. Viitna Pikkjar, are the poorest in Ca. The sediments of lakes with low biological productivity are characterized by high organic matter and low Ca accumulation.–Copyright 1978, Biological Abstracts, Inc.
W78-02504

APPLICATION OF STOCHASTIC METHODS IN EUTROPHICATION,
General Electric Co., Santa Barbara CA. Center for Advanced Studies.
For primary bibliographic entry see Field 5C.
W78-02506

COMPARATIVE HYGIENIC CHARACTERISTICS OF WORK CONDITIONS WITH DIFFERENT TECHNOLOGICAL METHODS OF IODINE PRODUCTION FROM DRILLING WATERS, (IN RUSSIAN),
Institut Gigieny Truda i Professionalnykh Zabolevanii, Baku (USSR).
A. I. Zamchalov, I. I. Alekperov, and V. Elisuiskaya.
Gig Tr Prof Zabol 12, p 17-19, 1976.

Descriptors: Industrial wastes, *Iodine, Methodology, *Public health, Pollutant identification, Atmosphere, *Carbon absorption method.

Working conditions in the extraction of iodine from drilling waters by the carbon-adsorption method (CAM) and aero-desorption (ADM) technological methods are characterized by the action of a complex of adverse factors (iodine vapor content in the air and in individual sections also of chlorine and sulfuric acid). CAM uses non-mechanized processes and manual operations. ADM distinguishes itself to advantage by using hygienically more favorable work conditions as a result of compounded processes, mechanization of manual operations, hermetic sealing of reactors and a comparatively low pollution of the atmospheric environment near and around the work places, making it preferable to CAM.–Copyright 1978, Biological Abstracts, Inc.
W78-02507

THE INFLUENCE OF ORGANIC MATTER AND ATMOSPHERIC DEPOSITION ON THE PARTICULATE TRACE METAL CONCENTRATION OF NORTHWEST ATLANTIC SURFACE SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-02512

INSECTICIDE RESIDUES ON STREAM SEDIMENTS IN ONTARIO, CANADA,
Department of Agriculture, London (Ontario). Research Inst.
J. R. W. Miles.
Pesticides Monitoring Journal, Vol 10, No 3, p 87-91, December 1976. 2 fig, 4 tab, 12 ref.

Descriptors: *DDT, *DDD, *Bed load, *Pesticide residues, Tobbaco, *Canada, *Ontario(Canada), *Suspended sediment, *Bottom material, *Vegetable muck area.

Insecticide residues on suspended and bottom sediments of streams in Ontario, Canada, were studied in a tobacco growing and vegetable muck area. The TDE:DDT values for Muskoka River bottom mud samples taken in September, 1971, were 1.6, 1.9, 2.4 and 5.4 DDT was banned in Ontario in 1970, suggesting that DDT on eroded soil incorporated in the bottom mud in the spring was gradually converted to TDE by microorganism activity from May through September. Also sampled from source to mouth was the Big Creek stream in Norfolk County, Ontario, which drains a tobacco growing area. Samples were taken in one day and overall change in TDE:DDT from source to mouth was 20 times. Average DDT in bed load samples was three times that in the bottom material. Dieldrin was also three times greater and endosulfan was six times greater in the bed load. Animals living in the bed load may be exposed to more insecticide than would be suggested by bottom material analysis alone. Residues on suspended sediment from Big Creek samples ranged from eight to 100% of the whole water analyses. Considerable dilution with uncontaminated bottom material occurs on deposit of sediment and/or DDT degrades more quickly in the bottom material. (Coyle-Wisconsin)
W78-02513

AQUATIC NITROGEN DETERMINATIONS IN REAL-TIME,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
T. Helfgott, and J. S. Mazurek.
Progress in Water Technology, Vol 8, No 4-5, p 433-446, 1977. 7 fig, 6 tab, 24 ref.

Descriptors: *Nitrogen, *Ammonia, *Measurement, Pollution abatement, Sewage treatment, Treatment facilities, Water pollution control, Nutrient removal, Analytical techniques, Instrumentation, *Nitrogen removal, Real-time.

A measurement system for real-time determination of aquatic borne nitrogen was evaluated and nitrogen removals and interactions within a pilot plant were studied in order to develop control strategies for aquatic nitrogen pollution abatement from sewage treatment plants. Measurements were taken in a train of unit steps composing of a model pilot plant conventional sewage treatment plan, followed by several advanced waste treatment unit processes and operations. It was found that with 15 minutes total nitrogen, ammonia, nitrate and organic nitrogen data can be obtained using, respectively, a total nitrogen analyzer, an ammonia probe, and a nitrate probe. Organic nitrogen can be estimated by subtracting ammonia probe and nitrate probe data from total nitrogen data. But when levels of sensitivity are approached, the accumulative error becomes predominant. Although analysis time is within 15 minutes, continuous monitoring is only feasible with the probes. Decisions leading to control of nitrogen through treatment with effective control strategies can be made with the accumulated research data available. (Coyle-Wisconsin)
W78-02515

DETECTION OF SMALL AMOUNT OF VIRUSES (ENTEROVIRUSES) IN DRINKING WATER, (IN FRENCH),
Clermont-Ferrand Univ. (France). Lab. of Bacteriology and Virology.
D. Beytout, H. Charrier, and M. Monghal.
Ann Microbiol (Paris) 128A(2): 255-262. 1977.

Descriptors: *Pollutant identification, Methodology, *Viruses, *Potable water, *Enteroviruses, *Adenoviruses.

A simple method to detect entero-viruses and adenoviruses in drinking water was developed, using a cellulose nitrate membrane adsorption-elution technique. Average entero viruses recovery is 23-80% when 30 l of water containing 60 PFU (plague forming units) are monitored. Only 10% of adenoviruses are recovered in the same conditions. This method allowed the detection of 12 PFU of enteroviruses in 120 l of water. Recovery of 1 PFU in 10 l when examining >100 l is reproducible.–Copyright 1978, Biological Abstracts, Inc.
W78-02525

DETERMINATION OF ORGANIC MATTER IN WATER: A REVIEW, (IN SWEDISH),
National Swedish Environment Protection Board, Stockholm. Undersokhningslab.
G. Ekedahl.
Vatten 32(4), p 328-336, 1976.

Descriptors: *Organic matter, *Pollutant identification, *Reviews, Water analysis, Oxygen demand, Chemical oxygen demand, Biochemical oxygen demand, Carbon, Chloride, Mercury.

A brief literature review and a critical assessment of different methods for determination of organic matter in water are presented. Historically, organic pollutants have been measured indirectly in terms of an equivalent Oz demand, measured biologically (biochemical Oz demand, BOD) or chemically (chemical Oz demand, COD). The Oz demand tests are valuable tools for evaluating the effects of organic pollutants on the water body, but do not give a precise determination of total organics. Introduction of modern equipment has opened the way for the new determinants total organic C (TOC) and total Oz demand (TOD). These new determinants should not be considered a relacement for COD or BOD, but rather valuable, additional parameters. BOD, COD, TOC and TOD do not measure the same aspects of organic pollution, neither theoretically nor practically, even though these parameters sometimes are correlated in a statistical sense. Some guidelines or references are given for the satisfactory disposal of Hg containing wastes. The use of Hg in the COD-analysis should be adapted to the chloride content of the sample. For samples with chloride concentrations less than 100 mg/l a Hg-free COD-method is proposed. In some cases the permanganate-method may be profitably used. For samples low in organic matter and high in chloride content the COD-determination is replaced by TOC or TOD.–Copyright 1978, Biological Abstracts, Inc.
W78-02526

THE DETERMINATION OF ORGANIC CARBON BY THE PERSULFATE METHOD IN CHLORIDE-RICH WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
B. A. Skopintsev, E. S. Bikbulatov, and N. Yu. Mel'Nikova.
Okeanologiya 16(6), p 1109-1114, 1976.

Descriptors: *Organic carbon, Chlorides, *Organic matter, *Pollutant identification, Carbon dioxide, Chlorides, Nitrogen, Potassium, Sodium, Sulfates.

Organic matter in inland water including colored humic compounds is completely oxidized by potassium persulfate. In the removal of CO2 from acidified water by N blow in the presence of persulfate, part of organic matter is lost. The loss increases with increasing blow time. In the presence of NaCl (at chlorinity approximately equal to 19%) organic matter in inland water is not oxidized completely. Silver sulfate introduction (in equivalent, by Cl-, quantity) results in a complete oxidation of organic matter.–Copyright 1978, Biological Abstracts, Inc.
W78-02529

DETERMINATION OF CARAGARD IN WATER, SOIL AND PLANT MATERIAL BY THIN LAYER CHROMATOGRAPHY, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gigieni i Toksikologii Pestitsidov, Kiev (USSR).

S. G. Gevorkyan, M. S. Petrosyan, A. E. Vasilenko, and G. S. Stepanyan.
Gig Sanit 12, p 78-80, 1976.

Descriptors: *Chromatography, *Pollutant identification, *Caragard, Herbicides, Pesticide residues, Chemcontrol, Methodology, Soil analysis, Apples, Fruit crops, Orchards, Toxicity.

A method is presented for determination of caragard, a herbicide used to control annual and perennial weeds and applied in the early spring to apple orchards in doses of 15-20 kg/ha. Caragard is one of a group of symmetric triazines, 2 components of which show mild to medium toxicity to mammals. The determination method is based on extraction of the preparation by an organic solution of chloroform, n-hexane and acetone, followed by purification of the extract and subsequent TLC. Quantitative determination of the preparation with reliable accuracy can be conducted up to 50 mgk in the sample and the method was approved for the detectuon of residual quantities of caragard in the soil treated in doses of 6.8 and 10 kg/ha, and in fruit.--Copyright 1978, Biological Abstracts, Inc.
W78-02533

MONITORING GROUNDWATER QUALITY,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
G. B. Morgan, E. A. Schuck, and L. G. McMillion.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 818, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-77-008. Published in Water Quality Bulletin, Vol. 2, No. 1, p 11-14, January, 1977. 3 p, 2 tab, 15 ref.

Descriptors: *Groundwater, *Water quality control, *Monitoring, Methodology, Publications, Pollutant identification, *Groundwater quality.

Recent emphasis on the need to protect groundwater quality has been provided by the U.S. Congress through the Federal Water Pollution Control Act Amendments of 1972 and the Safe Drinking Water Act of 1974. Present ground water monitoring programs, however, were designed mainly to assess the quantity and quality of ground water available for a particular use. To prevent contamination of ground water resources, a monitoring program must go beyond this and must provide a systematic approach to detecting and delineating ground water pollution before the pollution reaches the point of use. In response to this challenge, a monitoring methodology has been developed under the sponsorship of the U.S. Environmental Protection Agency. The methodology is briefly discussed and the published reports that contain details on it are summarized and referenced. (Eberle-NWWA)
W78-02547

STUDY OF WATER-SOLUBLE ORGANIC SUBSTANCES IN NATURAL WATER USING GEL CHROMATOGRAPHY, (IN RUSSIAN),
Moskovskaya Selskokhozyaistvennaya Akademiya (USSR), Div. of Soil Science.
I.. P. Stepanova, I. S. Kaurichev, and A. I. Karpukhin.
Izv Timiryazev S-Kh Akad 6, p 97-105, 1976.

Descriptors: *Organic wastes, *Gel chromatography, *Pollutant identification, Soil water, Moscow, *Podzolic soils, Soddy, Soils, USSR.

The fractionation of water soluble organic substances of natural soil water and water extract of soddy podzolic soil of the Moscow (USSR) region using systematized gel chromatography with the use of molselects G-10 and G-50 showed that composition and properties are not alike. The presence of high- and low- molecule compounds, the percentage of which depended on the nature of water soluble organic substances studied was typical of all the objects. MW fractions of the objects studied differed in the degree of saturation with ions of Fe and Al. The water soluble organic substances of surface water on the farm Mikhailovsoye were highest in Fe ions. Distribution of the radioactive isotope sq Fe according to MW fractions gave qualitative information about the strength of the bond of organo-mineral compounds, namely, the higher the specific activity per unit of C the higher the stability of organo-mineral compounds.-Copyright 1978, Biological Abstracts, Inc.
W78-02555

DESIGN FOR A UNIFIED SYSTEM FOR CHARACTERIZING CONTINENTAL BODIES OF WATER AND ITS USE FOR WATER QUALITY ANALYSIS, (IN RUSSIAN),
V. N. Zhukinskii, O. P. Oksiyuk, Y. Y. Tseeb, and V. B. Georgievskii.
Gidrobiol Zh 12(6), p 103-111, 1976.

Descriptors: *Design, *Classification, *Water quality, Water analysis, Ecosystems, Pollutant identification, Productivity, Sanitation, Ukrainian-SSR, USSR.

A design for a unified system for characterizing and subsequently classifying and typing bodies of water is described. The system is suitable for computer formalization, and may be continually improved. The proposed design includes 5 tables for classifying hydrological, hydrochemical, hydrobiological, functional-energetic and water quality characteristics of bodies of water. A letter-number matrix characterizing an elementary water ecosystem is presented on the basis of data on shallows of the Kremenchug Reservoir (Ukrainian SSR, USSR). The system is valuable for unifying data for the evaluation, control and prognosis of the sanitary-biological condition and bioproductivity of bodies of water, as well as for the optimal use of their water and biological resources.-Copyright 1978, Biological Abstracts, Inc.
W78-02559

AIR AND WATER CONTAMINATION BY 3,4-BENZPYRENE FROM ROAD ABRASION, (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Hygiene und Arbeitsphysiologie.
M. Waibel.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Betriebshyg Praev Med 163(5/6), p 458-469, 1976.

Descriptors: Air pollution, *Benzpyrene, Abrasion, Pollutant identification, Asphalt, Dust, Sewage, Tar, Water pollution.

Abrasion of tar-containing or bituminous road surfaces causes particles to be liberated which contain carcinophilic poly-aromatic hydrocarbons (e.g., 3,4-benzpyrene (BP)). The effects of abrasion were determined by comparative measurements alongside a highway section of tar asphalt and one of concrete, both subjected to an identical traffic load. Airborne dust, sedimented dust near the ground and the degree of sewage pollution were measured. The wearing layer of the tar-asphalt surface consisted of TA 16: maximum grain size 16 mm; bonding agent TB 2000 (containing 13% tar pitch and 87% bitumen). With a mean traffic load of 9000 vehicles/day abrasion liberated 15 mg BP/mo. in winter and in summer 10 mg BP/mo. and per 1 m length of a 2-laned highway. In the coarser dust particles the abrasion material containing BP prevails. The tar asphalt abrasion in precipitated dust contained more than 50% of total benzpyrene, while its share amounted even to 70% of the total load in the floating fraction of waste water.--Copyright 1978, Biological Abstracts, Inc.
W78-02562

BIOLOGICAL METHODS OF HERBICIDE RESIDUE DETERMINATION IN WATER, (IN CZECH),
Vyzkumne Ustavy Rostlinne Vyroby, Prague (Czechoslovakia). Ustav Ochrany Rostlin.
J. Zemanek, J. Kovar, and R. Sterba.
Ochr Rostl 12(2), p 99-107, 1976.

Descriptors: *Herbicides, *Pesticide residues, 2-4-D, *Pollutant identification, Methodology, Analytical techniques, *Atrazine, Cucumbers.

Two methods of herbicide residue determination in water were developed. For the determination of 2,4-D herbicide residues a laboratory method was used, whereas for the atrazine residue determination a water culture was employed. In both cases the test plant was cucumber (Cucumis sativus) and as a criterion of the herbicidal effect inhibitions of root growth were considered. The methods make it possible to establish in water 2,4-D herbicide concentration up to 0.05-0.1 mg/l and those of the atrazine herbicide between 0.1-0.5 mg/l. Simulated rain precipitations washed altogether 44.6% of the initial amount of the 2,4-D herbicide and 19% of the original amount of atrazine through a soil layer 5 cm thick.--Copyright 1978, Biological Abstracts, Inc.
W78-02574

ASSESSMENT OF THE QUALITY OF RECLAIMED WATER BY TOTAL ORGANIC CARBON LEVEL, (IN RUSSIAN),
V. M. Skuratov, V. B. Gaidadymov, and S. V. Chizhov.
Kosm Biol Aviakosm Med 10(6), p 66-70, 1976.

Descriptors: Analytical techniques, *Pollutant identification, Space technology, Urine, *Organic carbon.

Possible application to space technology of measuring the total content of organic C to evaluate the quality of reclaimed water was discussed. The content of organic C, ration of chemical consumption of Oz and C in the atmospheric condensate, urine, condensate of urine in low-temperature evaporation and potable water reclaimed from these sources were examined.--Copyright 1978, Biological Abstracts, Inc.
W78-02576

INVESTIGATIONS ON DISSOLVED URANIUM, SILICON AND ON PARTICULATE TRACE ELEMENTS IN ESTUARIES,
Physical Research Lab., Ahmedabad (India).
D. V. Borole, S. Krishnaswami, and B. L. Somayajulu.
Estuarine and Coastal Marine Science, Vol 5, No 6, p 743-754, November 1977. 6 fig, 4 tab, 29 ref.

Descriptors: *Uranium radioisotopes, *Silica, *Trace elements, *Water chemistry, *Estuarine environment, Colloids, Mineralogy, Clays, Chemical properties, Water analysis, Estuaries, Mixing, Salinity, Sea water, Water quality, Radioactivity, Water properties, Oceanography, *India, *Narbada Estuary(India), *Tapti Estuary(India), *Godavari Estuary(India).

The concentrations of dissolved uranium and silicon and the chemical composition of suspended phases in the Narbada, Tapti, and Godavari estuaries were measured as a function of chlorosity. The results suggested that the uranium behaves conservatively in all the three estuaries; whereas silicon shows conservation behaviour in the Narbada and Tapti estuaries and non-conservative in the Godavari estuary. The variation of chemical composition of particles with chlorosity does not show any systematic trend; the observed scatter can be attributed to variations in mineralogy and size distribution of these particles. The data on chemical composition also indicated that in these estuaries the degree of desorption of elements from particles is much less than those reported for European estuaries. (Henley-ISWS)

W78-02595

REMOTE SENSING REPORT, PACIFIC NORTHWEST AREA, WASHINGTON, OREGON, IDAHO, APRIL AND JULY 1973.
National Field Investigation Center, Denver, CO.
For primary bibliographic entry see Field 7B.
W78-02611

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS: PHASE II--FINAL REPORT (CHEMICALS 41-60),
Stanford Research Inst., Menlo Park, CA.
S. L. Brown, F. Y. Chan, J. L. Jones, D. H. Liu, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 163, Price codes: A09 in paper copy, A01 in microfiche. Report No. NSF-RA-E-75-190C, April 1975. 192 p, 20 tab. ECU-3386.

Descriptors: *Chemical properties, *Chemical analysis, Chemical potential, Hazards, Toxicity, Environmental effects, Biological properties, Physical properties, Public health, Chemicals, *Toxicology.

In Phase II of a two-phase effort 80 chemicals having the greatest potential for environmental effects were studied. Chemicals numbered 41 through 60 are described: (ethylenedinitrilo) tetraacetic acid, tetrasodium salt; benzidine; zine di(butylexyl) phosphorodithioate; N-(1,4-dimethlpentyl)-N'-phenyl-p-phenylenediamine; vinyltoluene; 2-mercaptobenzothiazole; chloroform; methyl bormide; acetonitrile; di(2-ethylhexyl) phthalate; vat blue dye No. 6 (7,16-dichloroindanthrone); di(2-ethylhexyl) adipate; dichlorobenzidine; hexamethylenetetramine, tech; dimethylamine; acyclic xanthic acid salts (sodium isopropylxanthate-Dow Z-11); sulfolane; p-nonylphenyl manganese phosphite; nitrilotriacetic acid, trisodium salt; and diarylarylenediamines, mixed (Wingstay 100). Information was collected on the extent of the exposure of the environment to these chemicals during manufacture and use and on the possible environmental effects of this exposure (chemical, physical, and biological properties, persistence, and toxicity). A questionnaire survey of industry was conducted to determine the amount and types of losses in the manufacturing plants. Information from the survey is tabulated in four formats: Flow diagram of industrial data on amounts used for various applications; assessment of data gathered on toxicology and environmental persistence; computer printout of a tubular summary of important data gathered; and pertinent abstracts found on toxicology. (See also W78-02659) (Wares-IPA)
W78-02614

AN AUTOMATED MULTISAMPLE-STREAM CHEMICAL MONITORING SYSTEM,
Environmental Research Lab., Athens, GA.
H. P. Kollig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 314, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-77/002, 1977. Published in American Laboratory, Vol. 9, No. 2, p 47-52, 1977. 5 fig, 2 tab, 1 ref. IBA609.

Descriptors: *Pollutant identification, *Automation, *Water analysis, Water pollution, Rivers, Nitrogen, Phosphorus, Carbon, Chemical analysis, Standards, Data processing, *Technicon autoanalyzer.

An automated system has been designed and operated successfully for two years for chemical analysis of nitrogen, phosphorus, and carbon compounds in the study of the fate of pollutants. Nine samples from along a simulated river are pumped into the laboratory, and eight different chemical analyses (total Kjeldahl nitrogen, ammonia, nitrite, nitrate, total phosphorus, orthophosphate, chemical oxygen demand, and glucose) are performed on each sample in a consecutive and automated mode with built-in internal standardization. The samples are directed by a series of solenoid valves, activated by either a mechanical or a solid state sequencer. The analyses are done with Technicon autoanalyzers in a continuous flow mode, and data processing is performed by a computer linked to the system. The unlimited number of samples that may be analyzed (dependent only on volume of sample that can be pumped) and the means of keeping the system clear of bacterial growth by means of cooling and frequent automatic cleaning are advantages of the system. The system provides a basis for additional models for other applications. (Wares-IPA)
W78-02616

EPA METHOD STUDY 8, TOTAL MERCURY IN WATER,
Environmental Monitoring and Support Lab., Cincinnati, OH.
J. Winter, P. Britton, H. Clements, and R. Kroner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 270, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-012, February 1977. 78 p, 12 fig, 21 tab, 10 ref, 1 append. IHD621, EPA P.O. No. 5-03-4294.

Descriptors: *Pollutant identification, *Water analysis, *Mercury, Methodology, Evaluation, Water pollution, Statistics, *Cold vapor technique, Accuracy, Interference.

Results of a joint Environmental Protection Agency/ASTM evaluation study of a method of analysis for total mercury in nautral water and waste waters are presented. The cold vapor technique includes an acid-permanganate-persulfate digestion at 95 degrees Centigrade for two hours followed by reduction and measurement of mercury in the vapor phase at 253.7 nm. Precision and accuracy which can be expected in routine work were estimated by preparation and measurement of samples containing similar but slightly different, mercury concentrations. Recovery from natural water samples was calculated by difference, and recoveries for all concentrations were compared and significant statistical measures such as standard deviation mean recovery were calculated. Recovery data received from participating laboratories indicated acceptable precision and accuracy of the method for a wide range of background water, with insensitivity of the method to natural interferences implied. (Wares-IPA)
W78-02617

THERMOMETRY IN THE CONTROL OF WATER QUALITY,
National Bureau of Standards, Washington, DC.
S. D. Wood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 608, Price codes: A07 in paper copy, A01 in microfiche. Report No. NBSIR 77-1227 (NBS), May 1977. 22 p, 2 fig, 1 tab, 28 ref.

Descriptors: *Water analysis, *Thermal pollution, Water temperature, Monitoring, Data collections, Measurement, Regulation, Operations, Effluents, Waste water(Pollution), Thermometers, *Thermometry.

A limited study of thermometry in water polluted focused on water analysis, thermal pollution, and the work of standards committees. Water pollution is addressed by over 200 different regulations at the state level as well as by many federal laws, some laws requiring monitoring. All industries, governmental agencies, and individuals who discharge effluents into navigable waters must monitor their own effluents for chemical and bacterial contaminants, and steam electric generating, cement, and sugar processing industries are required to monitor (and control) their effluent temperatures. State and local regulatory agencies also monitor water effluents to see that discharges conform to permitted limits. It was estimated that there were about 167,000 temperature entries per year (7% of total) in the EPA file of water pollution data, some 70% of which were generated by agencies of the Federal government. Some other temperature measurements are routinely made by government agencies which are not entered into EPA file presently, representing a potential source of additional information on thermometry. Such data are routinely needed and generated for water analysis, thermal pollution, utilities operation, plume monitoring, reservoir management, and biological research. The major deficiencies in thermal pollution thermometry lie in areas of system reliability and operator training. Recommendations are made for data quality control, sound engineering practices, personnel training in use of equipment, and development of more rugged and specialized sensors for use in field work. (Wares-IPA)
W78-02618

MONITORING ENVIRONMENTAL IMPACTS OF THE COAL AND OIL SHALE INDUSTRIES RESEARCH AND DEVELOPMENT NEEDS,
Radian Corp., Austin, TX.
D. C. Jones, W. S. Clark, W. F. Holland, J. C. Lacy, and E. D. Sethness.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 292, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/7-77-015, February 1977. 207 p, 56 fig, 49 tab, 255 ref, 2 append. EHB 529, Task 25, 68-02-1319.

Descriptors: *Forecasting, *Monitoring, *Water quality, *Air pollution, *Land use, Data collections, Oil shales, Oil, Coals, Fuels, Environmental effects, Technology, *Fuel conversion.

The extraction, processing, and conversion of coal and oil fuels were examined with regard to their impacts on air quality, water quality, and land use, including consideration of the technology for slurry pipeline transportation of coal. Promising technologies identified for coal and oil conversion include coal extraction, coal slurry pipelines, coal cleaning, coal gasification, coal liquefaction, oil shale extraction, oil shale retorting, and shale oil upgrading. For each technology, data were developed on air emissions, water emissions, thermal emissions (water only), solid wastes, land use, and water requirements. Known and potential environmental emissions of specific chemical species were identified and quantified from data available in the literature. Correlations were drawn with other industries and specific cases were discussed. It was concluded from an examination of exposure pathways, dependence of pathways on design and location of facilities, and potential impacts of specific chemicals that only sulfates and particulates are likely to present environmental problems. Areas indicated as important for monitoring and predicting coal and oil conversion environmental impacts include: development of techniques for continuously measuring low concentration species in the ambient environment, accurate techniques for monitoring ground water quality, and improved particulate monitors and remote sensing instrumentation. (Wares-IPA)
W78-02619

ASTP CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF POTABLE WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
R. L. Sauer, and S. A. Leslie.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-11675, Price codes: A02 in paper copy, A01 in microfiche. Technical Memorandum No. NASA TM-58192, October 1976. 13 p, 6 tab, 2 ref. JCS-11578; 199-73-01-05-72.

Descriptors: *Pollutant identification, *Water quality, *Potable water, Standards, Water analysis, *Spaceflight environment, Apollo-Soyuz Test Project.

The Apollo-Soyuz Test Project procedures for potable water system servicing and the results of preflight and postflight chemical and microbiological analyses of the water are discussed. Adequacy and quality analyses for the command and service module water servicing and dispensing system were made by injecting sodium hypochlorite, a buffer, and inhibitor into the water system and collecting water samples both before and after flight for chemical and microbiological analysis. The preflight chemical analysis showed that the pH of the drink gun samples taken before liftoff and of the final fill hot water port samples was lower than the specification limit. Postflight chemical analysis showed a nickel concentration calculated as 1.68 mg/liter and specific conductivity and total residue exceeding specification limits. Bacterial growth in all preflight samples was within specification limits, but exceeded specification limits upon postflight samples. All chemical and microbiological data indicated that the potable water was within acceptable limits, and the crew indicated that the water tasted reasonably good during the course of the mission. Results of analyses are presented in tabular format. It was concluded that the Apollo-Soyuz potable water system was adequate. (Wares-IPA)
W78-02621

ON-LINE MEASUREMENT OF THE INFRARED SPECTRA OF GAS CHROMATOGRAPHIC ELUENTS,
Ohio Univ., Athens. Dept. of Chemistry.
P. R. Griffiths.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 570, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/4-76-061, December 1976. 22 p, 2 fig, 7 ref. 1BA027, R803517-01-0.

Descriptors: *Analytical techniques, *Gas chromatography, *Spectrometers, Interferometry, Infrared radiation, Feasibility studies, Absorption, Sampling, Instrumentation, Measurements, Fourier analysis, Gases, Interfaces, Optical properties, *Pollutant identification, *Infrared spectrometry, Detectors, Digitization noise, Optical systems, Sensitivity.

Techniques have been developed to increase the sensitivity of the interface between a gas chromatograph and a rapid-scanning Fourier transform infrared spectrometer (GC-IR). A single-beam system, in which a triglycine sulfate detector is used to measure the interferogram, has been designed and constructed. Identifiable infrared spectra of submicrogram quantities eluting from a gas chromatograph have been measured without trapping the sample by use of this system. A double-beam configuration for GC-IR has also been designed so that a cooled mercury cadmium telluride detector can be used to further decrease the detection limits without limiting the sensitivity by digitization noise. Each of these systems necessitates the use of light-pipes with relatively long (30 cm) absorbing paths but low reflection losses. Feasibility studies showed that the dual-beam Fourier transform technique is uniquely suited for eliminatin of digitization noise problems that are found in Fourier transform infrared spectrometers when a sensitive detector is used for measurement of absorption spectra with an optically efficient sampling configuration. Using this technique, an optical system for GC-IR was designed and is currently being built. Suggestions are made for obtaining further increases in sensitivity through instrumental and sampling modifications, i.e., trigger design and analyte concentration. (Wares-IPA)
W78-02652

DEVELOPMENT OF A METHODOLOGY FOR DESIGNING CARBON MONOXIDE MONITORING NETWORKS,
Systems Applications, Inc., San Rafael, CA.
M.-K. Liu, J. Meyer, R. Pollack, P. M. Roth, and J. H. Seinfeld.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 642, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-019, March 1977. 62 p, 10 fig, 4 tab, 43 ref. 1HD620, 63-03-2399.

Descriptors: *Pollutant identification, *Air pollution, *Monitoring, Network design, Methodology, Model studies, Pollutants, Meteorology, Measurements, Mathematical models, Systems analysis, *Carbon dioxide, Air quality standards.

The design methodology for a carbon monoxide monitoring network based on the objective of identifying concentrations that exceed the national ambient air quality standards (NAAQS) is presented. The basis for identifying such concentrations is the Concentration Area Time-Product, where the concentrations are integrated over an area (i.e., a grid square in a gridded system) and over a time interval for averaging the concentrations. These are computed with a mesoscale air quality simulation model formulated as a 4-dimensional (x,y,z,t) partial differential equation of mass balance for the pollutant species, which yields space/time average concentration distributions. A frequency-weighted average of concentrations–Figure of Merit–is determined from these projected concentrations distributions, prevailing meteorological patterns, and the frequency of occurrence associated with each of the meteorological patterns. A mapping of these Figure of Merit values provides the basis of selection of the locations and number of sites in the network. A field measurement program provides air quality and meteorological data for model validation and simulation as required in development of the specifications for number and location of sites in the network design. Discussion is limited to design methodology. Previous work is reviewed, and objectives of air quality monitoring programs and factors pertinent to monitoring network design are described. (Wares-IPA)
W78-02653

THE PAST, PRESENT, AND FUTURE OF THE BIOSPHERE,
For primary bibliographic entry see Field 2B.
W78-02654

PROCEDURES FOR EVALUATING OPERATIONS OF WATER MONITORING NETWORKS,
URS Research Co., San Mateo, CA.
R. W. Shnider, and E. S. Shapiro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 920, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/4-76-050, September 1976. 80 p, 11 fig, 17 tab, 13 ref. 1HD 620, 68-03-0473.

Descriptors: *Monitoring, Networks, Evaluation, Data collections, Operations, Water quality, Management, Cost analysis, Cost allocation, Operations research, Water quality standard, Methodology, Network design, Personnel, Facilities, Equipment, Sampling, Quality control, Data storage and retrieval, *Network monitoring evaluation, *Water monitoring networks, Parameters, Data dissemination.

Procedures for performing an evaluation of the major factors affecting the efficiency and effectiveness of an existing surface water quality monitoring and standards compliance network are presented. The evaluational techniques pertain to subdivisions of network operations including network plan and design, personnel, facilities and equipment, sampling, quality assurance, data distribution and dissemination, agency interaction, total network operations, and budget allocation to technical services. The evaluation technique rates major elements that comprise the functions of each area and influence the effectiveness of output. For each area evaluated, a method is provided for integrating element ratings into an area evaluation, and finally a method is provided for integration of area evaluations resulting in an overall network evaluation. As an example of the procedures, the area of sampling is evaluated by rating parameters monitored and frequency of monitoring, i.e., in the case of mining areas and areas of geothermal activity, parameters would include trace metals, toxic materials, pH, alkalinity/acidity, turbidity/suspended solids, and specific conductance, using established criteria for range and acceptability. It is recommended that the evaluation procedure be carried out by personnel directly involved in the operation of the monitoring network. (Wares-IPA)
W78-02656

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS (CHEMICALS 21-40),
Stanford Research Inst., Menlo Park, CA.
S. L. Brown, F. Y. Chan, J. L. Jones, D. H. Liu, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 162, Price codes: A03 in paper copy, A01 in microfiche. Report No. NSF-RA-E-75-190B, April 1975. 196 p, 20 fig, 20 tab, 21 ref. ECU-3386.

Descriptors: *Chemicals, *Environmental effects, Industrial wastes, Water pollution, Effluents, Toxicity, Chemical properties, Physical properties, Biological properties, Persistence, Hazards, Priorities, Public health, Chemical industry, Chemical analysis, *Environmental exposure, Flow diagrams, Toxicology.

Chemicals 21 through 40 of the 80 chemicals chosen by an advisory panel of experts on trace contaminates as having the greatest potential for environmental exposure and effect. The chemicals studied were benzene (chemical uses), silicone fluids, nitrobenzene, toulenediisocyanate, xylenes (mixed total), aniline, dimethyl terephthalate, trichlorofluoromethane, p-dichloro-benzene, 2, 2-dithiobis (benzothiazole), o-dichlorobenzene, tetrabromoethane, 4, 4-methylene (bis)-2-choloroaniline, polyhalogenated biphenyls (Aroclor 1254), tricresyl phosphate, fluorescent brightening agents (No. 28), polyvinyl chloride, methylene chloride, 1, 3-dichloropropene/1, 2-dichloropropane mixture, and ethyl chloride. Information was collected on the extent of the exposure of the environment to these chemicals (during manufacture and use) and on the possible environmental effects of this exposure (chemical, physical, and biological properties, persistence, and toxicity). A questionnaire survey of industry was conducted to determine the amount and type of losses in the manufacturing plants; information from the survey is tabulated. Summary reports are presented for each chemical in the form of a flow diagram showing industrial data on the amounts used for various applications, an assessment of the data gathered on toxicology and environmental persistence, a computer printout of a tabular summary of important data gathered, and copies of the 25 most pertinent abstracts found in the area of toxicology, (See also W78-02614) (Wares-IPA)
W78-02659

LAB MODERNIZATION CREATES NEW PROBLEMS FOR PLANT OPERATORS,
Water Quality Lab., Las Cruces, NM.
D. W. Clark.
Water and Sewage Works, Vol. 124, No. 10, p 82-83, October, 1977.

Descriptors: *Water analysis, *Laboratory tests, *Sampling, *Laboratory equipment, *On-site data collections, Testing, Water quality control, Moni-

toring, Analytical techniques, Waste water treatment.

The addition of a water quality laboratory to the 4.5-mgd waste water treatment plant at Las Cruces, New Mexico has included the installation of automatic samplers, a spectrophotometer, a camera-equipped high power microscope, Kjeldahl nitrogen apparatus, grease extraction apparatus, a continuous-reading electrolytic BOD system, and a water purification system. The need for trained personnel in the field of water quality monitoring is discussed. Major division of water quality analysis for sewage treatment plants include: the identification of finished water contaminants, such as heavy metals and pesticides, and their effects on the environment; evaulations of new treatment processes; development of new testing procedures; surveillance of pollutants unaffected by present treatment processes; protection of the treatment process through upstream monitoring; and the determination of charges for industrial waste effluents. (Schulz-FIRL)
W78-02662

MERCURY CONTENT OF MUSSELS FROM ST. LAWRENCE ESTUARY AND NORTHWESTERN GULF OF ST. LAWRENCE, CANADA,
E. Bourget, and D. Cossa.
Marine Pollution Bulletin, Vol. 7, No. 12, p. 237-239, December 1976. 1 fig, 3 tab, 21 ref.

Descriptors: *Bioindicators, *Mussels, *Mercury, *St. Lawrence River, Estuarine environment, Water pollution sources, Canada, Toxicity, *Gulf of St. Lawrence.

A survey utilizing mussels as bioindicators was carried out to evaluate levels of mercury contamination of the lower St. Lawrence estuary (from the mouth of the Saguenay to Grosses-Roches) and part of the Gulf of St. Lawrence. Adult specimens of Mytilus edulis L. ranging between 2.5 and 4 cm were collected on rocky shores at mid-tidal level at 30 stations distributed over 1000 km along the estuary and gulf coasts. Mercury levels, although irregular from place to place, showed a general decrease along the south shore from Riviere du-Loup down to the Gaspe Peninsula. Mean values ranged between 0.160 to 0.629 ppm (dry weight). Highest values were found upstream at the mouth of the Saguenay Fjord and on the south shore of the lower estuary to Grosses-Roches Station 14 (mean 0.430 + or - 0.023 ppm). Lowest mercury concentrations were observed on the eastern part of the north shore (mean 0.72 + or - 0.062 ppm). Intermediate mercury concentrations (mean 0.306 + or - 0.028 ppm) were found along the coast of the Gaspe Peninsula. It appears that the mercury content of mussels in the estuary reflects the overall seaward dillution of mercury from terrigenous sources. (Harris-Wisconsin)
W78-02671

EVALUATION OF AN INDUCTIVELY COUPLED PLASMA, MULTICHANNEL SPECTROMETRIC ANALYSIS SYSTEM,
Ames Lab., IA.
R. K. Winge, J. M. Katzenberger, and R. N. Kniseley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 918, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-032, June 1977. 56 p, 8 fig, 12 tab, 14 ref. 1BD612, 1CC614, EPA-IAG-D6-0417.

Descriptors: *Spectrometers, *Chemical analysis, *Evaluation, *Water analysis, *Pollutant identification, Water supply, Sampling, Methodology, Trace elements, Lighting, *Atomic emission spectrometry, Optical equipment, Plasma quantometer, Excitation, Light levels.

An inductively coupled plasma, multielement atomic emission spectrometric analysis system was evaluated in response to EPA's need for a rapid method for determination of trace element concentrations in water. Main features of the system include the inductively coupled plasma quantometer, plasma radio frequency power supply, sample generation and excitation hardware, and the data aquisition system. Detection limits were obtained periodically from the system under several sets of operating conditions; The system was evaluated on performance parameters, which included detection limit capabilities, analytical curve fitting, analytical curve reproducibility, and photomultiplier performance. Results showed that the data acquisition of the system performed well and approached the state-of-the-art for the types of equipment involved. The polychromator, in which high stray light levels may cause significant analytical errors, especially for such critical elements as arsenic, lead, and selenium was found to be deficient. The need for a signal measuring system with a wider dynamic range and provision for reduction in warm-up time of the system were indicated. With reduced stray light levels, development of empirical methods for correction of remaining matrix-related background changes, and improvements in nebulizer performance, the inductively coupled plasma multielement atomic emission spectrometric analysis system should be the most practical approach for rapid multielement determinations of trace elements. (Wares-IPA)
W78-02672

A STUDY OF NEW CATALYTIC AGENTS TO DETERMINE CHEMICAL OXYGEN DEMAND,
Texas Southern Univ., Houston.
R. F. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 965, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-038, May 1977. 38 p, 14 tab, 9 ref, 9 append. 1BA027 1HA323, R803779-01.

Descriptors: *Pollutant identification, *Water analysis, *Catalysts, Chemical reactions, *Chemical oxygen demand, Sampling, Oxidation, Costs, Methodology, *Analytical techniques, *Silver sulfate, *Magnesium sulfate.

A study was conducted to find a catalyst to replace silver sulfate in chemical oxygen demand determination using the dichromate reflux method in order to recude the cost of the determination. Other catalysts considered were acetic acid, benzene, tert-butyl alcohol, ethyl alcohol, formaldehyde, 3-hydroxypyridine, oleic acid, pyridine, sucrose, and toluene. Results showed that among the catalysts investigated, silver sulfate is generally the best for carrying out chemical oxygen demand determinations, but practically the same results could be obtained from samples in the high-level range of approximately 500 milligrams by using a reduced amount of silver sulfate in combination with magnesium sulfate. To illustrate the modified procedure, a method was attempted for determining the chemical oxygen demand values of solutions having sample concentrations in the low-level range 5 to 50 milligrams. The method is a modification of the standard Moore procedure, in that a combination of silver sulfate, aluminum sulfate, and magnesium sulfate is used to replace the silver sulfate catalyst. The revised procedure was found to be comparable in completeness of oxidation and approximately one-fourth as expensive as the Moore procedure. Further research on analysis variables is recommended; appendices contain tabular data obtained during the evaluative determinations. (Wares-IPA)
W78-02673

ELECTRICAL DETECTION PROBLEMS IN WATER ANALYSIS BY SPARK SOURCE MASS SPECTROMETRY,
Virginia Univ., Charlottesville. Dept. of Chemistry.
W. W. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 822, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-042, October 1977. 49 p, 8 fig, 4 tab, 43 ref. 1BD713, R801829-03-0.

Descriptors: *Pollutant identification, *Water analysis, Instrumentation, Optical properties, Bioassay, Sampling, Trace elements, Electrical properties, Chemical analysis, *Spark source mass spectrometry, Accuracy, Ashing, Detection.

Research on factors affecting accuracy in spark source mass spectrometry (SSMS) is reported and the applications of SSMS to water-related problems are discussed. The project also involved the development of instrumental additions to improve the operation and control of SSMS procedures, particularly with respect to making the technique more quantitative and easier to use. Modification included: a spark gap monitor pick-up coil, a modified telescope mount to align electrodes on the ion beam axis and view discharge during sparking, modified spark shield to provide light entrance from the top, substitution of a continuously variable collector slit for the standard two position slit, replacement of the standard source chamber by a larger unit, and computation of a linear ratio output for peak area comparison by inputting logarithmic output of the ratio amplifier to an antilog converter. The application of the improved SSMS equipment and procedures was demonstrated in ashing of biological tissue (high and low temperature dry ashing and wet ashing). Results of use of the modified SSMS system showed that if close attention is paid to experimental variables, the technique can complement other analytical methods for obtaining qualitative and quantitative information on trace elements in water and related samples such as sediments and tissues. The SSMS technique is claimed to be invaluable in large regional, state, or federal laboratories for use on materials that require complete elemental screening. (Wares-IPA)
W78-02674

RESIDUAL 2,4-D LEVELS IN THE ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
J. C. Joyce, and H. C. Sikka.
Journal of Aquatic Plant Management, Vol 15, p 76-82, June 1977. 3 fig, 2 tab, 7 ref. Corp of Engineers DACW 39-74-C-0068.

Descriptors: *2-4-D, *Herbicides, *Pesticide residues, *Aquatic weed control, Florida, Water hyacinth, Chemcontrol, Rivers, Crabs, River basins, *St Johns River(FL), Eichhornia crassipes, Blue crabs, Callinectes sapidus.

In tests of water and blue crabs from the St. Johns River (FL), no excessive accumulation of the water hyacinth control herbicide 2,4-D were found. The use of the herbicide was suspended in December 1973 by EPA directive because 2,4-D had not been registered for use in flowing waters. Under a special exemption, operations were resumed on May 1974, but terminated again in October 1975. This study was conducted between May 1975 and January 1976 to evaluate residual 2,4-D levels expected to occur in naturally flowing waters and shellfish during large-scale water hyacinth control operations. Dimethylamine salt of 2,4-D was applied by airboat at 2.24 kg/ha or aircraft at 4.48 kg/ha. Quantities applied in any one section for a month ranged from 0-820 gal, and for a day from 0-340 gal. Water samples were collected between July 1975-January 1976 at nine locations on the river, which flows 502 km from Vero Beach to the Atlantic Ocean at Jacksonville. Blue crabs (Callinectes sapidus), were obtained locally. The 2,4-D concentrations in water samples varied from indetectable levels to 1.30 ppb, well below the 0.1 mg/l (ppm) tolerance limit set for 2,4-D in potable waters. No correlation was found between quantities of 2,4-D in potable waters. No

correlation was found between quantities of 2,4-D applied and the amount detected in the water, there was no apparent build-up of 2,4-D in downstream waters, and no 2,4-D was detected in crabs collected during the treatment period. (Lynch-Wisconsin)
W78-02679

ON THE ORIGINAL LOAD OF THE PROCESS WATER DURING PAPER PRODUCTION BY DISSOLVED SUBSTANCES. PART I: INVENTORY OF STONE GROUNDWOOD PRODUCTION (UEBER DIE DURCH GELOESTE SUBSTANZEN VERURSACHTE BELASTUNG DES FABRIKATIONSWASSERS BEI DER PAPIERHERSTELLUNG. TEIL I: BESTANDSAUFNAHME BEI DER ERZEUGUNG VON STEINSCHLIFF),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Paperfabrikation.
L. Goettsching, W. Luettgen, and H-L. Dalpke.
Das Papier, Vol. 31, No. 7, p 257-263, 1977. 3 fig, 4 tab, 6 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Fibers(Plant), *Chemical oxygen demand, Pilot plants, Industrial wastes, Biochemical oxygen demand, Organic wastes, Wood wastes, Waste water treatment.

Results of a survey of waste characteristics for waste water produced during various phases of stone groundwood production in paper manufacturing are presented. The operation of a pilot plant for the production of stone groundwood is described. Concentrations of various inorganic and organic substances, COD, and BOD are presented for waste water as well as for the initial load during grinding. The COD present in the wood fiber is then evaluated with respect to the amount released through the dissolution of the fiber material. Differences in the initial BOD concentrations of industrial groundwood plants and the pilot plant were attributed to inherent differences in the BOD levels of the rinse waters. The relationship between the initial COD load and the ambient temperature in the grinder pit of the groundwood slurry is described. (Schulz-FIRL)
W78-02683

THE UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE AND 14C-TOLUENE IN PACIFIC HERRING CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
For primary bibliographic entry see Field 5C.
W78-02687

SOME LABORATORY CULTURED CRUSTACEANS FOR MARINE POLLUTION STUDIES,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
W. Y. Lee.
Marine Pollution Bulletin, Vol. 8, No. 11, p 258-259, November 1977. 1 tab, 12 ref.

Descriptors: *Crustaceans, *Water quality control, *Bioindicators, *Toxicity, *Laboratory tests, Methodology, *Copepods, *Amphipoda, *Isopods, Aquiculture, Reproduction, Laboratory animals, Bioassay, Invertebrates, Acartia, Sphaeroma, Amphithoe, Laboratory populations, Culture techniques.

Three laboratory cultured crustaceans are recommended for use in marine pollution studies because they are characterized by (1) wide distribution, (2) a short life cycle, (3) high reproductive potential, and are (4) representative of the plankton and benthos in coastal waters and the intertidal zone, where oil spills most often occur and refinery wastes are discharged. Methods of culturing these crustaceans are described. The crustaceans are Acartia tonsa, a planktonic copepod, Sphaeroma quadridentatum, an isopod, and Amphithoe valida, an amphipod. (Katz)
W78-02695

5B. Sources Of Pollution

BIOLOGICALLY INITIATED AUTO-CATALYTIC MERCURY CONVERSION AND ITS EFFECT ON ELEMENTAL MOBILITY,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-02201

A MULTI-PARAMETER WATER QUALITY MANAGEMENT MODEL FOR RIVER BASINS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-02202

RUNOFF FROM SOFTWOOD PLOTS THAT HAVE BEEN THINNED AND CLEARCUT,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 4C.
W78-02204

ENVIRONMENTAL POLLUTION BY HEAVY METALS,
For primary bibliographic entry see Field 5C.
W78-02215

ALPHA- AND GAMMA-BHC IN TAMAGAWA RIVER WATER, JAPAN (SEPTEMBER 1968 TO SEPTEMBER 1969),
Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-02218

TEMPERATURE EFFECTS ON BOD STOICHIMETRY AND OXYGEN UPTAKE RATE,
Caldwell Consulting Engineers, Walnut Creek, CA.
T. M. Flegal, and E. D. Schroeder.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p. 2700-2707, December 1976. 8 fig, 3 tab, 10 ref.

Descriptors: *Biochemical oxygen demand, *Oxygen, *Analytical techniques, *Temperature, Absorption, Bacteria, Methodology, Waste water treatment, Stoichiometry.

Three bacterial seed preparation methods tested in laboratory experiments to determine the sensitivity of plateau biochemical oxygen demand (BOD) stoichiometry and oxygen uptake rate to incubation temperatures: (1) substrate-aclimated, grown at 21C ambient temperature; (2) substrate- and temperature-acclimated, grown in respirometer bath at experimental temperature; (3) wastewater aerated at ambient temperature. For methods (1) and (2) a 2-1 solution of 400 mg/l glutamic acid plus nutrients was inoculated with 50 ml of settled, filtered wastewater and aerated 24 hours. In method (3) 2 l of wastewater were aerated 24 hours, then settled, filtered, and diluted. Raw wastewater was obtained from two treatment plants in Davis, California. Results showed that plateau stoichiometry was not greatly affected by changes in temperature up to 37C. This finding has practical significance when the plateau is used as a reference point in BOD tests, as constant-temperature incubation probably is not necessary. Plateau BOD determination may thus be more feasible, in contrast to the conventional 5-day procedure which is highly temperature-dependent. Plateau values at each temperature ranged from 2-4%. Plateau BOD is important as the minimum oxygen demand that can be expected in the bio-oxidation of a given wastewater. In addition, the plateau BOD value coupled with cell production measurements provides a more precise estimate of ultimate BOD than 5-day BOD, and in a relatively short period of time. (Lynch-Wisconsin)
W78-02220

RADIUM-226, URANIUM, AND OTHER RADIOLOGICAL DATA COLLECTED FROM WATER QUALITY SURVEILLANCE STATIONS LOCATED IN THE COLORADO RIVER BASIN OF COLORADO, UTAH, NEW MEXICO, AND ARIZONA- JANUARY, 1961 THROUGH JUNE, 1972.
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-02231

WORKSHOP REPORT ON ACID PRECIPITATION AND THE FOREST ECOSYSTEM,
Northeastern Forest Experiment Station, Delaware, OH.
For primary bibliographic entry see Field 5A.
W78-02236

EXAMINATION OF THE ELUTRIATE TEST, A SCREENING PROCEDURE FOR DREDGING REGULATORY CRITERIA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-02253

MOVEMENT OF PHOSPHOROUS FROM A SEPTIC SYSTEM DRAINFIELD,
Connecticut Agricultural Experiment Station, New Haven.
B. L. Sawhney, and J. L. Starr.
Journal of the Water Pollution Control Federation, Vol 49, No 11, p 2238-2242, November 1977. 2 fig, 2 tab, 24 ref.

Descriptors: *Phosphorous, *Septic tanks, *Water table, Groundwater, Drainage, On-site investigations, Streams, Water pollution, Path of pollutants, Effluents, Soil water movement, Water sampling, Depth, Sorption, *Renovation.

Movement of phosphorus (P) from a septic tank drainfield through the surrounding soil to groundwater and its eventual discharge to surface waters were investigated. Suction probes and tensiometers were installed at various distances below and beside the drainfield to obtain effluent solutions and moisture distribution. Soon after the septic tank was put into use, ponding of the effluent in the trench began. Movement of P from the trench occurred in both the downward and the horizontal directions. The results showed that a soil with a water table deep below the drainfield should renovate wastewater effectively for a number of years and should permit minimum additions of P to the groundwater. Soils with a high or perched water table, on the other hand, likely would permit undesirably large P additions to groundwater. (Visocky-ISWS)
W78-02255

INPUT AND FATE OF PETROLEUM HYDROCARBONS ENTERING THE PROVIDENCE RIVER AND UPPER NARRAGANSETT BAY FROM WASTEWATER EFFLUENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. S. VanVleet, and J. G. Quinn.
Environmental Science and Technology, Vol 11, No 12, p 1086-1092, November 1977. 4 fig, 2 tab, 23 ref. Natl Sea Grant 04-6-158-44002.

Descriptors: *Water pollution, *Oil pollution, *Sewage effluents, *Oil, *Waste water(Pollution), Oil wastes, Water pollution sources, Waste water disposal, Suspended solids, Water quality, Municipal wastes, Hydrogen ion concentration, Coasts, Estuaries, Organic matter, Estuarine environment, *Coastal water pollution, *Sediment hydrocarbons, *Providence River, *Narragansett Bay, Coastal environment, Fecal coliform bacteria.

A one-year background survey of the petroleum hydrocarbons discharged to the Providence River by a municipal wastewater secondary treatment plant indicated that the plants may be significant contributors to oil pollution in estuarine and coastal waters. The hydrocarbons were discharged primarily in association with the suspended solids. Analysis of suspended material and sediments in the river and upper Narragansett Bay indicated that approximately half of the suspended hydrocarbons were rapidly sedimented out in the river, and the remainder were transported out of the river and throughout the bay. The petroleum products were persistent to 40 cm in some sedimentary cores, with the subsequent emergence of biologically produced hydrocarbons indicating the extent to which oil pollution was present in the sediments. (Henley-ISWS)
W78-02257

ENVIRONMENTAL MODEL OF KISSIMMEE RIVER BASIN,
Rice Univ., Houston, TX. Dept. of Environmental Science and Engineering.
P. B. Bedient, W. C. Huber, and J. P. Heaney.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol 103, No WR2, Proceedings Paper 13326, p 241-256, November 1977. 10 fig, 2 tab, 13 ref, 2 append.

Descriptors: *Runoff, *Drainage, *Florida, *Model studies, Mathematical models, Water quality, Flood control, Land use, Water pollution, Pollutants, *Path of pollutants, Phosphorus, Rivers, Lakes, Watersheds(Basins), Hydrographs, Hydrology, *Kissimmee River(Fla).

A hydrologic land-use model was developed and applied to the Kissimmee River Basin, Florida. Surface runoff quanity and quality were estimated for changing land-use and drainage patterns in order to explain hydrologic and water quality response along the river. The hydrologic model (HLAND) was based on a daily water balance for each soil land-use type in the watershed. Predicted runoff was routed down the river and compared to measured outflow hydrographs. Phosphorus loading rates were calculated using measured concentrations of total P and predicted runoff volumes. Observed concentrations and loading rates from tributaries along the river correlated well with the drainage density index, defined as the length of drainage network per unit area of watershed. Results indicated that greatest potential for control of runoff quanity and quality exists in on-site storage in marsh, pond, and lake areas. (Sims-ISWS)
W78-02258

METHANE PRODUCTION IN THE WATERS OFF WALVIS BAY,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
M. I. Scranton, and J. W. Farrington.
Journal of Geophysical Research, Vol. 82, No. 31, p 4947-4953, October 20, 1977. 9 fig, 27 ref. NSF DES75-02731, ONR N00014-74-C0262, NR 083-004.

Descriptors: *Methane, *Africa, *Atlantic Ocean, *Sampling, On-site investigations, On-site data collections, Temperature, Water temperature, Oxygen, Phosphates, Gases, Upwelling, Circulation, Ocean circulation, Coasts, Sediments, Bacteria, Oceans, Water chemistry, Data processing, Oceanography, *Walvis Bay(Namibia).

Nine stations were occupied in the vicinity of Walvis Bay, Namibia, during a detailed study of the distribution of methane in this highly productive coastal environment. The principal features of the observed coastal methane distribution included: (1) excess methane in the mixed layer of from 2 times to greater than 300 times solubility equilibrium with the atmosphere, (2) a subsurface maximum, located in the top of the pycnocline, at which concentrations ranged from 2.6 to 440 times solubility equilibrium, (3) an intermediate depth minimum, where concentrations were comparable to those offshore at similar depths and which were attributed to the influence of onshore movement of subsurface offshore water, and (4) a bottom maximum, which was attributed to input of methane to the water column from the anoxic sediments in the Walvis Bay area. An attempt was made to identify the relative importance for methane supply to the coastal mixed layer of in situ biological production and of eddy diffusive and advective transport of methane-rich water which has been in contact with the bottom at the coast. Calculations suggested that both in situ production and physical processes are major sources of excess methane for the highly productive coastal surface waters. However, the complicated circulation patterns make quantification extremely difficult. (Sims-ISWS)
W78-02261

PERSISTENCE OF SOME PHENYLAMIDE PESTICIDES IN THE AQUATIC ENVIRONMENT -- II. ADSORPTION ON CLAY MINERALS,
National Research Centre, Cairo (Egypt). Water Pollution Control.
M. A. El-Dib, and O. A. Aly.
Water Research, Vol. 10, No. 12, p 1051-1053, 1976. 3 fig, 1 tab, 5 ref.

Descriptors: *Adsorption, *Pesticides, *Soils, Hydrogen, Iron, Calcium, Bentonite, Clay, *Phenylamides, IPC, CIPC, Linuron, Neburon, Vitavax.

The capacity of bentonite clays to adsorb phenylamide pesticides was examined, using IPC, CIPC, Linuron, Neburon, and Vitavax in the tests and hydrogen, iron, and calcium forms of clay. A contact time of three days was required to reach equilibrium conditions. Adsorption of the pesticides on the hydrogen, calcium and iron forms of bentonite conformed with Freundlich's isotherm. The higher the computed amount of adsorbent required to reduce the concentration of a particular phenylamide solution, the lower will be the efficiency of the adsorbent. Hydrogen clay has the highest adsorption capacity, followed by iron clay, then by calcium clay. With hydrogen bentonite, slight differences exist with respect to the amount of clay required for the removal of a given amount of Linuron, Neburon or IPC; CIPC and Vitavax still required higher doses of the hydrogen clay for removal. With the calcium and iron forms, adsorption increases in the order of Vitavax, CIPC, IPC, Linuron and Neburon. Considerable amounts of bentonite would be needed to bring about removal of these pesticides from polluted surface water. (Spaeth-Wisconsin)
W78-02264

AVAILABILITY AND CONCENTRATION OF POLLUTANTS FROM AMERICAN FALLS RESERVOIR SEDIMENTS TO FORAGE AND PREDACEOUS FISHES,
Idaho State Univ., Pocatello.
D. W. Johnson, J. C. Kent, and D. K. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 564, Price codes: A06 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, March 1977. 95 p, 7 fig, 11 tab, 90 ref, 2 append. OWRT A-043-IDA(2), 14-34-0001-6013.

Descriptors: Reservoirs, *Sediments, *Chlorinated hydrocarbon pesticides, DDT, Dieldrin, *Polychlorinated biphenyls, *Mercury, Water pollution, *Cadmium, Metals, Fish, *Idaho, *Heavy metals, *Pesticide residues, *American Falls Reservoir(Idaho).

Predominant chlorinated hydrocarbons and heavy metal residues in American Falls Reservoir sediments, water and dominant 'rough' and 'game' fish are reported. Chlorinated hydrocarbon residues (DDT metabolites, dieldrin, and PCB's) vary with fish species and age. The mean value for PCB's in large suckers was 671/microgram/kg in contrasted to the EPA recommendation that it be no greater than 500 microgram/kg. Mercury and cadmium were found in all species analyzed for those particular metals. Results indicate that the Food and Drug Administration's standard of 0.5 mg/kg may be exceeded in crappie, suckers, and large rainbow trout. The mean value for mercury in water was 0.9 microgram/l. The Environmental Protection Agency has recommended, for the protection of fish and predatory aquatic organisms, that total mercury concentration in unfiltered water should not exceed 0.2 microgram/l at any time or place. The World Health Organization has recommended daily intake of cadmium be not more than 70 microgram/day. Consumption of fishes from the reservoir would exceed the recommended limit. The maximum concentration of cadmium in the water was seven times the value considered by the National Academy of Sciences to be an environmental threat. Arsenic was found only in the sediments and water. It was not detected in any of the fishes sampled. (Trihey-Idaho Univ)
W78-02265

STORM OVERFLOW DESIGNERS NEED GREATER FEEDBACK.
Surveyor, Vol. 150, No. 4448, p 22, September, 1977.

Descriptors: *Combined sewers, *Storm water, *Urban runoff, *Storm runoff, *Sewerage, Design criteria, Monitoring, Separated sewers, Waste water treatment, Scotland.

A recent report of the Working Party on Storm Sewage (Scotland), published by the Scottish Development Department, has suggested that although information is sketchy, storm overflow does not appear to be a serious problem in Scotland. The survey by the Working Party indicated that of the 2000 storm overflows observed in Scotland, approximately 20% could be considered hazardous by local authorities. The report suggested that Scottish rivers were probably able to assimilate the storm water without adverse effects and that elimination of all storm overflows was probably not economically feasible. A series of 10 recommendations were presented: direction of storm water to sanitary sewers in industrial areas served by separate systems, elimination of dual manholes, identification of existing storm and sanitary sewers, inspections and supervision of overflows and connections to sanitary sewers, designing of sewers and manholes to minimize blockage, and use of storage or settling basins where feasible. (Schulz-FIRL)
W78-02298

DESIGNING RETENTION BASINS FOR SMALL LAND DEVELOPMENTS,
McElhanney Surveying and Engineering Ltd., Surrey (British Columbia).
For primary bibliographic entry see Field 5G.
W78-02299

URBAN STORM RUNOFF MODEL,
CH2M Hill, St. Louis, MD.
E. W. Rovey, and D. A. Woolhiser.

Journal of the Hydraulics Division, Proceedings of ASCE, Vol 103, No HY11, p 1339-1351, November, 1977. 8 fig, 3 tab, 12 ref.

Descriptors: *Storm water, *Computer models, *Urban runoff, *Estimating, *Storm runoff, Urban hydrology, Hydrographs, Hyetographs, Urban drainage, Model studies, Mathematical models, Hydrology.

Kinematic equations for overland flow and flow in an open channel, as well as the derivation of an infiltration curve as a function of time from ponding and infiltration rate, are presented. A computer model has been developed to approximate the response of a watershed to a specified rainfall event with respect to overland flow on a rectangular surface, open channel flow in a trapezoidal channel, free surface flow in a circular conduit, and general watershed geometry. Input required for the model includes geometric parameters estimated from a topographic map of the watershed, parameters for surface resistance to flow, and infiltration parameters for pervious surfaces. Overland flow resistance coefficients are listed for various surface types. The 165-acre Hillcrest Drain watershed in Northglenn, a suburb of Denver, Colorado, is cited as an example of the use of the model to simulate runoff hydrographs with input of several observed rainfall hyetographs. Simulations of three observed storms were marked by underestimation of the initial peak of discharge and overestimation of the peak rate and volume, although peaking timing prediction was good. For a storm which consisted of two definite pulses of rainfall, the first peak was underestimated while the second peak was overestimated. The inability to predict the difference between actual rainfall and all losses is suggested as contributing to the differences between actual and computed results. Problems associated with estimation of the antecedent moisture condition of the soil and with the spatial distribution of gauging stations within the watershed are discussed. (Schulz-FIRL)
W78-02300

SAMPLES OF RHINE WATER REVEAL ORGANIC CARBON CONTENT,
Karlsruhe Univ. (West Germany). Dept. of Water Chemistry.
H. Sontheimer.
Water and Wastes Engineering, Vol. 14, No. 10, p 24, 26-27, October, 1977. 2 fig.

Descriptors: *Rivers, *Foreign countries, *Organic compounds, *Chemical oxygen demand, *Water analysis, Waste assimilative capacity, Water quality, *Path of pollutants, Hydrologic data, On-site collections, Waste water disposal.

Dissolved organic carbon, COD, ultraviolet extinction, oxygen content, temperature, and flow rate were measured in water samples collected at seven stations along the Rhine River in West Germany. Because current, temperature, and the nature and quantity of pollutants contribute to a wide variation in organic substances within the Rhine, the geometric means of several analyses was used in comparisons of analytical data with time of collection and location. The analyses indicated that a major increase in dissolved organic carbon, COD, and ultraviolet extinction occurred at Mainz, where effluents from the Mannheim-Ludwigshafen area were discharged. Concentrations below this point were relatively constant despite further considerable discharges of effluent, verifying the river's capacity for self-purification. The study concluded that the total dissolved organic carbon pollutant load increased with flow rate. A decrease in the load of biologically degradable substances with a decrease in flow rate was attributed to more time available for self-purification under conditions of low flow rate. Since deviations in COD values were greater than in dissolved organic carbons from curve fitting of 1970-1974 values, the use of dissolved organic carbon rather than COD was suggested for determining river quality. An equation to estimate pollutant loading with respect to flow rate was presented. The effects of the large BASF water treatment plant in Ludwigshafen on the quality of the Rhine were discussed. (Schulz-FIRL)
W78-02383

STUDY OF A SEPTIC TANK SYSTEM ON A LAKE SHORE: TEMPERATURE AND EFFLUENT FLOW PATTERNS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
M. M. Gibbs.
New Zealand Journal of Science, Vol 20, No 1, p 55-61, March, 1977. 7 fig, 10 ref.

Descriptors: *Septic tanks, *Effluents, *Infiltration, *Groundwater, *Analytical techniques, Subsurface mapping, Soil investigations, *Path of pollutants, Municipal wastes, Waste water disposal.

Septic tank effluent seepage was mapped over a shallow groundwater table near Lake Taupo in New Zealand to determine whether septic effluent was entering the lake. Because conventional tracer methods were prohibited by the area's low groundwater velocities, the extent and direction of movement was traced by measuring temperature changes produced at the groundwater surface by the effluent. A network of 10-mm dia borholes laid out on a grid pattern at 1-m centers was used to monitor effluent motion. The boreholes were equipped with a rapid response thermistor mounted in the tip of a rod of a low thermal conductivity substance. A finite difference method was used to determine the path of the effluent from the septic tank soakhole to the test borehole. Elevated temperatures were observed in the surface water at nearly all of the borehole sites, with a sharp thermal gradient below about 0.2 m and background groundwater temperature at about 1 m. A thermal plume which emanated from the soakhole was observed, with effluent water travelling considerable distances before entering the groundwater. The thermal buoyancy of the septic tank effluent and the thermal gradient between it and the background groundwater confined effluents to the upper 0.2 m of the water table at distances greater than 8 m from the soakhole. The probability of septic effluents reaching Lake Taupo in this situation was considered significant. This groundwater temperature mapping technique is recommended for areas where low groundwater velocities or anisotropic soil properties limit the application of traditional tracer techniques. (Schulz-FIRL)
W78-02385

DOES POLLUTION ABATEMENT IMPROVE AQUATIC LIFE,
Normandeau Associates, Bedford, NH.
N. Savage, and J. Alcamo.
Water and Wastes Engineering, Vol. 14, No. 9, p 198, 111-112, 158, September, 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Aquatic life, *Environmental effects, *Mathematical models, *Path of pollutants, Rivers, Water pollution control, On-site data collections, Hydrologic data, Waste assimilative capacity, Waste water disposal.

The environmental effects of water pollution control efforts are discussed with respect to finfish and benthic invertebrates in the Merrimack River in Massachusetts. SNSIM (Stream Network Simulation) was used as a computerized mathematical model for this analysis. The model, developed by the EPA in 1974, calculates carbonaceous BOD of a stream from carbonaceous BOD values for point source loads and tributaries. The dissolved oxygen content is calculated with respect to the oxygen demand from biochemical breakdown of nitrogenous wastes; algal production and respiration of oxygen; benthal oxygen demand; and diffusion of atmospheric oxygen. Reaction coefficients on which the mode is based include the oxidation rate of nitrogenous BOD and carbonaceous BOD by bacteria, the rate of algal assimilation of ammonia and nitrate, and the diffusion rate of atmospheric oxygen into the river. Use of the model requires data preparation, model calibration and refinement, and water quality projections. The Merrimack River was divided into segments according to flow, velocity, cross-sectional area, and depth. Water quality projections were calculated on the basis of 7-day, 10-yr low flow conditions. Projections of aquatic organism response were evaluated according to the sensitivity of the organism to pollutants and a direct linear relationship between dissolved oxygen concentration and biological response. The study concluded that changes in resident aquatic organism populations were not widespread as a result of pollution abatement schedules, although substantial improvements were observed in certain highly polluted stretches of the river. (Schulz-FIRL)
W78-02390

OCCURRENCE AND DISTRIBUTION OF BACTERIAL INDICATORS AND PATHOGENS IN CANAL COMMUNITIES ALONG THE TEXAS COAST,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
S. M. Goyal, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol. 34, No. 2, p 139-149, August, 1977. 6 fig, 7 tab, 31 ref.

Descriptors: *Coliforms, *Canals, *Estuaries, *Enteric bacteria, *Salmonella, Sewage bacteria, On-site data collections, Saline water-freshwater interfaces, Disinfection, Sewage disposal, Microorganisms, Texas, Soil analysis, Water analysis, Sea water, Waste water disposal.

The occurrence and distribution of bacterial indicators and pathogens were examined in residential canals of six Texas coastal communities which use a variety of waste disposal methods. The disposal systems include three which utilize collection systems and treatment plants, one in which sewage was initially collected in septic tanks and which later changed to collection and treatment, and two in which disposal was 25% septic tank and 75% collection system and treatment plant. Other parameters measured for the canals included depth and age. Measurements of coliforms, fecal coliforms, and salmonella were made in the surface water and bottom sediments of the canals over a 17-month period. The most-probable-number (MPN) method was used to analyze all samples. The results indicated that there was no significant correlation between organism concentrations and physical-chemical characteristics of canal waters such as temperature, pH, turbidity, and suspended solids. Organism concentrations, however, did decrease as the salinity increased. Levels of enteric bacteria in the sediment were higher, often by a factor of several logs, than in the accompanying surface water. The rapid increase in bacteria concentrations in surface waters was attributed to the desorption of bacteria in the sediment as a result of decreasing salinities. (Schulz-FIRL)
W78-02391

THE DELINEATION OF A POINT SOURCE PLUME BY THE STUDY OF BACTERIAL POPULATIONS,
Canada Centre for Inland Waters, Burlington (Ontario).
S. S. Rao, and R. P. Bukata.
Journal of Applied Bacteriology, Vol. 43, No. 1, p 61-66, August, 1977. 6 fig, 5 ref.

Descriptors: *Lakes, *Rivers, *Microorganisms, *Analytical techniques, *Bioindicators, Path of pollutants, Coliforms, Remote sensing, Aerial photography, Environmental gradient, Hydrology,

*Lake Ontario, Great Lakes, Streptococcus, Aerobic bacteria, Temperature, Mixing, *Niagara River(Canada).

The radial sampling grid method and remote sensing techniques were used to examine the plume of Niagara River water in Lake Ontario. Water samples were collected at nine sampling stations on four radii from the mouth of the Niagara River and analyzed for aerobic heterotropic bacteria, coliforms, fecal coliforms, and fecal streptococci. Thermal scans over the Niagara plume and aerial infrared photography indicated that the thermal regimes estblished by the merging lake and river had the same spatial distribution as microbial populations. The aerobic heterotropic bacterial populations were indicative of lake waters, while the coliforms and streptococci were indicative of river water. The microbiological data were used to define the main impact zone of the river, the zone of minor influence of the plume, and non-plume lake waters. Microbiological and air remote sensing measurements are suggested for use in studies on the dynamic interaction of lakes and rivers at the source of discharge. (Schulz-FIRL)
W78-02392

GROUND WATER QUALITY MODEL OF THE CHIPUXET AQUIFER IN THE UPPER PAWCATUCK RIVER BASIN,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
A. S. Marcus, W. E. Kelly, and L. J. Kirschenbaum.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 767, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, (1977). 20 p, 15 fig. OWRT A-061-RI(1).

Descriptors: *Groundwater, *Aquifers, Water pollution sources, Model studies, Rhode Island, *Chipuxet Aquifer(RI), *Water quality models, Measurements, *Specific conductivity, Monitoring.

The Chipuxet Ground Water Aquifer is located in Kingston, R.I. The apparent pollution sources are a landfill, highways, agriculture and farming areas, and residential septic systems. Both wells and surface water quality measurements were made in an attempt to trace pollution sources into, through, and out of the aquifer. While many chemical measurements were made the major part of the report deals with specific conductivity measurements. The conclusions indicate that some of the suspected pollution sources were successfully monitored.
W78-02402

NITROGEN SOURCE DIFFERENTIATION THROUGH CARBON ISOTOPES,
Nebraska Univ., Lincoln. Conservation and Survey Div.
R. F. Spalding.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 777, Price codes: A03 in paper copy, A01 in microfiche. Nebraska Water Resources Research Institute, Lincoln, Completion Report, September 1977. 31 p, 2 fig, 1 tab, 25 ref, append. OWRT A-047-NEB(1), 14-34-0001-7058.

Descriptors: *Nitrogen, *Nitrates, *Carbon isotopes, Groundwater, Water pollution sources, *Nebraska, *Platte River(Neb), Water wells, Sampling, Dissolved organic carbon, *Nitrate-nitrogen, Isotopic studies.

Fifty-one groundwater samples and one Platte River surface water sample were analyzed for nitrate-N, dissolved organic carbon (DOC), and 13C ratios. Ten samples contaning sufficient NO3-N (> 5.0 ppm) were analyzed for 15N. Water samples were pumped from 51 observation wells located in a 25 square mile area near the Platte River south of Shelton, Nebraska. Wells were chosen such that any concentration or isotopic differences could be related to areal land use and depth. Ranges in concentrations and isotopic ratios were 0.0 to 27.0 mg/l, 0.5 to 4.8 mg/l, -15.6 to -25.4, and +4.7 to +11.5 for nitrate-N, DOC, 13C and 15N. DOC concentrations were negatively stratified with depth indicating the soils are the predominant source of DOC to the groundwater reservoir. Highest DOC concentrations always appeared in shallow wells adjacent to the intensively farmed areas. Heavier 13C values were always associated with these wells and appear to reflect the decomposition of either field corn or corn-fed animal waste products. Nitrogen isotopes indicate the major nitrogen contamination to vary between animal wastes and fertilizer depending on the land use near the well. Wells in cottonwood groves, islands, pastures and hay meadows had very low NO3N concentrations (1.0 ppm), lower DOC concentrations, and lighter 13C values averaging -22.5.
W78-02406

TIME OF TRAVEL OF SOLUTES IN MISSISSIPPI RIVER FROM BELLE CHASSE TO THE VICINITY OF HEAD OF PASSES, LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
A. J. Calandro.
Louisiana Department of Transportation and Development, Baton Rouge, Office of Public Works, Water Resources Technical Report No 13, 1977. 5 p, 5 fig, 6 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Flow rates, *Mississippi River, Wastes, *Tracking techniques, Tracers, Dye releases, Dye dispersion, Dye concentrations, Time of concentration, Mathematical models, Forecasting, Louisiana, Mississippi, *Time of travel(Solutes), *Accidental spills.

Accidental spills of pollutants could be harmful to water users along a river. Planners and downstream water users should have knowledge of the behavior of dissolved pollutants accidentally spilled into the river. A water tracer was injected into the Mississippi River near Belle Chasse, La., (mile 77.0) to determine the travel-time, the maximum concentration, the dispersion characteristics, and the duration of a tracer cloud for the reach from Belle Chasse, La., to the vicinity of Head of Passes (mile 0.0). The average flow in the reach was 468,000 cubic feet per second during the study. Information from this study and from previous studies was used to calibrate a mathematical model developed by the U.S. Geological Survey at the Gulf Coast Hydroscience Center. The model was to generate time-of-travel curves of the leading edge, the peak, and the trailing edge of the tracer cloud for discharge ranging from 200,000 to 1,200,000 cubic feet per second. (Woodard-USGS)
W78-02426

FACTORS AFFECTING THE AVAILABILITY OF SEDIMENT-BOUND CADMIUM TO THE ESTUARINE, DEPOSIT-FEEDING CLAM, MACOMA BALTHICA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-02427

WATER-QUALITY STUDY OF TULPEHOCKEN CREEK, BERKS COUNTY, PENNSYLVANIA, PRIOR TO IMPOUNDMENT OF BLUE MARSH LAKE,
Geological Survey, Harrisburg, PA. Water Resources Div.
J. L. Barker.
Available from the National Information Service, Springfield, VA 22161 as ADA-045 865, Price codes: A16 in paper copy, A01 in microfiche. Water-Resources Investigations 77-55, September 1977. 59 p, 22 fig, 11 tab, 22 ref.

Descriptors: *Pre-impoundment, *Water quality, *Chemical analysis, Nutrients, Bacteria, Insecticides, Trace elements, Streamflow, Sediments, Evaluation, *Pennsylvania, Berks County(Penn), *Tulpehocken Creek(Penn).

Blue Marsh Lake is planned as a multipurpose impoundment to be constructed on Tulpehocken Creek near Bernville, Berks County, Pennsylvania. Prior to construction, samples of water, bed material, and soil were collected throughout the impoundment site to determine concentrations of nutrients, insecticides, trace metals, suspended sediment, and bacteria. Analyses of water suggest the Tulpehocken Creek basin to be a highly fertile environment. Nitrogen and phosphorus concentrations near the proposed dam site had median values of 4.5 and 0.13 mg/liter, respectively. Suspended sediment discharges average between 100 and 200 tons per day during normal flows but may exceed 10,000 tons per day during storm runoff. Highest yields were measured during winter and early spring. Concentrations range from 3 mg/liter to more than 500 mg/liter. Bed material samples contain trace quantities of aldrin, DDT, DDD, DDE, dieldrin, and chlordane. Polychlorinated biphenyls (PCB's) ranged from 10 to 100 micrograms per kilogram. Soils at the impoundment site are of average fertility. However, the silt loam texture is ideal for attachment and growth of aquatic plants. (Woodard-USGS)
W78-02433

SALINE-WATER INTRUSION RELATED TO WELL CONSTRUCTION IN LEE COUNTY, FLORIDA,
D. H. Boggess, T. M. Missimer, and T. H. O'Donnell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 012, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-33, September 1977. 29 p, 10 fig, 4 tab, 7 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Water wells, *Well casings, *Florida, Chlorides, Corrosion, Drilling, Water pollution sources, Groundwater, Lee County(Fla), Well construction.

An estimated 30,000 wells have been drilled in Lee County, Florida, since 1900. These wells range in depth from about 10 to 1,240 feet and tap the water-table aquifer of one or more of the artesian aquifers underlying the area. Many of these wells are sources of saline-water intrusion into freshwater aquifers. The artesian aquifers in the lower part of the Hawthorn Formation and upper part of the Tampa Limestone and the Suwannee Limestone have high water levels and contain water with dissolved solids concentrations ranging from 1,500 to 2,400 mg/liter (milligrams per liter). Few of the 3,000 wells drilled to these water-bearing units contain sufficient casing to prevent upward leakage into overlying aquifers; intrusion into the upper part of the Hawthorn Formation has resulted in an increase in chloride concentrations from a normal of 80-150 to 300-2,100 mg/liter. Saline-water intrusion into the upper part of the Hawthorn Formation also has occurred as a result of downward leakage of saline water through corroded metal casings of wells drilled in areas adjacent to tidal water bodies. Where this leakage has occurred, the chloride concentration has increased to as much as 9,500 mg/liter. (Woodard-USGS)
W78-02434

PRELIMINARY DESIGN OF WASTEWATER LAND APPLICATION SYSTEMS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5E.
W78-02438

INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL,
Tel-Aviv Univ., (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-02440

STATISTICAL MODELS OF RIVER LOADINGS OF NITROGEN AND PHOSPHORUS IN THE LOUGH NEAGH SYSTEM,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
R. V. Smith, and D. A. Stewart.
Water Research, Vol. 11, No. 8, p 631-636, 1977. 1 fig, 3 tab, 15 ref.

Descriptors: *Statistical models, *Computer programs, Rivers, Lakes, *Water pollution control, *Nitrogen, *Phosphorus, Nutrients, Estimating, Flow, Sampling, Equations, Chemical analysis, Systems analysis, *Path of pollutants, *Forecasting, *Waste loads, *Northern Ireland.

To establish nutrient budgets of Lough Neagh in Northern Ireland, and to provide strategies for the reduction of nitrogen and phosphorus, it became necessary to obtain estimates of their inputs to the lake. On the six major rivers entering the lake, continuous flow metering was available but chemical concentrations were only available every 8 or 15 days. To associate river chemical concentrations and loadings with flows for these observed dates, and hence to predict from their relation the loads at the unobserved dates, a computer program using eight possible statistical relations was used. Those methods examined include various regressions with adjustments, higher order (polynomial) fits, logarithmic and other transforms, and different rising and falling flow relations. Results produced by the various methods with discussion of their relative merits are presented. Reasons are given for the final selection of a sample log load on log flow relation for rivers derived from terrestrial catchments. (Bell-Cornell)
W78-02441

A MODELLING METHOD FOR EVALUATING WATER QUALITY POLICIES IN NONSERIAL RIVER SYSTEMS,
Calgary Univ., (Alberta). Faculty of Business.
For primary bibliographic entry see Field 5G.
W78-02442

SENSITIVITY ANALYSIS OF STREETER-PHELPS MODELS,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
S. Rinaldi, and R. Soncini-Sessa.
Research Report No. RR-77-1, International Institute for Applied Systems Analysis, Laxenburg, Austria, February 1977. 18 p, 7 fig, 5 ref.

Descriptors: *River systems, *Water quality, *Simulation analysis, Biochemical oxygen demand, Dissolved oxygen, Flow, Temperature, Thermal pollution, Mathematical models, Equations, Systems analysis, *Streeter-Phelps models, *Sensitivity analysis, Heat discharge, Balance equations.

Sensitivity theory is applied to a class of generalized Streeter-Phelps models in order to predict the variations induced in biochemical oxygen demand (BOD) by the variations of some parameters characterizing the river system. The paper demonstrates the simplicity and elegance of this technique and proves that many relatively complex phenomena can be explained by Streeter-Phelps models. Considered are load variations, flow rate variations, temperature variations, and the interactions between heat pollution and biodegradable pollution. The results are of general applicability and are presented in a very simple analytical form. The main limitation of the study could be the fact that sensitivity theory makes reference only to small perturbations of the parameters. However, the direct comparison with the simulation study carried out by Lin et al. (1973) (See W75-08006) shows that the results obtained herein are largely satisfactory for realistic variations of the parameters of river-quality models.
W78-02444

QUANTITATIVE STUDIES OF FAUNAL LIMITS IN THE NORTH ADRIATIC PHYTAL, USING POLYCHAETES AS AN EXAMPLE, (IN GERMAN),
Vienna Univ. (Austria). Zoologisches Inst.
For primary bibliographic entry see Field 2L.
W78-02451

CONCENTRATION FACTORS AND TRANSPORT MODELS FOR RADIONUCLIDES IN AQUATIC ENVIRONMENTS. A LITERATURE REPORT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-02452

SEASONAL PATTERNS IN ACIDITY OF PRECIPITATION AND THEIR IMPLICATIONS FOR FOREST STREAM ECOSYSTEMS,
Forest Service (USDA), Durham, NH. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 5C.
W78-02455

ENVIRONMENTAL PHOSPHORUS HANDBOOK.
John Wiley and Sons, Inc.: New York, N.Y., 1973. 718 p. $34.95. Griffith, Edward J. (Ed).

Descriptors: Algae, Bacteria, *Environmental effects, Eutrophication, Nutrition, Organic, *Phosphorus, Sea, Viruses, Water pollution, *Ecology, *Pollutant identification, *Path of pollutants.

This handbook's 37 contributing articles define and clarify the various P related topics. Beginning with studies on P in the larger systems, and progressing into the smaller systems, the book continues studies into the microscopic and submicroscopic systems. Several chapters discuss: P in meteorites, lunar samples and the lithosphere; phosphate deposits; inorganic P in seawater and in minerals. The next group of articles discussed P compounds and methods for their study: organic P compounds in aquatic systems; dissociation constants of P-containing chelating agents; polyphosphate deflocculants; pH titration; solubility; hydrolysis; gravimetric analysis; spectrometric methods and gas chromatography detectors. Colorimetric analysis of P at low concentrations, phosphate measurements in natural waters and low-level P detection methods are other topics of discussion. Another group of articles examine the biological aspects of P and/or its compounds: transformation of naturally occurring organophosphorus in the environment; P in human nutrition; biomineralogy of phosphate and physiological mineralization; P nutrition of algae; role of P in bacteria and viruses; phosphorus cycle in lakes; and vertical movement of phosphate in freshwater. Other articles consider role of P in eutrophication, wastewater treatment and ecology. P as a factor in the United States' economy and an editorial on environment P conclude this book.--Copyright 1974, Biological Abstracts, Inc.
W78-02457

A STOCHASTIC MODEL FOR BOD AND DO IN STREAM WHEN POLLUTANTS ARE DISCHARGED OVER CONTINUOUS STRETCH,
South Carolina Univ., Columbia. Dept. of Mathematics and Computer Science.
W. J. Padgett, G. Schultz, and C. P. Tsokos.
International Journal of Environmental Studies, Vol. 11, No. 1, p. 45-55, 1977. 4 fig, 14 ref. U.S. Air Force Office of Scientific Research Grant, AFOSR-75-2711.

Descriptors: *Water pollution sources, *Biochemical oxygen demand, *Dissolved oxygen, *Stochastic processes, Fishkill, *Model studies, Path of pollutants.

A stochastic model for stream pollution is given in terms of a random differential equation giving the biochemical oxygen demand (BOD) and dissolved oxygen (DO) at a distance downstream from a major source of pollution. The joint probability distribution of BOD and DO at each point is derived for several cases and computer-simulated trajectories as well as the mean and variance functions are presented which indicate the statistical properties of the BOD and DO processes. Results are considered important in determining the possibilities of fish kills in the stream as well as in studying the statistical properties of the BOD and DO processes. It is assumed there are five major activities in the stream. First, the pollution (BOD) and DO are decreased by action of the bacteria. Second, dissolved oxygen is increased due to reaeration at a rate proportional to the dissolved oxygen deficit. Third, pollution only is decreased by sedimentation and adsorption at a rate proportional to the amount of pollution present. Fourth, pollution is increased from small sources along the stretch of the stream. And finally, dissolved oxygen is decreased at a measured rate per day. (Coyle-Wisconsin)
W78-02458

FACTORS AFFECTING THE DENITRIFICATION RATE IN TWO WATER-SEDIMENT SYSTEMS,
Agricultural Univ., Wageningen (Netherlands).
For primary bibliographic entry see Field 5D.
W78-02460

IMPACTS OF MAN'S ACTIVITIES ON THE CHEMICAL COMPOSITION IN THE SEDIMENTS OF LAKES ONTARIO, ERIE AND HURON,
Canada Centre for Inland Waters, Burlington (Ontario).
A. L. W. Kemp, and R. L. Thomas.
Water, Air, and Soil Pollution, Vol 5, No 4, p 469-490, June, 1976. 7 fig, 4 tab, 41 ref.

Descriptors: *Sediments, *Lake Ontario, *Lake Erie, *Lake Huron, *Water pollution sources, Great Lakes Region, Chemicals, Water pollution, Sedimentation, Lakes, Sediment-water interfaces, Palynology, Dating, History, Ambrosia, Pollen analysis.

Triple core samples were taken at 14 locations in Lakes Ontario, Erie, and Huron to determine concentrations of organic matter, major elements, and trace elements. The increase in Ambrosia pollen in the sediments with settlement of the area about 120 years ago provided a chronological framework for ascertaining both man's effect on sediment chemical composition over time, and the extent of present-day anthropogenic and natural sediment inputs. It was assumed that differences between presettlement (before 1850) levels of trace elements and nutrients, and surface concentrations, represent net anthropogenic input. Analysis of chemical profiles of the cores for most locations showed that for most of the major elements there was little change in concentration except for small changes near the sediment-water interface. But that a number of elements showed marked enrichments near the sediment surface, including mercury, lead, zinc, cadmium, copper, beryllium, vanadium, organic carbon, nitrogen, and phosphorus. At the Ambrosia horizon only trace amounts of anthropogenic particles were found, presumably due to early shipping on the lakes. Major enrichments in Lakes Ontario and Erie are

estimated to have taken place since about 1950. Nutrient and mercury loadings to surface sediments of Lake Huron are much less than to the other lakes. Data on sedimentation rates, elemental concentrations, and natural and anthropogenic sediment inputs are given in tabular form. (Lynch-Wisconsin)
W78-02464

ANAEROBIC DECOMPOSITION OF OIL IN BOTTOM SEDIMENTS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
T. B. Shelton, and J. V. Hunter.
Journal Water Pollution Control Federation, Vol 47, No 9, p 2256-2270, September 1975. 14 fig, 1 tab, 13 ref.

Descriptors: *Oil pollution, *Decomposing organic matter, *Dissolved oxygen, *Aerobic conditions, *Anaerobic conditions, *New Jersey, Sediment, Organic matter, Carbon, *Path of pollutants, Environmental effects, Water pollution sources, *Oil decomposition, Benzene, Elizabeth River(NJ), Woodbridge Creek(NJ).

Natural bottom sediment from the Elizabeth River and Woodbridge Creek in New Jersey, containing 8% oil on a dry weight basis, were studied to obtain an insight into the relative persistence of oils and the length of time they exert their effects on the environment. It was found that oils are lost from natural bottom sediments with time when anaerobic conditions occur in the overlying water, and that oils are more readily lost than other organic matter present. In addition it was found that there is a steady release of organic carbon with time from a natural bottom sediment containing oil with anaerobic conditions in the overlying water. This loss is greater than that obtained under aerobic conditions with the same sediment. Natural bottom sediments under anaerobic conditions consolidate under their own weight with time. Moreover, there is no observable change in the benzene extractables in a natural bottom sediment containing oil under anaerobic conditions. Finally, functional group analysis by spectrophotometry of aliphatic, aromatic, and oxy-compound fractions of oil indicated an increased loss of oxy-compounds under anaerobic conditions. (Coyle-Wisconsin)
W78-02466

THE FATE OF STORM WATER AND STORM-WATER POLLUTION IN THE PARRAMATTA ESTUARY, SYDNEY,
Snowy Mountains Engineering Corp., Cooma (Australia).
E. Wolanski.
Australian Journal of Marine and Freshwater Research, Vol. 28, No. 1, February 1977, p. 67-73. 5 fig, 15 ref.

Descriptors: *Model studies, *Storm runoff, Storm water, Water pollution sources, Estuaries, Saline water-freshwater interfaces, Hydrodynamics, Turbulence, Buoyancy, *Australia, *Upper Parramatta estuary(Australia), Sydney(Australia), Richardson number.

A simple model is proposed to trace the fate of storm water and its effects on water quality in the upper Parramatta River estuary near Sydney, Australia. Quantitative study of urban storm water pollution in this location has been difficult because the estuarine hydrodynamics of the river are complex. At least after intense rainfalls, storm water often forms a well-defined freshwater plume floating passively at the surface of the upper Parramatta estuary. As a result the Parramatta estuary is quite different from most intensively-studied estuaries, such as the Thames, Potomac or Delaware rivers. Conditions at the Parramatta call instead for a new approach to estuary modeling based on the parameterization of the interaction of turbulence and buoyance at high values of the Richardson number. Such a simple two-layer box model is proposed. Based on numerical experiments with a model it appears that the rainfall history (duration and intensity) is a very important variable controlling the fate of storm water in the upper estuary, and of the resulting storm water pollution. It is suggested that a similar parameterization of buoyancy effects could be included in a water quality model which would also accomodate lateral and longitudinal anomalous characteristics. (Harris-Wisconsin)
W78-02473

OXYGEN CONSUMPTION BY FRESHWATER SEDIMENTS,
Clemson Univ., SC. Dept. of Environment Systems Engineering.
W. S. Brewer, A. R. Abernathy, and M. J. B. Paynter.
Water Research, Vol 11, No 5, p 471-473, 1977. 3 fig, 1 tab, 8 ref.

Descriptors: *Oxygen, *Aerobic conditions, *Respiration, *Sediments, *Organic material, Sediment-water interfaces, *Biological respiration, Sediment chemistry.

A study measured the oxygen consumption rate of sediments and determined the amount of oxygen consumption attributable to biological activity. Closed systems were used to measure oxygen uptake and phenol or potassium cyanide were introduced to eliminate biological respiration. Declines in oxygen consumption in the presence of biological inhibitors demonstrated that oxygen removal by sediments from the overlying water is mainly a biological process. Reduction of rates up to 91% by poisoned samples clearly demonstrated that biological respiration was the major process removing oxygen from the overlying water. Further, the reduction--99.9%--of the aerobic bacterial population--indicated that oxygen consumption was due mainly to bacterial respiration. The study demonstrates that as the amount of available organic material increases, oxygen demand of the aerobic, heterotrophic bacteria at the sediment interface would also increase. The subsequent consequence would be an additional stress on the oxygen-poor hypolimnion. (Coyle-Wisconsin)
W78-02481

THE COMBINED RELATIONSHIP OF TEMPERATURE AND MOLYBDENUM CONCENTRATION TO NITROGEN FIXATION BY ANABAENA CYLINDRICA,
Baylor Univ., Waco, TX. Inst. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02483

RATES OF REMINERALIZATION AND ASSIMILATION OF UREA BY FRACTIONATED PLANKTON POPULATIONS IN COASTAL WATERS,
Queen's Univ., Belfast (Northern Ireland). Marine Biology Station.
For primary bibliographic entry see Field 5C.
W78-02484

THE IMPORTANCE OF ALLOCHTHONOUS PARTICULATE CARBON PATHWAYS IN A SUBALPINE LAKE,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W78-02496

NUTRIENTS IN ESTUARIES,
Marine Biological Lab., Woods Hole, MA. Ecosystems Center.
J. E. Hobbie.
Oceanus, Vol. 19, No. 5, p 41-47, 1976. 6 fig, 4 tab, 16 ref.

Descriptors: *Estuaries, *Nutrients, *Sediments, *Sediment-water interfaces, Nitrogen, Phosphorus, Photosynthesis, Aquatic plants, Runoff, Agricultural runoff, Seawater, Eutrophication, Algae, Phytoplankton, Suspended solids, Ythan River estuary(Scotland).

Seawater is rich in nutrients needed by plants, such as potassium, calcium, and magnesium; only phosphorus and nitrogen are sufficiently limited in supply to control estuarine plant growth. P and N are supplied by land runoff, erosion of older marine sediments, and seawater that comes upstream at a river's mouth. In turbid estuaries where much sediment is in suspension, there is a correspondingly high rate of exchange between sediments and water. In clear estuaries there is very little sediment-water interaction. Streams draining farmland and urban areas contain much more P and N than those draining undisturbed forest lands. A few estuaries, including the Ythan in Scotland, receive most of their nutrients from seawater. The upstream movement of bottom water and the sedimentation and coagulation of particulate matter help prevent nutrients from being washed out to sea. Nutrients move from sediments to water through the circulation of water through the upper layers of sediment and the resuspension of sediments into the water column. Both eelgrass and Spartina also pump P from the sediments into the water column. Although human activities have enriched streams feeding estuaries, phytoplankton blooms are uncommon due to the active circulation in estuaries and the ability of estuaries to deal with quantities of nutrients that would destroy the ecological balance of a lake or reservoir. Rooted plants and attached algae thrive in the nutrient-rich estuaries. (Lynch-Wisconsin)
W78-02508

POLLUTION HISTORY OF ESTUARINE SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg.
Oceanus, Vol 19, No 5, p 18-26, 1976. 6 fig, 8 ref.

Descriptors: *Estuaries, *Water pollution, *Sediments, *Pollutants, Estuarine environment, Geologic history, Radioactive dating, Lead, Chesapeake Bay, Hurricanes, Fossil fuels, Coal, Industrial wastes, Sewage effluents, Path of pollutants, Metals, Puget Sound(WA), Geochronology.

Agricultural, social, and industrial activities, as well as natural events, introduce pollutants into estuarine environments. Some of these pollutants are deposited in sediments; flow rates can be determined, particularly in anoxic deposits with high levels of organic matter. Such deposits do not support burrowing organisms which can distort or eliminate the pollution record. To ascertain the amount of a pollutant entering a deposit per unit time, the strata must be dated (geochronology) through lead-210 or other radioactive dating methods. Pollutants may be transported to the sea floor through biological activity--in fecal matter or organic remains. The primary source of lead to the environment from human activities is the combustion of lead alkyls in gasoline. Lead reaches estuaries directly from the air or from treated sewage, or indirectly via rivers or dry runoff (e.g., from lawn watering). Evidence of hurricane Agnes (1972) was found in core samples from Chesapeake Bay. Materials from fossil fuels are released to the atmosphere by burning, and enter estuaries through washout and dry fallout. The enrichment of heavy metals in the sediments is associated with coal burning. In Puget Sound (WA), sediments included arsenic and antimony from a copper smelter, and mercury from a chlor-alkali plant. DDT, PCBs, and radioactive wastes are other pollutants which can be detected in estuarine sediments. (Lynch-Wisconsin)
W78-02509

MATHEMATICAL MODELING OF DISPERSION IN STRATIFIED WATERS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
G. C. Christodoulou, J. J. Connor, and B. R. Pearce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 091, Price codes: A14 in paper copy, A01 in microfiche. Report No NOAA-77012507, November 15, 1976. 309 p, 68 fig, 13 tab, 93 ref. MIT Sy 76-14. S6-04-5-158-1.

Descriptors: *Mathematical models, *Dispersion, *Stratification, Model studies, Summer, Thermocline, Equations, Massachusetts, Coasts, Bays, Entrainment, Finite element analysis, Analytical techniques, Effluents, *Massachusetts Bay(MA).

A mathematical model is developed for the quantitative description of the dispersion process in a two-layer representation of a natural water body during the summer, when a distinct thermocline usually exists. The purpose is to predict the spread of an effluent in a given coastal or inland body of water under strongly stratified conditions, and in this study the model is applied to Massachusetts Bay. Physical mechanisms associated with dispersion are first analyzed, and then numerical requirements for simulating the dispersion are established by the finite element method. Rational quantitative expressions for dispersion coefficients and interfacial transport in terms of mean flow characteristics are proposed. The model can handle any passive constituent, dissolved or suspended, possessing vertical mobility and arbitrary decay characteristics, in a domain of irregular geometry and bottom topography. The formulation is based on the convection-diffusion equation, vertically integrated between the layer boundaries. Verification using field experiments in Massachusetts Bay showed that the numerical model adequately predicted the dispersion process. Improvement of the model's applicability will require extension, such as treatment of vanishing bottom layers, and a reliable circulation field is essential, for which extensive field monitoring is necessary. (Lynch-Wisconsin)
W78-02511

THE INFLUENCE OF ORGANIC MATTER AND ATMOSPHERIC DEPOSITION ON THE PARTICULATE TRACE METAL CONCENTRATION OF NORTHWEST ATLANTIC SURFACE SEAWATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. T. Wallace, Jr., G. L. Hoffman, and R. A. Duce.
Marine Chemistry, Vol 5, No 2, p 143-170, 1977. 1 fig, 10 tab, 80 ref. NSF GX-33777 and GX-39147.

Descriptors: *Organic matter, *Trace elements, *Metals, *Winds, *Sea water, *Fallout, Atlantic Ocean, Carbon, Nitrogen, Aluminum, Aerosols, *Particulates, Sargasso Sea, Bermuda.

A study of factors affecting concentrations of particulate trace metals (PTMs) in the mixed surface layer of seawater offers evidence that particulate organic carbon (POC) played a dominant role in controlling particulate Cu, Zn, Pb, Cd, and to a lesser extent Ni and Cr. This was largely due to the low concentrations of alumino-silicates in open ocean and coastal surface waters. The importance of wind was also assessed through comparison of PTMs in marine aerosols collected in Bermuda over two years with Atlantic Ocean samples collected for this study between New England and Bermuda (including the Sargasso Sea). The relatively low and constant PTM concentrations in Sargasso Sea surface waters suggested wind as a significant source of PTMs. A marked similarity was noted between the enrichment factors for both water and air PTM concentrations, but a simplistic vertical model indicated that the similarity may be accidental. The probability of in-situ generation of PTM-POC associations from dissolved forms suggest that atmospheric deposition was not significant for Ni, Cr, Cu, Zn, Pb, and Cd, but that for Al, Fe, and Mn surface layer concentrations were largely a function of atmospheric deposition. Over 90% of the Cu, Zn, Pb, and Cd was apparently associated with particulate organic matter. (Lynch-Wisconsin)
W78-02512

INSECTICIDE RESIDUES ON STREAM SEDIMENTS IN ONTARIO, CANADA,
Department of Agriculture, London (Ontario). Research Inst.
For primary bibliographic entry see Field 5A.
W78-02513

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5E.
W78-02537

POSSIBLE CONTAMINATION OF GROUND WATERS BY OIL-AND GAS-WELL DRILLING AND COMPLETION FLUIDS,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
A. G. Collins.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF 75051331, Price codes: A03 in paper copy, A01 in microfiche. May, 1975. 37 p, 9 fig, 8 tab, 8 ref.

Descriptors: *Groundwater, *Water pollution sources, *Drilling fluids, *Oil wells, Natural gas, Mud, Emulsions, Additives, Aquifers, Brines, Well casings, Drilling, Blowouts, *Groundwater pollution, Abandoned wells, Well cementing, Surface pits.

Drilling fluids or drilling muds are used in oil and gas well construction to remove drilled cuttings from the bottom of the hole and to maintain a hydrostatic pressure that counterbalances or exceeds formation pressures. A host of drilling mud additives are available to condition the fluid to meet the demands of a wide variety of drilling situations. The chemistry of both water-and oil-base muds poses a threat to potable water aquifers in the vicinity of a drilling site. Not only is direct contamination possible from drilling through fresh-water aquifers, but various other avenues for pollution exist, including mud and chemical spills on the surface, improper casing selection, faulty cementing jobs, improperly abandoned wells in the vicinity of the drilling sites, and blowouts. Oil field brines which are frequently used as drilling fluid make-up water are some of the most significant polluting constituents of muds. Rehabilitation of a mud-contaminated aquifer is possible in some cases, but is frequently difficult and costly. Extensive evaluation of the exact nature of the pollution and local hydrology is necessary before initiating a rehabilitation program. (Eberle-NWWA)
W78-02546

MONITORING GROUNDWATER QUALITY,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-02547

AIR AND WATER CONTAMINATION BY 3,4-BENZPYRENE FROM ROAD ABRASION, (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. fuer Hygiene und Arbeitsphysiologie.
For primary bibliographic entry see Field 5A.
W78-02562

THE SEASONAL DISTRIBUTION OR ORGANIC CARBON IN A LOUISIANA ESTUARY,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
G. Happ, J. G. Gosselink, and J. W. Day, Jr.
Estuarine and Coastal Marine Science, Vol 5, No 6, p 695-705, November 1977. 2 fig, 3 tab, 29 ref.

Descriptors: *Path of pollutants, *Estuaries, *Carbon, *Organic matter, *Louisiana, Chlorophyll, Biota, Biomass, Marine biology, Marshes, Salt marshes, Plankton, Vegetation, Surveys, Sampling, Seasonal, Analytical techniques, Chemical analysis, Tidal waters, Biology, *Organic carbon, *Barataria Bay(La).

Dissolved organic carbon (DOC), total organic carbon (TOC), and chlorophyll a (CHla) were measured monthly from November 1972 to November 1973 at stations in the upper, middle, and lower areas of Caminada and Barataria bays, Louisiana, and the Gulf of Mexico. The results were used as measures of the concentration and distribution of organic detritus in the coastal waters. There was a clear gradient of organic carbon from the estuary to the Gulf of Mexico. DOC was highest in water bodies within the marshes fringing the bay, averaging 6.7 + or - 0.2 mg/l. DOC decreased towards the middle and lower bay where the average levels were 5.8 + or - 0.2 mg/l and 4.7 + or - 0.2 mg/l, respectively. The average DOC for offshore Gulf water was 2.4 + or - 0.1 mg/l. Concentrations in the bay were highest in winter and lowest in the spring, while offshore concentrations were lowest in the winter increasing toward the fall. TOC closely followed DOC. The late winter-early spring peak probably represents the washing of dead organic matter from the marsh which accompanies heavy rains and high water levels. Chl a averaged 9.7 + or - 0.98 microgram/l in Caminada Bay, 9.3 + or - 0.65 microgram/l in Barataria Bay, and 7.6 + or - 0.8 microgram/l offshore. Seasonal peaks occurred in late January (20.6 microgram/l) and July (19.2 microgram/l) in the inshore waters. Low temperature and north and easterly winds of 8-16 km/h were positively correlated with DOC. The winds could have stirred up the bottom sediments, causing correlated with DOC. The winds could have stirred up the bottom sediments, causing release of interstitial DOC into the water column. New organic carbon flux from Barataria Bay to offshore Gulf waters was calculated to lie between the extremes of 25 and 5540 gC/sq m inshore water/year, with most probable values around 150 gC/sq m/year. (Sims-ISWS)
W78-02593

INVESTIGATIONS ON DISSOLVED URANIUM, SILICON AND ON PARTICULATE TRACE ELEMENTS IN ESTUARIES,
Physical Research Lab., Ahmedabad (India).
For primary bibliographic entry see Field 5A.
W78-02595

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 8, PESTICIDES INDUSTRY,
Radian Corp., Austin, TX.
F. I. Honea.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 225, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-023h, January 1977. 242 p, 30 fig, 19 tab, 7 ref, 5 append. Parsons, T. B., Ed. 1AB015ROAP 21AFH-025 68-02-1319, Task 34.

Descriptors: *Environmental effects, *Pesticides, Agricultural chemicals, Water pollution sources, Plant growth regulators, Soil contamination, Organic compounds, Chemistry, Industrial production, *Processes, Hormones.

A catalogue, developed to aid in defining the environmental impacts of U.S. industrial activity in pesticides, is presented. The pesticides industry is

considered to be that which produces organic chemicals used to control agricultural pests, to disinfect and condition soil, and to supply plant hormones. The inorganic chemicals, petroleum and creosote used as pesticides are excluded from discussion. The U.S. pesticides industry is discussed in 12 segments: simple and aromatic chlorinated hydrocarbons; diene-based; organophosphates; carbamates and thiocarbamates; triazines; anilides; ureas and uracils; nitrated hydrocarbons; other nitrogeneous; organoarsenicals and organometallics; microbial or natural derivates; and others. Thirteen chemical trees, 17 process flowsheets, and 37 process descriptions are used to describe industry activities. For each process description, available data are presented on input materials, operating parameters, utility requirements, and waste streams. Appendices contain related information on input materials, pesticide designations and producers, and 1972 pesticide production. (Wares-IPA)
W78-02615

ENVIRONMENTAL, HEALTH, AND CONTROL ASPECTS OF COAL CONVERSION: AN INFORMATION OVERVIEW: VOLUMES 1 AND 2.
Oak Ridge National Lab., Oak Ridge, TN.
For primary bibliographic entry see Field 5C.
W78-02622

A RATIONALE FOR EVALUATING THERMALLY INDUCED BIOLOGICAL EFFECTS DUE TO ONCE-THROUGH COOLING SYSTEMS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-02647

OHIO EPA WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Ohio State Environmental Protection Agency, Bowling Green. Northwest District Office.
For primary bibliographic entry see Field 5G.
W78-02649

THE PAST, PRESENT, AND FUTURE OF THE BIOSPHERE,
For primary bibliographic entry see Field 2B.
W78-02654

ENVIRONMENTAL CONTAMINATION FROM TRACE ELEMENTS IN COAL PREPARATION WASTES. A LITERATURE REVIEW AND ASSESSMENT,
Los Alamos Scientific Lab., NM.
E. M. Wewerka, J. M. Williams, P. L. Wanek, and J. D. Olsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 339, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/7-76-007, ERDA LA-6600MS, August 1976. 69 p, 6 fig, 34 tab, 197 ref. EHB527, EPA/ERDA IAG-D5-E681.

Descriptors: *Coals, Coal mine wastes, *Trace elements, Environmental effects, Toxicity, Chemistry, Water pollution, Weathering, Leaching, Burning, Air pollution, Iron, Aluminum, Cobalt, Nickel, Manganese, Zinc, Degradation(Decomposition), Assessments, Pollution abatement, Chemical reactions, *Contaminants, Literature review, Coal preparation, Pollution sources.

A literature review and assessment project was carried out to collect and evaluate the available information on the chemistry and behavior of trace elements in coal processing wastes in order to assess the potential for environmental contamination from the trace elements in these wastes. Although only limited attention has been given previously to the chemistry of trace elements in coal waste materials, most of the growing body of knowledge concerning trace elements and minerals in raw coals can be applied directly to coal wastes. The consensus from analytical studies is that nearly every naturally occurring element is likely to be present in coal and coal refuse. The fate of these during coal preparation is poorly defined; however, large concentrations of trace elements are discarded in the washing refuse. Toxic or harmful quantities of elements, such as iron, aluminum, manganese, cobalt, nickel, and zinc, are released into the environment in the drainage from coal mineral wastes, but, in general, the behavior of trace elements during refuse weathering, leaching, and burning is not well understood. Although the literature acknowledges mineral and inorganic matter in coal wastes as a major contributor to both air and water pollution, a comprehensive assessment of the full potential for environmental contamination from the trace elements in coal preparation wastes cannot be made without the benefit of further specific applied research. (Wares-IPA)
W78-02655

GROUND-WATER CONTAMINATION: PROBLEMS AND REMEDIAL ACTIONS,
Illinois State Geological Survey, Urbana.
D. E. Lindorff, and K. Cartwright.
Environmental Geology Notes, No. 81, May 1977. 58 p, 2 fig, 3 tab, 75 ref, 1 append.

Descriptors: *Water pollution, *Groundwater, *Water pollution control, *United States, *Illinois, Wastes, Water pollution sources, Remedies, Pollutants, Mine wastes, Pollutant identification, Leachate, Groundwater movement, Landfills, Administration, Management, Administrative agencies, Decision making, Water treatment, Industrial wastes, On-site investigations, Organic wastes.

Case histories from 27 states of 116 groundwater contamination incidents reveal that remedial action is usually complex, time consuming, and expensive. Quick recognition of and response to an emergency involving groundwater are essential to minimize the spread of contamination and to make only minor remedial action necessary. However, the hydrogeologic setting and the pollution hazard at the specific locality should be assessed before corrective action is taken. The remedies most frequently used to renovate the subsurface environment include pumping and treating groundwater, removing soil, draining away groundwater via trenches, and removing the source of contamination. A combination of these techniques also has been used. Existing emergency strategies, however, are designed for coping with spills affecting surface water. No formal programs have been developed for dealing specifically with contamination of land or groundwater. Each incident has been handled as a separate problem. In Illinois, many resources are available for handling emergency pollution problems, but they are scattered among a number of state agencies. Guidelines for strategies that consider the hydrogeologic framework and administrative structure of Illinois were presented. A committee or task force should define the scope of the problem and develop a formal procedure for dealing with various kinds of land and ground-water pollution emergencies. (Humphreys-ISWS)
W78-02675

SILVER IN SOILS, STREAM SEDIMENTS, WATERS, AND VEGETATION NEAR A SILVER MINE AND TREATMENT PLANT AT MARATOTO, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry, Biochemistry and Biophysics.
N. I. Ward, R. R. Brooks, and E. Roberts.
Environmental Pollution, Vol. 13, p 269-280, 1977. 4 fig, 3 tab, 15 ref.

Descriptors: *Metals, *Mining, *Mine wastes, *Treatment facilities, Soil properties, Water quality, Water pollution, Sediments, Streams, Pastures, Plant physiology, Metabolism, Fallout, Water pollution sources, Environmental effects, Distribution, Vegetation, Mode of Action, *Silver, New Zealand, Maratoto.

Silver is soils showed elevated levels near the treatment plant (due to aerial fallout), and also in natural vegetation growing over the ore deposits. Pasture soils showed silver contamination derived partly from deposition from ore trucks and partly from flooding by mineralized stream sediments. Silver in pasture species reflected the same pattern. Silver levels in leaves and trunks of Beilschmiedia tawa showed distinctly different mechanisms of uptake from aerial fall-out and natural uptake by root systems. The silver content of stream waters and stream sediments, though anomalous near the deposits and treatment plant, showed a progressive decrease with increasing distance from the source. (Klein)
W78-02700

5C. Effects Of Pollution

BIOLOGICALLY INITIATED AUTO-CATALYTIC MERCURY CONVERSION AND ITS EFFECT ON ELEMENTAL MOBILITY,
Ohio State Univ., Columbus. Dept. of Microbiology.
R. M. Pfister.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 648, Price codes: A04 in paper copy, A01 in microfiche. Ohio State University, Water Resources Center, Completion Report, April 1977. 61 p, 13 fig, 64 ref. OWRT A-042-OHIO(1).

Descriptors: *Heavy metals, Model studies, *Microorganisms, Translocation, Food chains, Aquatic populations, Sediments, Mercury, Path of pollutants, Water pollution effects, Mercury concentration, Catalytic mercury conversion.

Mercury, sometimes called quick silver, has been found in abundant quantities in various locations in the environment. An artificially induced mercury burden in the water column (due to accidental spillage) is particle associated. Whether these particles are organic or inorganic, the load carried appears related to their density. An experimental lake was established with a constant inflow and outflow and translocation of mercury in the sediments indicated an ever increasing number of microorganisms capable of methylation. This biologically initiated catalytic conversion reached equilibrium while higher organisms (fish) were still accumulating mercury. Results indicated that mercury translocation mediated via organic particulates in the model was a surface related phenomenon. Organisms (e.g. snails) feeding on surface material high in mercury pick up mercury at an increased rate. This material was primarily biologic in nature and consisted of an algal mass with many protozoa.
W78-02201

BIOLOGICAL AND WATER QUALITY EFFECTS OF WHOLE LAKE MIXING,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5G.
W78-02203

ENVIRONMENTAL POLLUTION BY HEAVY METALS,
J. Cook.
International Journal of Environmental Studies, Vol 9, No 4, p. 253-266, 1977. 2 fig, 3 tab.

Descriptors: *Heavy metals, *Environmental effects, Cadmium, Mercury, Lead, Effluents, Industrial wastes, Pollution abatement, Strontium radioisotpoes, Radioactivity, Metals, Waste treatment policy(United Kingdom).

A paper describing environmental pollution by heavy metals such as cadmium, lead, and mercury, covers comparative effects on the environment of radioactive and nonradioactive metals, describes health hazards involved in heavy metals pollution, and discusses ways to reduce pollution through treatment and recycling of industrial wastes and effluents. In addition to well-documented environmental effects of radioactive elements such as strontium-90, cesium-137, iodine-131 and barium-140, a serious and growing problem is seen in the deposition of nonradioactive heavy metals in many niches of the environment. Nonradioactive heavy metals contaminate the atmosphere, bodies of water, and land via industrial wastes. It is now recognized that many lower organisms take up and concentrate heavy metals and other pollutants. Cadmium may have more lethal possibilities than any other metal. It tends to occur as a pollutant in the vicinity of zinc smelters, where it may comprise 20% of the distillate from dust in the furnace receivers. The yearly average value of cadmium in air in the U.S. is 0.002 micrograms/sq m. Lead is released into the environment at an annual rate of about 210,000 tons. The major source of human lead intake is food (100-500 micrograms per day); about 90% of this amount is excreted. Burning fossil fuels injects about 5k000 tons of mercury each year into the atmosphere. Most of this ends up in the sea, which reeives a similar amount from industrial wastes. (Lynch-Wisconsin)
W78-02215

SOME ECONOMIC AND ENVIRONMENTAL EFFECTS OF HIGHWAYS IN JAPAN AND THE UNITED STATES,
Federal Highway Administration, Washington, D.C. Transportation Economics Div.
F. I. Thiel, and A. Kane.
Traffic Quarterly, Vol. 31, No. 3, p. 399-419, July 1977. 7 fig, 1 tab.

Descriptors: *Environmental effects, *Highway effects, *United States, *Highways, *Planning, *Land use, *Japan, *Citizen participation, Noise barrier walls, Vehicles.

A study of economic and environmental effects of highways in Japan and the United States emphasizes differences rather than similarities. Reviewed in detail are Japanese toll structures, the planning process for expressways, study approaches, roadway design, types of vehicles using the highways, and special vehicle equipment. Citizen participation in the planning process is compared, noting that the Japanese are hesitant of drawing in citizens at an early stage in the planning process because of resulting delays. Japan also lacks a technical citizen participation process permitting evaluation of various alternatives. Deleterious environmental effects of highways in Japan appear responsive to problems which may preclude legalistic remedies. Similarities are noted in study approaches used in the two countries and solutions to development problems are outlined. Both countries need better land use controls along highways and better monetary quantification of the accessibility and proximity effects of highways. (Coyle-Wisconsin)
W78-02221

INTERACTION OF SOLUBLE PHOSPHATE WITH ALUMINUM HYDROXIDE IN LAKES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
M. G. Browman, R. F. Harris, D. E. Armstrong, and G. Chesters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 571, Price codes: A05 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-05, June 1977. 79 p, 14 fig, 12 tab, 34 ref. OWRT B-088-WIS(3), 14-31-0001-4140.

Descriptors: *Phosphorus, Lakes, *Eutrophication, *Algae, *Chemicals, *Metals, Nutrients, *Aluminum hydroxide, Productivity, Water pollution effects, Sediments, *Snake Lake(Wisc), Pickerel Lake(Wisc), *Lake renewal.

Criteria were defined for predicting the short and long term potential effectiveness of aluminum hydroxide treatment for reversing lake eutrophication by reducing the phosphorus status of the lake photic zone to levels limiting algal productivity. The basic approach was an examination of the interactions of added aluminum with various phosphorus compartments in the lake as related to the direct removal of dissolved inorganic phosphorus in the photic zone from other forms of phosphorus and other zones of the lake. Aspects of aluminum treatment examined experimentally were the ability of an aluminum hydroxide floc to (1) remove dissolved inorganic phosphorus and other forms of phosphorus from water, (2) maintain its inorganic phosphorus-sorptive capacity upon aging in different lake environments, and (3) retard movement of inorganic phosphorus from anaerobic sediments to the overlying water. These aspects were examined individually and then in an integrated fashion in sediment-water columns. Success of aluminum hydroxide treatment is good provided (1) external sources of phosphorus are relatively small or are reduced concurrent with aluminum treatment, (2) particulate phosphorus and 'dissolved' organic phosphorus levels are not high at the time of treatment, (3) the aluminum dosage is increased where local epilimnetic and hypolimnetic inorganic phosphorus concentrations demand and (4) the aluminum treatment is increased and a fairly even distribution of floc on the top sediment is achieved eliminating 'bare' spots on the sediments. (Diamantis-Wisconsin)
W78-02222

AVAILABILITY AND CONCENTRATION OF POLLUTANTS FROM AMERICAN FALLS RESERVOIR SEDIMENTS TO FORAGE AND PREDACEOUS FISHES,
Idaho State Univ., Pocatello.
For primary bibliographic entry see Field 5B.
W78-02265

THE LAKE TROUT OF TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 8I.
W78-02269

ECOLOGY OF MYSIS RELICTA IN TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 8I.
W78-02270

FOREWORD, OZONE SYMPOSIUM,
Air Products and Chemicals, Inc., Allentown, PA.
For primary bibliographic entry see Field 5D.
W78-02329

INVESTIGATION OF MUTAGENIC EFFECTS OF PRODUCTS OF OZONATION REACTIONS IN WATER,
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W78-02378

DOES POLLUTION ABATEMENT IMPROVE AQUATIC LIFE,
Normandeau Associates, Bedford, NH.
For primary bibliographic entry see Field 5B.
W78-02390

AGAT SEWAGE TREATMENT PLANT: IMPACT OF SECONDARY TREATED EFFLUENT ON GUAM COASTAL WATERS,
Guam Univ., Agana. Water Resources Research Center.
R. T. Tsuda, and D. A. Grosenbaugh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 857, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 3, October 1977. 39 p. 4 fig, 8 tab, 15 ref. OWRT A-003-GUAM(1), 14-31-0001-5054.

Descriptors: *Sewage effluents, *Phosphates, *Coliform, Biota, Algae, Fish, Coral, Zooplankton, Nitrates, Waste water treatment, *Treatment facilities, *Water pollution effects, Nutrients, *Guam, Coastal waters.

This study characterizes the effluent and provides information on the impact of a secondarily treated sewage effluent on Guam coastal waters and reef biota. Nutrient levels of effluent are high, with reactive phosphate varying between 170 and 400 microgram-at./l and nitrate-nitrogen ranging from 10 to 530 microgram-at./l. Forty-six of 67 fecal coliform samples obtained from the effluent were less than 200 counts per 100 ml. Chlorine levels in the treatment tank varied between 0.2 and 4.0 ppm. The effluent discharged in 2.4 m of water rises immediately to the surface. Surface phosphate levels are reduced to one third of that originating at the point of discharge. Upon reaching the surface, the fate of the effluent depends on wind, wave, and current conditions existing at any given time. The additional nutrient input from the sewage to the marine environment has little effect on the benthic biotas, since the nutrients are carried directly to the surface. Zooplankton, per unit volume displaced, are consistently higher in the control sample obtained from an area south of the outfall just off the reef platform.
W78-02398

A COMPARISON OF THE EFFECTS OF CHELATED AND NON-CHELATED CADMIUM ON THE SPECIFIC GROWTH RATE OF SELENASTRUM CAPRICORNUTUM,
Oklahoma State Univ., Stillwater. Reservoir Research Center.
D. Parrish, and S. L. Burks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 775, Price codes: A02 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1977). 13 p, 1 tab, 17 ref. OWRT A-073-OKLA(1).

Descriptors: *Bioassay, *Cadmium, *Chelation, Chlorophyta, *Growth rates, *Phytotoxicity, Water pollution effects, Aquatic algae, *Algal assay, Bioaccumulation, EDTA, *Selenastrum capricornutum.

A modification of the U.S. Environmental Protection Agency's Algal Assay Procedure was used to determine the effect of chelation on cadmium toxicity to Selenastrum capricornutum Printz. Specific growth rates and bioaccumulation were measured. No differences in growth rate compared to the controls occurred in cultures treated with 2 to 10 micro-g/l cadmium. No growth was observed in cultures treated with 0.2 to 5.0 mg/l cadmium. Bioaccumulation of 2 to 20 micro-g/l cadmium in 60ml cultures in five days was below the detection limit of flame atomic absorption for cadmium.
W78-02399

DETECTION OF A POTENTIAL HEALTH HAZARD IN RECREATIONAL AND OTHER SURFACE WATERS,
Nebraska Univ. at Omaha. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-02405

FACTORS AFFECTING THE AVAILABILITY OF SEDIMENT-BOUND CADMIUM TO THE ESTUARINE, DEPOSIT-FEEDING CLAM, MACOMA BALTHICA,
Geological Survey, Menlo Park, CA. Water Resources Div.
S. N. Luoma, and E. A. Jenne.
In: Proceedings of the Fourth National Symposium on Radioecology, held at Corvallis, Oregon, May 12-13, 1975; Special Publication No 1, Ecological Society of America, p 283-290, 1976. 4 fig, 2 tab, 20 ref.

Descriptors: *Cadmium, *Bottom sediments, *Food chains, *Clams, Estuarine environment, Benthos, Sampling, Analytical techniques, Evaluation, Water pollution effects, *San Francisco Bay(Calif).

The uptake of Cd-109 by the deposit-feeding clam, Macoma balthica, varied significantly among several types of sediments. To directly estimate the amount of Cd-109 taken up through ingestion of sediment, experimental techniques were developed for determining the gut content of labeled sediment and the contribution of solute Cd-109 to the total body burden of the nuclide in the clams. No detectable uptake of Cd-109 occurred through ingestion of either labeled organic detritus of particulate hydrous-iron oxide which had been coprecipitated with the nuclide and coated with organic material. Detectable uptake of Cd-109 was observed when clams were exposed to either hydrous-iron oxide particulates which lacked the organic coating or San Francisco Bay sediment labeled with the nuclide. Uptake of Cd-109 through ingestion of labeled sediment was relatively inefficient for all sediment types. Apparent steady-state concentrations of Cd-109 in the clam were never greater than 10% of the concentration of the nuclide in any type of sediment studied. The results from several preliminary chemical extractions of sediments indicate that the amount of Cd-109 removed by selected extractants does not correlate in a simple manner with the bioavailability of this trace metal. (Woodard-USGS)
W78-02427

EVALUATION OF CHEMICAL, BIOLOGICAL, AND PHYSICAL CONDITIONS IN THE WINTER HAVEN CHAIN OF LAKES, FLORIDA, MARCH-JUNE 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-02435

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972 - SUPPLEMENT,
Geological Survey, Anchorage, AK. Water Resources Div.
J. W. Nauman, and D. R. Kernodle.
Open-file report 77-634 (basic data), 1977. 55 p, 1 fig, 4 tab, 15 ref.

Descriptors: *Water quality, *Benthic fauna, *Invertebrates, *Alaska, *Pipelines, Oil, Surface waters, Data collections, Aquatic life, Systematics, Classification, Varieties, Baseline studies, *Trans-Alaska pipeline corridor, Aquatic organisms, Taxa.

This report is a supplement to earlier preconstruction studies of benthic invertebrates and water quality at selected sites along the trans-Alaska pipeline corridor. Some of the problems which arose during the course of data collection and analysis are discussed. Benthic invertebrate abundance and community-structure data are presented for 20 sites along the trans-Alaska pipeline for the period September 1970 to September 1972. In addition, a list of invertebrate taxa identified to various taxonomic levels is given for 42 sites along the pipeline. (See also W74-08369) (Woodard-USGS)
W78-02437

CONCENTRATION FACTORS AND TRANSPORT MODELS FOR RADIONUCLIDES IN AQUATIC ENVIRONMENTS. A LITERATURE REPORT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
R. G. Patzer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 097, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-054, May 1976. 56 p, 1 fig, 10 tab, 72 ref.

Descriptors: *Aquatic environment, *Water pollution effects, *Environmental control, Freshwater, Invertebrates, Fish, Food chains, Human population, Risks, Estimating, Mathematical models, Monitoring, Effects, Bibliographies, *Radionuclides, Literature review, Biological concentration, Aquatic organisms, Marine environment, Waste discharge, Order of magnitude.

The relative risks to man from radionuclides released to the environment depend heavily on their accumulation or concentration in aquatic organisms. The organisms which accumulate those radionuclides present in the environment may be useful as indicators for environmental monitoring purposes. In addition, these organisms may be directly in food chain pathways to humans. Herein, literature is reviewed and summarized in regard to biological concentration of radionuclides in freshwater and marine environments. Concentration factors for elements found in organisms are tabulated for plants, invertebrates, and fish in marine and freshwater environs. Literature is also reviewed on models developed to calculate the possible radiatin dose delivered to humans from radionuclides released into aquatic environments. The model approaches summarized range from simple generalized forms which, at best, give order of magnitude estimates to detailed models for a specific area which may be used to guide waste discharge practices. (Bell-Cornell)
W78-02452

EFFECT OF WASTEWATER SLUDGE ON SOIL MOISTURE RELATIONSHIPS AND SURFACE,
Wisconsin Univ.-Madison. Dept. of Soil Science.
K. A. Kelling, A. E. Peterson, and L. M. Walsh.
Journal Water Pollution Control Federation, Vol 49, No 9, p 1698-1703, July 1977. 2 fig, 1 tab, 16 ref. UW 1602 1921.

Descriptors: *Infiltration rates, *Runoff, *Soil moisture, Sludge, Moisture content, Phosphorus, Nitrogen, Wisconsin, Sludge disposal, Soils, *Liquid sludge.

Applications of digested waste water sludge can favorably affect soil moisture holding capacity, aggregation, porosity, bulk density and permeability. Productivity of both coarse testured and fine testured soils can be increased. This study was undertaken to clarify the effect of liquid sludge on soil moisture content and infiltration, and the relative sediment, nitrogen and phosphorus content of runoff as influenced by rate of sludge application and time after treatment. Field applications of liquid digested waste at rates up to 20 cm (60 metric tons dry solids/ha) significantly increased soil moisture and, under certain circumstances, infiltration. Sludge applications influenced the soil moisture regime for at least two years. Measurements with a spinkling infiltrometer showed that surface runoff from sludge treated areas contained increased amounts of inorganic nitrogen whereas seiment load and organic nitrogen in the rnoff were somewhat reduced by the sludge applications probably because of increased infiltration and improved aggregation. Significantly more dissolved ortho phosphorus and total phosphorus were contained in the runoff water from the sludge treated areas. (Coyle-Wisconsin)
W78-02454

SEASONAL PATTERNS IN ACIDITY OF PRECIPITATION AND THEIR IMPLICATIONS FOR FOREST STREAM ECOSYSTEMS,
Forest Service (USDA), Durham, NH. Northeastern Forest Experiment Station.
J. W. Hornbeck, G. E. Likens, and J. S. Eaton.
Water, Air, and Soil Pollution, Vol 7, No 3, p 355-365, March 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Acidity, *Hydrogen ion concentration, *Streamflow, New York, Pennsylvania, New Hampshire, Seasonal, *Hubbard Brook Experimental Forest(NH).

Data collected since 1965 at eight stations in New York and Pennsylvania and one in central New Hampshire show that precipitation is mostly acidic in the growing season--May through September--and least acidic in winter-December through February. The New York and Pennsylvania stations are part of a U.S. Geological Survey (USGS) network. The Hubbard Brook Experimental Forest station in New Hampshire is operated by the U.S. Forest Service. USGS stations were used only to determine the existence and extent of seasonal patterns in acidity. Hubbard Brook was studied in greater detail for causes and implications of seasonal patterns. Precipitation at the Hubbard station is decidely more acid in the summer, although the hydrogen ion concentration is lowered as precipitation passes through the forest canopy. Acidity of precipitation in spring and autumn is intermediate between summer and winter values. In the absence of a leaf canopy or snowpack, the acidity of precipitation entering the soil during spring and autumn may be higher. However the streamflow acidity shows little effect, remaining fairly constant year round. (Coyle-Wisconsin)
W78-02455

EFFECTS OF ACID MINE WASTES ON AQUATIC ECOSYSTEMS,
Southern Illinois Univ. at Carbondale. Dept. of Botany.
J. D. Parsons.
Water, Air, and Soil Pollution, Vol 7, No 3, p 333-354, March, 1977. 16 fig, 44 ref.

Descriptors: *Strip mine lakes, *Strip mines, *Acid mine water, *Acidic water, *Water pollution effects, *Water quality, *Persistence, Fish, Plankton, Benthos, Missouri, Environmental effects, Artificial lakes, *Cedar Creek Basin, *Long-term environmental effects.

The Cedar Creek Basin in central Missouri was studied during a 26-month period ending August 1954 to observe effects of continuous and periodic acid effluent flows on aquatic communities. Acid strip mine effluent was toxic to many aquatic organisms. In areas of Cedar Creek subjected to continuous acid flow, planktonic and benthic species had become adapted to the severe conditions and varied in abundance and diversity. No fishes were observed in the continuous acid effluents areas. Downstream where periodic mineral acid conditions changed drastically during an excessive effluent flow, planktonic and benthic communities had high diversity but low density. Fish populations were variable in this stream reach. The chemical basis of water quality variability was shown to be time-related and statistically-related to the aquatic communities. A cursory series of aerial and ground observations made ten years later noted chevron red lakes were still reddish-black and acid, while the single parallel lake was natural in appearance and supported submergent vegetation. (Coyle-Wisconsin)
W78-02456

ENVIRONMENTAL PHOSPHORUS HANDBOOK.
For primary bibliographic entry see Field 5B.
W78-02457

THE ACUTE TOXICITY OF 47 INDUSTRIAL CHEMICALS TO FRESH AND SALTWATER FISHES,
Battelle Pacific Northwest Labs., Richland, WA. Water and Waste Management Section.
G. W. Dawson, A. L. Jennings, D. Drozdowski, and E. Rider.
Journal of Hazardous Materials, Vol 1, No 4, p 303-318, March 1977. 4 tab, 16 ref.

Descriptors: *Fish, *Toxicity, *Chemicals, *Industrial production, Water pollution, Pollutants, Water quality standards, Sunfishes, Regulation, Federal Water Pollution Control Act, Fishkill, Federal Water Pollution Control Act Amendments of 1972(PL 92-500), Bluegill sunfish, Lepomis macrochirus, Tidewater silversides, Menidia beryllina.

Forty-seven industrial chemicals were tested for toxicity to freshwater fish (bluegill, sunfish, Lepomis macrochirus) and saltwater fish (tidewater silversides, Menidia beryllina) to assist the EPA in designating hazardous substances under the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). The proposed median lethal concentration (50% mortality after 96 hours, or 96-hour LC50) for aquatic animals is 500 mg/l. Twenty-nine of the substances clearly qualify as hazardous under the proposed criteria. Three additional substances were toxic under 500 ppm only to saltwater fish, but still qualify as hazardous. The remaining 15 substances were well above the proposed criteria. Tables present the test results. All fish were held in all-glass 30-gal aquaria, and tested in 5-gal aquaria. Potable well water was used in the freshwater tests; pH was 7.6-7.9, and hardness was 55 mg/l (as CaCO3). If, after addition of the toxicant, dissolved oxygen was being depleted rapidly, aeration was initiated. For saltwater tests a synthetic sea salt mix was added to the well water until the specific gravity was 1.018. No anomalous results were evident between the two species for any substance. The greatest variation was for tetramethyllead in which the freshwater LC50 value was 6.2 times greater than that for saltwater. (Lynch-Wisconsin)
W78-02463

IMPACTS OF MAN'S ACTIVITIES ON THE CHEMICAL COMPOSITION IN THE SEDIMENTS OF LAKES ONTARIO, ERIE AND HURON,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-02464

A METHOD OF STUDYING PHOTOSYNTHETIC CAPACITIES IN UNICELLULAR ALGAE BASED ON IN VIVO CHLOROPHYLL FLUORESCENCE,
Umea Univ. (Sweden). Dept. of Plant Physiology.
For primary bibliographic entry see Field 5A.
W78-02467

THE PROBLEM OF THE SANITARY PROGNOSIS OF THE WATER QUALITY OF THE NIZHNEKAMSK RESERVOIR, (IN RUSSIAN),
Kazan Inst. of Porsgraduate Medicine (USSR).
L. N. Krepkogorskii, Y. N. Pochkin, N. B. Sorokina, and T. P. Devyatkova.
Gig Sanit 10, p 19-22, 1976.

Descriptors: *Water quality, Reservoirs, Bioindicators, Water analysis, Pollutant identification, *USSR(Nizhnekamsk Reservoir).

On the basis of analyses of the indices of the Nizhnekamsk reservoir (Russian SFSR, USSR), the hygienic significance of its water composition prognosis was substantiated with a usage of 95% of the amount supplied. The filed investigations were carried out in the rainiest years.--Copyright 1978, Biological Abstracts, Inc.
W78-02468

MICROBIOLOGICAL STUDIES OF THE WANDA LAKE (ANTARCTICA), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Mikrobiologii.
A. E. Kriss, I. N. Mitskevich, E. P. Rozanova, and L. K. Osnitskaya.
Mikrobiologiya 45(6), p 1075-1081, 1976.

Descriptors: *Microbiology, *Antarctica, *Wanda Lake(Antarctica), Lakes, Isolation, Bacillus, Chromobacterium, Mycobacterium, Photosynthesis, Pseudomonas, Salinity, Saprophytes, Sulfates, Yeast.

The deep-water (68 m) Wanda lake in Antarctica has 3 characteristics: a relatively high temperature in the bottom layer, elevated salinity and the presence of HzS. Only several (less often, dozens) saprophytic microorganisms per 40 ml of water are encountered in the lake. The total number of bacteria varies from 6 x 10 to the 3rd power to 172 x 10 to the 3rd power cell/ml. The highest content of the total bacterial population, and saprophytes, is found in intermediate layers, 30 and 40- 50 m deep, respectively. Microbial strains isolated from water and ooze belong to the genera Pseudomonas, Chromobacterium, Bacillus, and Mycobacterium. Yeast organisms were also found. Sulfate reducing bacteria could not be detected only at 1 station in ooze of the lake while thionic bacteria could not be determined at all. Photosynthetic bacteria were isolated from ooze at all 4 stations.--Copyright 1978, Biological Abstracts, Inc.
W78-02469

THE RATE OF GROWTH AND PRODUCTION OF BACTERIOPLANKTON IN THE VOLGA, (IN RUSSIAN),
Gorkii State Univ. (USSR).
T. N. Tarasova.
Mikrobiologiya 45(6), p 1082-1086, 1976.

Descriptors: *Growth rates, *Bacteria, Plankton, *Bacterioplankton, USSR(Volga River), Biomass, Seasonal.

The time of generation and production of bacteria were assayed in the Volga river (USSR). The time of generation of bacterioplankton was about 35.6-62.1 h/season during different years. The mean daily production of bacteria during a season was 30-50% of the biomass. The duration of vial exposition for estimating the time of generation and production was determined experimentally for conditions of the Volga.--Copyright 1978, Biological Abstracts, Inc.
W78-02470

EFFECT OF SOME POLLUTANTS ON THE FILTRATION RATE OF MYTILUS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. D. Abel.
Marine Pollution Bulletin, Vol. 7, No. 12, p 228-231, December 1976. 2 fig, 1 tab, 16 ref.

Descriptors: *Water pollution effects, *Mussels, *Feeding rates, Respiration, Laboratory tests, Analytical techniques, *Copper, *Zinc, *Mercury, *Sulfides, Toxicity, Estuarine environments, *Feeding filtration rates(Mussels), *Cyanide, *Thiocyanate.

Effects of six pollutants (copper, zinc, mercury, cyanide, thiocyanate and sulfide, on the feeding filtration rate of the mussel Mytilus edulis were studied and their effective concentrations compared with results of conventional, but more time-consuming lethal toxicity tests. Lethal toxicity tests showed that the concentrations of copper lethal to Mytilus edulis were: 7 day LC50 0.2 mg/l, 9 day LC50 0.3 mg/l, and 7 day LC50 0.3 mg/l. Results of the filtration rate measurements (96 h LC 0.28 mg/l and 7 day LC 0.26 mg/l) stand in agreement with results of the lethal toxicity tests. According to both techniques, pollutants follow the expected general pattern of toxic behaviour--cyanide being more toxic than thiocyanate, and among the metals tested, mercury being the most and zinc the least toxic. Comparison of results of the lethal toxicity and filtration rate measurements suggest that the latter gives reliable indication of toxic effect, and that as a technique for testing pollutant effectiveness it is comparable or superior in sensitivity to the more time-consuming and elaborate procedure. (Harris-Wisconsin)
W78-02471

BASELINE LEVELS OF BENZO(A)PYRENE IN SOUTHERN CALIFORNIA MUSSELS,
British Columbia Univ., Vancouver. Dept. of Zoology.
B. P. Dunn, and D. R. Young.
Marine Pollution Bulletin, Vol. 7, No. 12, p 231-233, December 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Baseline studies, *Mussels, *Bioindicators, California, Human pathology, Human diseases, Oil spills, Organic compounds, Sea water, Pacific Ocean, Oil pollution, Water pollution sources, Water pollution effects, *Benzo(a)pyrene, Carcinogens, Mytilus edulis, Mytilus californianus, Chlorinated hydrocarbons.

A survey of levels of benzo(a)pyrene in mussels from 19 mainland and six island stations situated in the Southern California Bight was conducted to establish baseline values for the contamination of coastal waters by this carciogenic substance originating in either natural or artificial petreoluem oil accumulations. The mussel Mytilus californianus was preferred for the survey. However, where unobtainable, Mytilus edulis was sampled. Generally, mussels were obtained from locations at least 1 km from the nearest pier. In some cases, however, only mussels growing directly on pilings could be obtained. The survey showed little evidence of contamination. At both mainland and island stations, levels of contamination in mussels taken from locations of at least 1 km from piers was at or near the detection limit of 0.1 micrograms/kg. Mussels growing on pilings and near large harbors had elevated (B(a)P) levels. The highest (B(a)P) level was found in mussels growing on a neo-creosoted subsrate on the San Gabriel river breakwater (2.3 micrograms/kg). The next highest (B(a)P) level (1.4 microgram/kg) was found near the western end of the San Pedro harbor breakwater, with mussels from the adjacent stations also showing elevated (B(a)P) levels (0.5 micrograms/kg, station 10; and 0.6 microgram/kg, station 12). Mytilus californianus tended to show lower (B(a)P) levels than Mytilus edulis. (Harris-Wisconsin)
W78-02472

THE FATE OF STORM WATER AND STORMWATER POLLUTION IN THE PARRAMATTA ESTUARY, SYDNEY,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 5B.
W78-02473

RATES OF DIRECT PHOTOLYSIS IN AQUATIC ENVIRONMENT,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5A.
W78-02474

EFFECT OF FERTILIZERS ON THE NUMBER OF BACTERIA INVOLVED IN THE NITROGEN CYCLE IN POND WATER OF THE ASTRAKHAN OBLAST, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
K. V. Gorbunov, and A. F. Sokolskii.
Mikrobiologiya 45(5), p 888-893, 1976.

Descriptors: *Fertilizers, *Bacteria, *Nitrogen cycle, Phosphorus, Ponds, Reeds, Spawning, *USSR(Astrakhan Oblast).

Reed intensification affects the distribution of bacteria involved in turnover of N in pond water. Green fertilizers (reed) stimulate the number of N-fixing bacteria and the number and activity of nitrifying bacteria to a higher degree than N and P fertilizers. Reed is recommended as the main means for spawning pond intensification in the Astrakhan Region, USSR.--Copyright 1978, Biological Abstracts, Inc.
W78-02475

STUDIES ON PRIMARY PRODUCTION IN THE GREEN GIRDLE OF NEUSIEDLER LAKE: I. CAREX RIPARIA CURT, (IN GERMAN),
Vienna Univ. (Austria). Pflanzenphysiologishches Inst.
R. Maier.
Pol Arch Hydrobiol 23(3), p 377-390, 1976.

Descriptors: *Primary productivity, Lakes, *Reeds, *Neusiedler Lake(Austria), Standing crops, Reed harvesting, Biomass, Caricetum-acutiformis-ripariae, Crops, Summer.

The primary production of C. riparia in a Caricetum acutiformis-ripariae association on Neusiedler Lake (Austria) was investigated via a harvesting method. C. riparia shows highest density in an area without inundation but of high wetness. In comparison with temporarily half-submerged Carices in inundation zones the plants of the wetland are smaller and have a lower fresh and dry weight (DW). The production of the sedge is higher where no industrial reed-harvesting takes place, and the maximum of measured standing crop is 400.0 g DW, with regularly harvested stands 168.3 g DW. The standing crop:underground biomass relation in the temporarily flooded area is about 70:30 (summer).--Copyright 1978, Biological Abstracts, Inc.
W78-02476

RECOVERY OF AQUATIC BACTERIAL POPULATIONS IN A STREAM AFTER CESSATION OF CHEMICAL POLLUTION,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 5G.
W78-02477

PHOSPHATE AND SILICATE GROWTH AND UPTAKE KINETICS OF THE DIATOMS ASTERIONELLA FORMOSA AND CYCLOTELLA MENEGHINIANA IN BATCH AND SEMICONTINUOUS CULTURE,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
D. Tilman, and S. S. Kilham.
Journal of Phycology, Vol. 12, No. 4, p. 375-383, 1976. 6 fig, 2 tab, 25 ref. NSF GB-41315.

Descriptors: *Diatoms, *Phosphates, *Silicates, *Kinetics, Phytoplankton, Nutrients, Model studies, Analytical techniques, Plant growth, Growth rates, Adsorption, *Asterionella formosa, *Cyclotella meneghiniana.

To test the hypothesis that interspecific competition for nutrients determines phytoplankton species composition and seasonal succession in lakes, it is necessary to have data on relationships between external nutrient concentration, nutrient supply rate, internal nutrient concentration, and growth rates. This paper reports phosphate and silicate nutrient kinetic information for two freshwater diatom species, Asterionella formosa and Cyclotella meneghiniana. Two experimental and theoretical approaches were used to determine if comparable results would be obtained. Short-term batch cultures were fit to the Monod growth model, and long-term seimcontinuous cultures and short-term uptake experiments were fit to the variable internal stores model. The qualitative results of the two methods agreed. For limiting phosphate experiments, A. formosa was better able to grow at low extracellular PO4-P concentrations than C. meneghiniana, and is almost one order of magnitude more efficient at using internal phosphate for growth. C. meneghiniana is more efficient at using intracellular silicate for growth than A. formosa. For short-term batch culture, the half saturation constant for SiO2-Si-limited growth for C. meneghiniana was less than for A. formosa. In nutrient uptake experiments, there was no significant differences between the two species in half saturation constants for either phosphate or silicate. (Lynch-Wisconsin)
W78-02478

EFFECTS OF ATHENS POLLUTION OUTFALLS ON MARINE FAUNA OF THE SARONIKOS GULF,
Durham Univ. (England). Dept. of Botany.
C. R. C. Sheppard.
International Journal of Environmental Studies, Vol. 11, No. 1, p. 39-43, 1977. 3 fig, 1 tab, 9 ref.

Descriptors: *Oil pollution, *Wastes, *Water pollution, Gulfs, International commissions, *Saronikos Gulf(Aegean Sea), *Athens(Greece).

The Saronikos Gulf, offshore of Athens, Greece in the Aegean Sea, receives a considerable load of untreated waste discharges from that city. Pollution in this gulf is the subject of a multidisciplinary study sponsored by Greece, the World Health Organization and the United Nations Development Program. A survey of 10 sublittoral Gulf sites shows a marked response by benthic fauna to the pollution greatly reduced community diversity, coupled with massive increases of certain pollution-tolerant, suspension feeding species indicates a stressed ecosystem in the north of the Gulf. Near the industrially-polluted regions a marded overall loss of species and diversity occurs. A few species appear to tolerate pollution and exploit it as a food source as is shown by the dominance and relative abundance of these animals. This seems to be the case also with phytoplankton and zooplankton. Selective and gross mortalities of marine species and state of anoxia which were previously confined to small areas appear to be spreading to large and more open parts of the Gulf. (Coyle-Wisconsin)
W78-02479

SOME EFFECTS OF NITROGEN-STARVATION OF NITROGEN AND CARBOHYDRATE METABOLISM IN ANKSTRODESMUS BRAUNII,
University Coll. of Swansea (Wales). Dept. of Botany and Microbiology.
C. R. Hipkin, and P. J. Syrett.
Planta, Vol. 133, No. 3, p 209-214, 1977. 3 fig, 35 ref.

Descriptors: *Photosynthesis, *Enzymes, *Algae, Protein, Chlorophyll, Water pollution effects, *Metabolism, Carbohydrates, *Ankistrodesmus braunii, *Nitrogen starvation.

Enzymic activities were measured in cell-free extracts from nitrogen-starved cultures of Ankistrodesmus braunii. Over a 10-hour period of nitrogen starvation, the activities of the enzymes nitrite reductase, glutamic dehydrogenase, glutamine synthetase and urea amidolyase were derepressed. Activities of the enzymes malate dehydrogenase and hexokinase remained more or less unchanged. In contrast, phytosynthetic capacity of the nitrogen starved cultures dropped rapidly. Accompanying the decline were losses in activities of ribulose dephosphate carboxylase and triose phosphate-dehydrogenase. Nitrogen starvation does not lead to a stable condition in such algae but instead induces rapid changes in the quality and quantity of cellular biochemicals, particularly enzymes. Protein turnover must be rapid under these conditions and perhaps intracellular proteinase activity increases in algae in response to nitrogen starvation. It is proposed that losses in photosynthetic enzyme activities are the principal cause of the initial losses in photosynthetic activity in nitrogen starved algae. (Coyle-Wisconsin)
W78-02482

THE COMBINED RELATIONSHIP OF TEMPERATURE AND MOLYBDENUM CONCENTRATION TO NITROGEN FIXATION BY ANABAENA CYLINDRICA,
Baylor Univ., Waco, TX. Inst. of Environmental Studies.
R. Jacobs, and O. Lind.
Microbial Ecology, Vol. 3, No. 3, p 205-217, 1977. 4 fig, 2 tab, 24 ref.

Descriptors: *Cyanophyta, *Nitrogen fixation, *Molybdenum, *Temperature, Eutrophication, Metabolism, *Anabaena cylindrica, *Acetylene reduction, Metabolic process.

Joint effects of growth and incubation temperature and molybdenum concentration on the nitrogen fixation rate of the blue-green alga Anabaena cylindrica is determined using the acetylene reduction technique. Nitrogen fixation response to increased molybdenum concentration varied among three growth temperatures--15C, 23C and 30C. The rate change pattern was similar within a growth temperature but increased overall in magnitude with the three incubation temperatures (also 15C, 23C and 30C). Maximum rate of nitrogen fixation occurred at 30C regardless of previous growth temperature. The minimum molybdenum concentration necessary to yield substantial acetylene reduction varied with growth temperature. At all three growth temperatures, increases in molybdenum concentration above the minimum effective contraction produced increases in acetylene reduction. However a higher molybdenum concentration inhibition of nitrogen fixation occurred. the response of Anabaena cylindrica may also extend to other genera of nitrogen fixing blue-green algae, since the nitrogenase system is characteristic of known nitrogen fixing species. (Coyle-Wisconsin)
W78-02483

RATES OF REMINERALIZATION AND ASSIMILATION OF UREA BY FRACTIONATED PLANKTON POPULATIONS IN COASTAL WATERS,
Queen's Univ., Belfast (Northern Ireland). Marine Biology Station.
G. Savidge, and H. T. Hutley.
Journal of Experimental Marine Biology and Ecology, Vol. 28, No. 1, p 1-16, January 1977. 5 fig, 6 tab, 22 ref.

Descriptors: *Ureas, *Nitrogen, *Sea water, Phytoplankton, Eutrophication, *Size fractionated, *Assimilation, *Remineralization, Strangford Lough(Northern Ireland).

The study considers rates of remineralization and assimilation of (14)C-labelled urea in the dark by size-fractionated populations of plankton from selected sites in the vicinity of Strangford Lough, a large tidal inlet on the east coast of Northern Ireland. Urea appears to be a substantial component of the nitrogen system in the water of the Lough. Plankton populations from three contrasting sites were collected and fractionated by differential filtration into a larger fraction and smaller fraction.

Linear kinetics was generally found for total (14)C turnover by the larger and smaller fraction collectively. Lowest turnover times were always found at the station in open water outside the Lough. There was no relation between turnover time and in-situ urea concentrations. Maximum velocity of uptake of urea was greatest in May, least in August. Lowest values of urea were always encountered in the main water body of the Lough. Linear kinetics of (14)C urea turnover was not shown by the smaller fraction, a fraction which accounted for up to 40% of (14)C turnover. The proportion of (14)C utilized by the smaller fraction increased with increasing concentrations of added urea. (14)C was only assimilated by the larger fraction, the amount being 10% or less of the total (14)C turnover. (Coyle-Wisconsin)
W78-02484

TEMPORAL CHANGES IN PELAGIC BIOMASS OF PLEURONCODES PLANIPES STIMPSON (DECAPODA ANOMURA, GALATHEIDAE) OFF BAJA CALIFORNIA, MEXICO,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. Blackburn.
Crustaceana, Vol. 32, No. 2, p 178-184, 1977. 2 fig, 3 tab, 9 ref. NSF GX-33502.

Descriptors: *Temporal distribution, *Biomass, Benthic fauna, Pacific Ocean, *Mexico, Seasonal, *Pleuroncodes planipes, Pelagic nekton, Mean pelagic biomass, *Baja California.

Changes in the mean pelagic biomass of Pleuroncodes planipes taken by miconekton net off the west coast of Baja California, Mexico are analyzed. Preliminary studies reported Pleuroncodes planipes comprising 90% or more by weight of each of the samples. The remainders were fish and it was concluded that the pelagic nekton was almost entirely Pleuroncodes. The observed biomass of one group was always much less than the amount estimated from the growth rates, and in fact declined. Differences could be due to mortality, active or passive emigration, and descent to the bottom. Active emigration seems unlikely because Pleuroncodes are weak swimmers and area conditions appear favorable for them to remain in place. Passive emigration by current drift occurs but most of the known instances refer to younger and smaller planipes than in the observed group. If mortality or emigration or both reduced the biomass of the observed group, the biomass would become negligible. But the observed group remains very abundant in the area studied. It is concluded that much of the difference between the observed and expected biomass of the observed group is probably due to part of the biomass remaining on the bottom. (Coyle-Wisconsin)
W78-02485

PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
W. L. Lockhart, and A. Lutz.
Water, Air, and Soil Pollution, Vol. 7, No. 3, p. 317-332, March, 1977. 1 fig, 4 tab, 72 ref.

Descriptors: *Fish reproduction, *Fish physiology, *Acid water, *Canada, Freshwater fish, Water types, Water pollution effects, Trace elements, Lake George(Ontario, Canada), Lake Manitoba(Ontaro, Canada), Roddy Lake(Ontario, Canada), Georgian Bay(Ontario, Canada).

Blood serum and other tissues of white suckers and other species of fish from Lake George (Canada) were examined in a preliminary effort to understand losses of fish from acid lakes. Values for hemoglobin indicated that an anticipated adaptive response to asphyxia was absent. Apparent sampling artifacts were noted in brown bullheads with respect to hematocrit, blood pH, sugar and inorganic phosphate analyses. No biochemical deficiencies were found in rib analyses, although it had been thought deformities observed in white suckers in the acid lake might be explained by demineralization of the skeleton. No indication of starvation was found and it appears that reduced growth was not caused by starvation. Female white suckers and other species undergoing reproductive failure did not achieve as great an excess of serum Ca values over males in the acid lake as they did in non-acid locations. It is suggested that calcium dynamics are altered in fish from the acid lake. High levels of manganese particularly in skin, were found in acid lake suckers. Calcium metabolism in fish seems to deserve increased attention in attempts to understand the pathology of acid pollution. (Coyle-Wisconsin)
W78-02486

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park, Dept. of Microbiology.
G. S. Sayler, M. Shon, and R. R. Colwell.
Microbial Ecology, Vol. 3, No. 3, p. 241-255, 1977. 6 fig, 2 tab, 24 ref. NSF GD-31707, N.O.A.A. 04-5-15811, EPA R-803300-01-0.

Descriptors: *Polychlorinated biphenyl, *Microbial degradation, Sewage bacteria, Estuaraine environment, Food chains, Chesapeake Bay, *Bacteria, *Estuarine bacteria, *Pseudomans strain 1008.

Preliminary results of a study of degradation of PCB by an estuarine bacterium indicate that a potential for microbial degradation of highly chlorinated commercial PCB mixtures exists in the estuarine environment. Studies of the degradation of PCB by isolates from freshwater and sewage-contaminated environments yielded a similar conclusion. And it is apparent also that there is a measurable bacteria action on polychlorinated biphenols, shown by low grade stimulation of growth, simulation of oxygen uptake during glucose metabolism, and accumulation of PCB in capsular slime when high PCB concentrations are added to the growth medium in the case of Pseudomans strain 1008. In addition the strain demonstrated an ability to degrade both a relatively pure PCB isomer and a commercial PCB preparation. The paper reports that since PCB's can evoke a response from microorganism under laboratory conditions, environmental influence of PCB at the microbial level requires further investigation. Sixteen cultures representing five bacterial genera were isolated during the study, which utilized Chesapeake Bay water. (Coyle-Wisconsin)
W78-02487

NUTRIENT-ALGAL RELATIONSHIPS IN LAKE LILLINONAH, DANBURY, CONNECTICUT, JUNE-SEPTEMBER, 1975.
National Enforcement Investigations Center, Denver, CO
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 611, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-330/2-75/009, November, 1975. 37 p, 2 fig, 9 tab, 6 ref, 3 append.

Descriptors: *Phosphorus, *Nutrient removal, *Eutrophication, *Algal control, Nutrients, Cyanophyta, Anabaena, Aquatic weed control, Water pollution control, Waste water disposal, *Connecticut, Effluents, Impoundments, *Lake Lillinonah(CT), Aphanizomenon.

Lake Lillinonah, a narrow (1-1.5 km), 16 km-long impoundment of the Housatonic River in western Connecticut, receives effluent from the Danbury Wastewater Treatment Plant, which contributes over 30% of the lake's phosphorus load. Phosphorus has been found to be the growth-limiting nutrient for the summer algal blooms in the lake of the filamentous blue-green algae Anabaena and Aphanizomenon. This study concludes via field and laboratory tests that a reduction of 96% of the plant's phosphorus loading to the lake would reduce algal growth by at least 29% (each 1 microgram/l reduction in phosphorus would decrease algae by 0.02 mg/l dry weight,) and result in a phosphorus contribution to the lake of 0.01-0.02 mg/l. For minimum algal problems, the level of inorganic nitrogen should not exceed 0.30 mg/l, and orthophosphorus should not exceed 0.01 mg/l. Simulated lake water mixed with treatment plant effluent and inoculated with algal cells resulted in an algal growth increase of an average of 482% on a maximum dry-weight basis over lake water without the effluent. Effluent treated with calcium hydroxide precipated an average of 96% of the phosphorus, and effluent so treated stimulated 90% less algal growth. It is recommended that a state permit requiring phosphorus removal by the treatment plant be implemented. (Lynch-Wisconsin)
W78-02488

A CYTOCHEMICAL AND BIOCHEMICAL INDEX OF STRESS IN MYTILUS EDULIS L.,
Institute for Marine Environmental Research, Plymouth (England).
B. L. Bayne, D. R. Livingstone, M. N. Moore, and J. Widdows.
Marine Pollution Bulletin, Vol. 7, No. 12, p. 221-224, December 1976. 2 fig, 2 tab, 20 ref.

Descriptors: *Water pollution effects, *Mussels, *Bioindicators, *Enzymes, *Cytological studies, Indicators, Analytical techniques, Incubation, Estuarine environments, Laboratory tests, *Biological stress, Lysosomal enzymes, Lysosmes.

Two indices of stress, one measuring lysosomal stability and the latency of lysosomal enzymes, and the other measuring the ratio of taurine and glycine concentrations, were related to the scope for growth of the mussel Mytilus edulis. Measurements of lysosomal stability in the digestive cells of Mytilus over a period of eight months indicated consistent values for labilization period (length of incubation) ranging from 16-20 minutes. Starvation at 10 degrees C did not induce a significant decrease in latency in spite of the negative scope for growth. In other experimental treatments (18C, starved cells; 18C, fed cells; 25 degrees/o salinity, fed cells; 15 degrees/o salinity, fed cells) there was a significant reduction in the labilization. In all treatments there was a significant correlation between scope for growth and latency. The taurine concentration in the tissues did not change in response to temperature or ration stress and was little affected by the length of time the animals spend under laboratory conditions. The concentration of glycine declined in response to temperature increase but not in response to lack of food. A positive correlation was found between the taurine:glycine ration and the product of the temperature increment and time. While the taurine:glycine ration had a marked effect of the scope for growth it had little effect on the concentration of glycine. (Harris-Wisconsin)
W78-02489

LEAD IN PORT PHILLIP BAY MUSSELS,
La Trobe Univ., Bundoora (Australia). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-02490

BIOACCUMULATION FACTORS OF CHLORINATED HYDROCARBONS BETWEEN MUSSELS AND SEAWATER,
California Univ., Bodega Bay. Bodega Marine Lab.
For primary bibliographic entry see Field 5A.
W78-02491

RELEASE OF DISSOLVED ORGANIC MATTER BY PHOTOSYNTHESIZING ALGAE IN LAKE KINNERET, ISRAEL,
Kinneret Limnological Lab., Tiberias (Israel).
T. Berman.
Freshwater Biology, Vol. 6, No. 1, p 13-18, 1976. 2 fig, 3 tab, 22 ref.

Descriptors: *Dissolved organic matter, *Photosynthesis, *Algae, Carbon, Dinoflagellates, Bacteria, Phytoplankton, Eutrophication, Trophic level, Lakes, Chlorophyta, *Lake Kinnert(Israel), *DOM release, Particulates, Chlorobium phaeobacteriodes, Peridinium cinctum.

The hypothesis that dissolved organic matter (DOM) released by algae is lower in eutrophic waters than in oligotrophic waters is confirmed by analysis of water samples taken at various depths in pelagic waters of Lake Kinneret, Israel from Aug. 1972 to Dec. 1973. The dinoflagellate Peridinium cinctum dominated in February and May during the annual bloom. A dense layer of photosynthetic green sulfur bacteria (Chlorobium phaeobacteroides) develops during summer after the bloom. Algal composition during fall and early winter is heterogeneous, with chlorophyta in the majority. Photosynthetic rates (particulate 14C assimilation) in the phototrophic zone varied from 560-8,052 mg/sq m/day (12 December and 25 April 1973), and from 102-2,589 mg/cu m/day on the same dates at depth of maximum photosynthesis. Released DOM ranged from 6.8-210.8 mg C/sq m/day (10 January and 18 July 1973) in the trophogenic zone and at optimum depths from 0.8-44.8 mg C/cu m/day on those dates. DOM released was directly related to particulate inorganic carbon assimilation. Despite the correlation between released DOM and the rate of photosynthetic fixation of carbon into particulate matter, there were considerable variations in the percentage of extracellular release (PER) of DOM in respect to total C assimilation by phytoplankton. PER was low during the Peridinium bloom, and high when algal standing crops were low. PER was inversely related to chlorophyll a concentration. (Lynch-Wisconsin)
W78-02492

SPECIFIC ASSOCIATION OF THE BLUEGREEN ALGAE ANABAENA AND APHANIZOMENON WITH BACTERIA IN FRESHWATER BLOOMS,
Department of Scientific and Industrial Research, Taupo (New Zealand). .
H. W. Paerl.
Journal of Phycology, Vol. 12, No. 4, p 431-435, 1977. 2 fig, 11 ref. NSF-RANN GI-22.

Descriptors: *Algae, *Bacteria, *Symbiosis, Anabaena, Nitrogen fixation, Photosynthesis, California, Lakes, Cyanophyta, *Eutrophication, *Anabaena circinalis, *Aphanizomenon flos-aquae, Algal-bacterial associations, Heterocysts, Lake Rotongaio(New Zealand), Lake Rotaira(New Zealand), Clear Lake(CA).

Mechanism underlying association of heterocysts of two N2-fixing bluegreen algae, Anabaeno circinalis and Aphanizomenon flos-aqae, with attached bacteria during algal blooms, were investigated with microautoradiography and scanning electron microscopy on natural communities in Clear Lake, CA, and Lakes Rotongaio and Rotaira, New Zealand. Bacterial attachment to a wide range of bluegreen algae has been reported, but ecological significance has been neglected. It is suggested that attached bacteria assimilate substances released by the heterocysts: whether the algae benefit from the association is unknown. Conditions present during peak bloom are, however, reminiscent of symbiotic conditions noted with lichens. It has been pointed out that low 02 tension is essential for N2 fixation, while high 02 tension tends to be inhibitory. In Cyanophyta blooms photosynthetically generated concentrations of 02 build up in scums and surface waters. Bacterial respiration of organic substrates near the N2-fixing heterocyst may be effective enough to permit high rates of photosynthesis and N2 fixation during blooms. The study showed that bacteria are attached at the polar region of the heterocysts. Glucose, glycine, and alanine were assimilated by the small, rod-shaped bacteria. (Lynch-Wisconsin)
W78-02493

METABOLIC RELATIONSHIPS BETWEEN GREEN HYDRA AND ITS SYMBIOTIC ALGAE,
California Univ., Irvine. Dept. of Developmental and Cell Biology.
R. L. Pardy, and B. N. White.
Biological Bulletin, Vol. 153, No. 1, p. 228-236, August 1977. 2 tab, 23 ref. ASPHS RR07008.

Descriptors: *Metabolism, Carbohydrates, Chlorophyta, Food chains, *Green hydra, *Respiratory quotient, *Symbiotic algae, *Caloric demand.

Metabolic requirements of green hydra under various conditions are estimated and the major product of the animals' metabolism is deduced. Caloric demands of the association are compared with calories potentially available from nutrition provided by exogenous food and available from the symbiotic algae. Hydra that maintain algal symbients showed three modes of metabolism depending on the nutritional state of the host and the photoperiodic conditions under which the animals were maintained. Animals either fed or fasted but kept in the dark exhibited a respiratory quotient (RQ) of 0.725 indicating fat metabolism. Fasting green hydra maintained in the light showed a pronounced metabolism typified by an RQ of 0.970. Aposymbiotic hydra fed or fasted exhibited an RQ of 0.725 indicating a high degree of fat metabolism. Symbiotic hydra fed and maintained in light demonstrated a respiration rate 2.5 times greater than animals maintained under any other condition of fasting or photoperiod. Calculations based on respiratory measurements and indirect calorimetry suggest that hydra consume approximately 0.0320 calories per day and that symbiotic algae may supply up to 69% of the host caloric requirements. (Coyle-Wisconsin)
W78-02494

THE RELATIONSHIP BETWEEN PHOTOSYNTHESIS AND LIGHT FOR NATURAL ASSEMBLAGES OF COASTAL MARINE PHYTOPLANKTON,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
T. Platt, and A. D. Jassby.
Journal of Phycology, Vol. 12, No. 4, p. 421-430, 1976. 4 fig, 6 tab, 35 ref.

Descriptors: *Phytoplankton, *Photosynthesis, *Light intensity, Depth, Temperature, Marine microorganisms, Canada, Light, Respiration, Equation, Seasonal, Chlorophyll, Primary productivity, *Light saturation curve, Nova Scotia(Canada), St. Margaret's Bay(Canada).

Light-saturation measurements were made using populations of phytoplankton taken from three coastal locations off Nova Scotia during a 20-month period. Two depths were sampled on each sampling day. Uptake of 14C was measured at various levels of irradiance in specially-constructed water-cooled incubators using artificial illumination. Chlorophyll-a was measured in quadruplicate. The purpose of the research was to measure seasonal and photic-zone depth variations of three parameters of the light saturation curve, which relates photosynthesis per unit of chlorophyll biomass (P superscript B) to the irradiance. The three tested parameters were the initial slope of the light saturation curve, the specific production rate at optimal light intensity (the assimilation number), and the intercept at zero irradiance. It was found that initial slope and the assimilation number varied five-fold throughout the year, both decreased with depth, and both correlated positively with one another. Initial slope correlated positively with mean solar radiation, but not with temperature; the assimilation number correlated strongly with temperature but not with solar radiation. The assimilation number could be estimated from initial slope and temperature. Cell size and nutrient status may also be important factors. (Lynch-Wisconsin)
W78-02495

THE IMPORTANCE OF ALLOCHTHONOUS PARTICULATE CARBON PATHWAYS IN A SUBALPINE LAKE,
Washington Univ., Seattle. Fisheries Research Inst.
R. C. Wissmar, J. E. Richey, and D. E. Psyridakis.
Journal of Fisheries Research Board of Canada, Vol 34, No 4, p 1410-1418, September 1977. 4 fig, 3 tab, 65 ref. NSF GB-20963 and BMS-74-20744.

Descriptors: *Washington, *Carbon cycle, *Food chains, *Ecosystems, Carbon, Oligotrophy, Insects, Sedimentation, Lakes, *Findley Lake(WA), Insect production, Zooplankton production.

The paper examines some primary and secondary carbon pathways in Findley Lake, Washington, an oligotrophic subalpine lake near Seattle which has not been subject to any disturbance or management by man. The effort is to determine if material from outside the immediate ecosystem contributes significant amounts of organic matter for use by consumers. Seasonal and annual values are given for inputs of such allochthonous matter, phytoplankton production, and consequent carbon flows to important consumers, with results discussed in the form of a pedagic carbon budget and a pelagic benthic carbon flow diagram. Results suggest that allochthonous carbon provides a food base for insect production and autochthonous production of carbon appears to maintain zooplankton production. Most of the autochthonous carbon losses through grazing and respiration were retained in the water column. A pelagic carbon budget did not balance by a number well within the propagated variations of 26% and 21% respectively for input and outputs. The study illustrates the probable dependence of many lakes in coniferous forests upon allochthonous inputs and their sensitivity to land-based disturbances. (Coyle-Wisconsin)
W78-02496

CHRONOLOGY OF ORGANOCHLORINE COMPOUNDS IN LAKE MICHIGAN FISH, 1929-66,
Wisconsin Univ.-Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5A.
W78-02497

EFFECTS PRODUCED BY EXTRACTS OF MACROSCOPIC MARINE ALGAE ON BACTERIAL GROWTH, (IN SPANISH),
Universidad Central de Venezuela, Caracas. School of Biology.
G. Nunez, and L. M. Serpa Sanabria.
Acta Biol Venez 9(1), p 121-134, 1975.

Descriptors: *Marine algae, *Bacterial growth, Bacteria, Coasts, Pollutant identification, Bacteria, E. coli, *Venezuela.

In vitro experiments carried out with organic extracts of macroscopic marine algae collected from the Venezuelan central coast showed that some species produce substances with antibiotic character against gram-positive bacteria and Escherichia coli.--Copyright 1978, Biological Abstracts, Inc.
W78-02498

CONTROLLING AQUATIC WEEDS,
New York Sea Grant Advisory Service, Albany.
For primary bibliographic entry see Field 5G.
W78-02500

WATERFOWL AS INDICATOR FOR THE ECOLOGICAL QUALITY OF LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W78-02501

KEPONE BIOCONCENTRATION, ACCUMULATION, LOSS AND TRANSFER THROUGH ESTUARINE FOOD CHAINS,
Environmental Research Lab., Gulf Breeze, FL.
L. H. Bahner, A. J. Wilson, Jr, J. M. Sheppard, J. M. Patrick, Jr, and L. R. Goodman.
Chesapeake Science, Vol. 18, No. 3, p. 299-308, September 1977. 9 fig, 5 tab, 15 ref.

Descriptors: *Trophic level, Estuarine environments, *Chesapeake Bay, *Oysters, *Shrimp, *Water pollution effects, *Food chains, Algae, Fish, *Virginia, *James River(VA), *Kepone, Mysids.

Accumulation, transfer and loss of Kepone in estuarine organisms was studied in laboratory bioassays in light of contamination of the James River. Biota of the James River estuary and Chesapeake Bay contain Kepone, apparently due to transport of the chemical downstream from the freshwater portion of the river. Kepone was bioconcentrated by oysters, grass shrimp, sheepshead minnows and sppt. Bioconcentration factors ranged from ten to 340 in static exposures and 900 to 13,500 in flow-through bioassays, and were dependent on species and exposure duration. Depuration of Kepone from oysters in Kepone free water was rapid--35 per cent in 24 hours. Depuration of Kepone was slow in crustaceans and fish, with tissue concentrations decreasing 30 per cent to 50 per cent in 24 to 28 days. Spot obtained Kepone when fed live mysids that had grazed on Kepone laden brine shrimp, approaching the concentration of their food. At lower concentrations tested, Kepone concentrations below detection limits in prey accumulated in the predator to detectable concentrations within 30 days. Initial bioconcentration of Kepone from water by plankton was the dominant source of Kepone to each member of this food chain. But significant quantities of Kepone transferred from prey to predatory fish. (Coyle-Wisconsin)
W78-02502

UTILIZATION OF EXOGENOUS PURINE AND PYRIMIDINE COMPOUNDS BY BACTERIA ISOLATED FROM WATER BASINS, (IN RUSSIAN),
Latvian State Univ., Riga.
For primary bibliographic entry see Field 5A.
W78-02503

ENVIRONMENTAL REGULATION OF PHYTOPLANKTON PRODUCTIVITY IN THE LOWER HUDSON ESTUARY,
City Univ. of New York. Dept. of Biology.
T. C. Malone.
Estuaries and Coastal Marine Science, Vol. 5, No. 2, p. 157-171, March 1977. 11 fig, 1 tab, 25 ref. NOAA 03-4-0430310 and 04-5-022-22.

Descriptors: *New York, *Eutrophication, *Phytoplankton, Estuarine environment, Estuaries, *Primary productivity, Chlorophyll, Euphotic zone, Bays, *Hudson Bay, *Net plankton, Advective transport.

Research was undertaken to determine mechanisms by which phytoplankton biomass in the lower Hudson estuary around New York City remains low while nutrient input rates are high and predictable. Except during the summer when phytoplankton growth rates were high, increases in phytoplankton biomass were related to the advection of phytoplankton into the lower Hudson estuary from Raritan Bay or the apex of the New York Bight. Although major nutrient concentrations were consistently high, net plankton growth rates were apparently less than flushing rates and, therefore, too low to generate blooms in the lower estuary. It is considered unlikely that the balance between growth rate and advective transports determines the distribution of phytoplankton biomass throughout the year. Grazing could also be an important factor during the summer and fall. In addition to discussion of estuarine circulation and zooplankton grazing on phytoplankton biomass, there is discussion of monthly variations in phytoplankton productivity and the environmental regulation of chlorophyll a specific primary productivity in the upper bay. (Coyle-Wisconsin)
W78-02505

APPLICATION OF STOCHASTIC METHODS IN EUTROPHICATION,
General Electric Co., Santa Barbara CA. Center for Advanced Studies.
L. G. Everett, and G. C. Slawson, Jr.
Journal of Environmental Systems, Vol. 6, No. 4, p. 343-353, 1976-77. 1 fig, 14 ref.

Descriptors: *Monte Carlo method, *Poisson ratio, *Eutrophication, *Stochastic processes, *Phytoplankton, Zooplankton, Mathematical models, Model studies, Nutrients.

A stochastic model of a phytoplankton-zooplankton population is described where x and y represent the respective sizes of the two populations. The state of the system at any time can be represented by the ordered pair, x, y. The system can change state as a result of either births or deaths of either species. Migrations are not considered, although it is conceded that they pose serious additional difficulties. It is assumed that births and deaths are independent events that individually satisfy the four assumptions of the Poisson process. Water temperature, solar radiation, and nutrients from external sources are inputs to the model. It is notes that model evaluation is extremely important and extremely difficult and the model outlined in the paper has not been applied to a real world situation. Evaluation is thus restricted to the model described and other models that have been evaluated. Specific comparisons are made with the differential equation model developed by DiToro and the Monte Carlo simulation. It is reported that the model described has indicated a deficiency in data generally available and to calibrate, data should be taken more frequently than every two or three weeks. (Coyle-Wisconsin)
W78-02506

POLLUTION HISTORY OF ESTUARINE SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-02509

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX C: MAT-WATER EXCHANGE IN A STRATIFIED BOG LAKE,
Michigan Univ., Ann Arbor. Dept. of Zoology.
F. F. Hooper, and J. P. Koenings.
Available from the National Technical Information Service, Springfield, VA 22161 as COO17716, Price codes: A04 in paper copy, A01 in microfiche. In: Publication No 016440-7-T, December 1975. 14 p, 2 fig, 4 tab, 7 ref. AT(11-1)-1771.

Descriptors: *Stratification, *Bogs, *Thermal stratification, *Lakes, Meromixis, Acidic water, Michigan, Phosphorus, Iron, Nutrients, Interstices, *North Gate Lake(MI), *Sphagnum, *Mats, Mat-water interfaces, Dichothermy, Monimolimnion.

An investigation was made in a stratified bog lake of the relationship of mat-water exchanges to the lake's circulation, thermal structure, and chemical cycles. The bog community consisted of an open lake (North Gate Lake, Gogebic County, MI) of highly stained acid water; a marginal floating mat of Spagnum and bog shrubs; and a marginal forest of black spruce and tamarack. North Gate Lake has a surface area of about 0.4 ha. A stratum between 7 and 8 m does not circulate during the vernal overturn, leaving a small monimolimnion and temperature inversion. 1971 mat-labelling experiments using P-32 suggested the possibility of density-flow currents moving through the mat-water interface zone into the deeper water; thermal profile data were collected which demonstrated that isotherms of the mat interstitial water dip sharply toward the hypolimnion. Phosphorus and iron transport from the mat zone to the monimolimnion early in the spring is thought to be the mechanism for maintaining dichothermy in the lake. Heat input from the bottom of the basin after the spring overturn and resulting increase in monimolimnion thickness coincided with increasing phosphorus concentration. The study showed that the mat-water interface of stratified bog lakes provides a site for dispersion processes not found in non-bog stratified lakes. (Lynch-Wisconsin)
W78-02510

A BIOLOGICAL AND CHEMICAL COMPARISON OF VARIOUS AREAS OF A RESERVOIR,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. C. Hendricks, and J. K. G. Silvey.
Water Research, Vol 11, No 5, p 429-438, 1977. 3 fig, 8 tab, 18 ref.

Descriptors: *Limnology, *Eutrophication, *Microbiology, *Nutrients, *Texas, Reservoirs, Water pollution effects, *Garza-Little Elm reservoir(TX).

A limnological survey was made of the Garza-Little Elm reservoir on the North Fork of the Trinity River, about 22 miles northwest of Dallas, Texas. Purpose were to obtain an indication of the nutrients present, the standing crop of primary producers, and the microbial activity. Water samples from diverse areas of the reservoir were analyzed for gross and net productivity, respiration, BOD, chlorophyll-a, phosphates an d nitrates, autotrophic and heterotrophic carbon-14 uptake, pH and bicarbonate contents. The areas were physically different--covers, open water and near-shore water, with testing designed to determined if biochemical differences also exist among the areas. Data indicated that a cove with a marina located on it was not significantly different from one that did not have a marine but was similar in other respects. An open water area in which many trees had been left standing was more eutrophic than other areas nearby. Another open water area with sediments rich in nutrients was less eutrophic than shallower areas near it. (Coyle-Wisconsin).
W78-02514

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS: PHASE II--FINAL REPORT (CHEMICALS 41-60),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-02614

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 8, PESTICIDES INDUSTRY,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5B.
W78-02615

MONITORING ENVIRONMENTAL IMPACTS OF THE COAL AND OIL SHALE INDUSTRIES RESEARCH AND DEVELOPMENT NEEDS,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5A.
W78-02619

ENVIRONMENTAL, HEALTH, AND CONTROL ASPECTS OF COAL CONVERSION: AN INFORMATION OVERVIEW: VOLUMES 1 AND 2.
Oak Ridge National Lab., Oak Ridge, TN.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-FIS-94, Price codes: A23 in paper copy, A01 in microfiche. Report No. ORNL/EIS94, UC-11, -41, -48, -90i, 2 volumes, April 1977. 1,440 p, 268 fig, 467 tab, 1,722 ref, 4 append. Braunstein, H. M., Copenhaver, E. D., and Pfuderer, H. A., Eds. W-7405-eng-26.

Descriptors: *Coals, *Environmental effects, *Pollutants, Water pollution, Public health, Physical properties, Chemical properties, Technology, Effluents, Biology, Microbiology, Chemicals, *Coal conversion.

Environmental and health information about possible pollutants from coal conversion processes is presented. The information overview assembles and summarizes relevant technical information gathered from several disciplines into a single data source without assessing the data or sythesizing new data from its collection. Topics discussed include: origin, classification, and physical and chemical properties of coal; coal conversion processes; quantities and control technologies from process effluents; analysis of coal and coal products; environment interactions; microbial interactions; plant interactions; bioenvironmental effects on animals; and metabolism and biological effects on humans. Four appendices present related information on unit conversion, glossary of terms, glossary of polycyclic aromatic hydrocarbons, and a chemical index. (Wares-IPA)
W78-02622

PROCEEDINGS OF THE NINTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
Sea Grant Report No. TAMU-SG-77-115, October 1977. 267 p. Also as CDS Report No. 206. J. B. Herbich (Ed.).

Descriptors: *Dredging, *Benthos, *Mining, *Waste disposal, Pollution, *Spoil banks, Heavy metals, Phosphates, Ecosystems, *Dredging, Water pollution effects, Environmental effects, Corbicula manilensis.

The following papers were presented at the Ninth Dredging Seminar sponsored by the Center for Dredging Studies at Texas A&M University, College Station, Texas: Stabilization of coastal subaerial dredged material sites in North Carolina; Availability of sediment-adsorbed heavy metals to benthic deposit-feeding organisms; Feasibility of developing biological habitats on dredged material; Mining of phosphates by dredge; Techniques for reducing turbidity with present dredging procedures and operations; The future of the dredging market; Selected environmental aspects of dredging in San Diego Bay, California; Corbicula manilensis Phillipi in the Arkansas River: Should the Corps of Engineers be concerned; Cost-effectiveness analysis of solids-liquid separation alternatives in dredged material disposal operations; Research to dewater dredged material; Primary consolidation and compressibility of dredgings; and Stabilization of polluted dredgings by electro-osmosis. (NOAA)
W78-02646

A RATIONALE FOR EVALUATING THERMALLY INDUCED BIOLOGICAL EFFECTS DUE TO ONCE-THROUGH COOLING SYSTEMS,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
H. H. Carter, J. R. Schubel, R. E. Wilson, and P. M. J. Woodhead.
Special Report No. 7, Reference 77-3, September 1977. 75 p, 46 fig, 8 tab, 59 ref.

Descriptors: *Thermal pollution, *Cooling water, *Water pollution effects, *Powerplants, *Baseline studies, Ecology, Ecosystems, Model studies, *Environmental impact, *Biological effects, Ecological assessment, Open cycle, Cooling systems, Fish populations.

A simple thermal response model was developed that combines in graphical form: (1) the distribution of thermal doses computed from the physical models for an assumed distribution of organisms in the receiving waters with (2) the distribution of thermal doses calculated from laboratory-determined thermal resistance curves which have demonstrated to produce mortality at a particular level, usually 50%, for Representative Important Species. From the relative positions of these two curves, predictions can be made of the mortality rate expected from thermal stresses at a particular site. The thermal response model can be used with data from existing and proposed power plants to estimate what fraction of plankton in waters contiguous to the plant will be exposed to thermal doses greater than that for mortality at any stated level, usually 50%. The model can also be used to aid in the design of once-through cooling systems to keep the mortality rate caused by thermal stresses below any designated threshold. The inputs to the model are the frequency distribution of time-excess temperature histories experienced by the plankton of particular concern, thermal resistance curves for those organisms, and the spatial and temporal variations of the natural temperature of the receiving waters. (NOAA)
W78-02647

OHIO EPA WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Ohio State Environmental Protection Agency, Bowling Green. Northwest District Office.
For primary bibliographic entry see Field 5G.
W78-02649

AQUATIC VASCULAR PLANTS OF THE SANDUSKY RIVER BASIN,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-02650

SHORELINE AND BATHYMETRIC CHANGES IN AND AROUND UPPER SANDUSKY BAY SINCE 1905,
Ohio Dept. of Natural Resources, Sandusky. Div. of Geological Survey.
C. H. Carter, D. J. Benson, and D. E. Guy.
In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 335-357. 4 fig, 6 tab, 3 ref.

Descriptors: *Bathymetry, *Lake Erie, *River basins, *Shores, *Sedimentation, Beach erosion, Sedimentation rates, Depth, Bays, Erosion, Eutrophication.
Identifiers: *Sandusky Bay(OH), *Sandusky River Basin(OH).

Much of the upper shore of Upper Sandusky Bay is receding and filling simultaneously with sediment derived from the upper bay shore and from the Sandusky River. Upper Sandusky Bay receives about 209,000 tons/yr of sediment from erosion of the upper bay shore and 284,000 tons/yr from the Sandusky River. Most of the sediment is deposited in the upper bay, with an annual deposition rate of 5.5 mm. At this rate the upper bay has a life expectancy of 300 to 400 years. The loss of land in the upland area and at the shore, and sedimentation in the bay, are expected to be accompanied by increasing turbidity, a change in bottom texture, and an increase in eutrophication. Current measurements of the bay depth and relief were made in 1973-74. Upper Sandusky Bay is shallow (mean depth 5-6 ft), and is bordered by low-relief, easily erodable, clay-rich banks. The nearshore slope is less than one degree; offshore the bottom is nearly horizontal. Shore relief is low (5-6 ft); wave action is largely responsible for shore erosion. Both north and south shores have a modal recession rate of 1-3 ft/yr. However, the range is much greater on the south shore (<1 ft/yr to 13-15 ft/yr)k than the north shore (<1 ft/yr to 7-9 ft/yr) 62% of the south shore receded at the 3-5 ft/yr rate compared with 9% of the north shore. These differences appear primarily due to shoreline orientation. (See also W78-01518) (Lynch-Wisconsin)
W78-02651

ENVIRONMENTAL CONTAMINATION FROM TRACE ELEMENTS IN COAL PREPARATION WASTES. A LITERATURE REVIEW AND ASSESSMENT,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 5B.
W78-02655

MERCURY CONTENT OF MUSSELS FROM ST. LAWRENCE ESTUARY AND NORTHWESTERN GULF OF ST. LAWRENCE, CANADA,
For primary bibliographic entry see Field 5A.
W78-02671

RESTORATION OF WATER QUALITY IN LAKE WESTON, ORLANDO, FLORIDA,
Orange County Pollution Control Dept., Orlando, FL.
For primary bibliographic entry see Field 5G.
W78-02678

RESIDUAL 2,4-D LEVELS IN THE ST. JOHNS RIVER, FLORIDA,
Army Engineer District, Jacksonville, FL.
For primary bibliographic entry see Field 5A.
W78-02679

GENETIC ASPECTS OF LARVAL GROWTH UNDER REDUCED SALINITY IN MYTILUS EDULIS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
D. J. Innes, and L. E. Haley.
Biology Bulletin, Vol 153, p 312-321, October 1977. 2 fig, 2 tab, 30 ref.

Descriptors: *Mussels, *Growth rates, *Genetics, *Salinity, Analytical techniques, Water properties, Laboratory tests, Larval, Mollusks, Invertebrates, Water quality, Animal behavior.

There was no significant difference in mean length between Mytilus edulis larvae raised at 30o/oo and those raised at 18o/oo after 18 days of growth. Salinities below this significantly decreased growth. Families of larvae of known parentage were raised at different salinities. The genetic analysis indicated substantial genetic variation in larval length measured 16 days after fertilization, as well as significant genetic interaction with salinity. This was interpreted as the presence of genes influencing larval growth which depend on salinity for their expression and may be related to the past selective influence of a fluctuating environment. These quantitative genetic techniques provided a useful approach to studying genetic variation in marine organisms and its interaction with the environment. (Klein)
W78-02685

EFFECT OF DISSOLVED OXYGEN CONCENTRATIONS AND SALINITY ON SWIMMING SPEED OF TWO SPECIES OF TUNA,
National Marine Fisheries Service, Honolulu, HI. Southwest Fisheries Center.
A. E. Dizon.
Fisheries Bulletin, Vol 75, No 3, p 149-153, 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Dissolved oxygen, *Fish behavior, *Fish physiology, *Salinity, Oxygen, Marine fish, Toxicity, Mode of action, Water quality, Temperature, Oxygen requirements, Respiration, Environmental effects, Resistance, *Swimming speed, *Skipjack tuna, *Yellowfin tuna, *Tuna.

Behavioral responses of skipjack tuna and yellowfin tuna to decreasing levels of salinity were unremarkable. No consistent swimming speed changes were observed when salinity was decreased from 34% to 29%. Yellowfin tuna were not apparently stressed by low dissolved oxygen levels. The relation between increased swimming speeds and decreased water oxygen content of other species was discussed. (Klein)
W78-02686

THE UPTAKE, DISTRIBUTION, AND DEPURATION OF 14C-BENZENE AND 14C-TOLUENE IN PACIFIC HERRING CLUPEA HARENGUS PALLASI,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
S. Korn, N. Hirsch, and J. W. Stuhsaker.
Fishery Bulletin, Vol 75, No 3, p 633-636, 1977. 1 tab, 8 ref.

Descriptors: *Organic compounds, *Metabolism, *Distribution, *Absorption, *Herrings, *Aromatic compounds, *Carbon radioisotopes, Retention, Path of pollutants, Analytical techniques, Distribution patterns, Fish physiology, Radiochemical analysis, Bioaccumulation, Tissue analysis, *Benzene, *Toluene, Depuration, Clupea harengus.

In all herring tissues toluene accumulated to higher levels than did benzene despite the faster loss of toluene compared with benzene. The gallbladder exhibited the highest accumulation of both toluene and benzene; the immature gonad accumulated the least. Within 24 h maximum residues were obtained in all tissues except the gallbladder and pyloric caeca. Toluene accumulated to the maximum level before benzene peaked in all tissues except the gallbladder and intestine. Residues were depurated rapidly with most tissues having detectable amounts after 3-4 days. The gallbladder, intestine and pyloric caeca retained residues through the duration of the study (7 days). (Klein)
W78-02687

RESPONSES OF PERCID FISHES AND THEIR HABITATS TO EUTROPHICATION,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
J. H. Leach, M. G. Johnson, J. R. M. Kelso, J. Hartmann, and W. Numann.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1964-1971, 1977. 2 fig, 3 tab, 43 ref.

Descriptors: *Eutrophication, *Fish behavior, *Fish, Habitats, Trophic level, Resistance, Physiochemical properties, Fish behavior, Freshwater fish, *Environmental effects, Benthos, Zooplankton, Phytoplankton, Water quality, Ecosystems, Food chains, Populations, Aquatic plants, Forage fish, Lakes, *Percid fish.

Percid fishes were found in lakes that covered a wide range of trophic conditions. The responses of percides and their habitats to progressive cultural eutrophication were investigated. Alterations in physiochemical characteristics of habitats precipitated changes in phytoplankton, macrophytes, zooplankton, and benthos that were ultimately deleterious. Enrichment initially lead to favorable responses in percides but eventually became unfavorable. The relative level at which the response became negative varied with the species according to tolerances to altered environment, adaptabilities to new habitat and forage base, and reproductive behavior. Other perturbations such as exploitation and habitat modification acted synergistically with cultural eutrophication in accelerating the sequence. (Klein)
W78-02688

EFFECTS OF SALINITY ON FASTED RAINBOW TROUT, SALMO GAIRDNERI,
Stirling Univ. (Scotland). Dept. of Biology.
M. G. MacLeod.
Marine Biology, Vol 43, 1977, p 103-107. 3 fig, 11 ref.

Descriptors: *Rainbow trout, *Salinity, *Bioassay, Laboratory tests, *Fish diets, *Fish farming, Aquiculture, Fish physiology, Fish hatcheries, Fish food, Estuaries, Starvation, Fasting, Weight loss, Muscle water, Tissue water.

Rainbow trout (Salmo gairdneri Richardson) which has been maintained for 120 days in salinities of fresh water, 7.5, 15.0 and 32.5 o/oo at 10C were fasted for up to 48 days under these same environmental conditions. Live weight loss between Days 7 and 48 of starvation could be described by a straight line, as could the decrease in condition factor. Trout maintained in 32.5 o/oo S showed a significantly greater weight loss than those in salinities of 15.0o/oo and below. Muscle water content increased slightly during fasting in fresh water, 7.5 and 15.0o/oo S. In 32.5o/oo S, however, muscle water fell significantly between Days 19 and 37. Liver water content also increased slightly during fasting, except in 32.5o/oo S, where water content again decreased betwee Days 19 and 37. The volume of the gall bladder contents increased during fasting. (Katz)
W78-02689

EFFECTS OF SALINITY ON FOOD INTAKE, ABSORPTION AND CONVERSION IN THE RAINBOW TROUT SALMO GAIRDNERI,
Stirling Univ. (Scotland). Dept. of Biology.
M. G. MacLeod.
Marine Biology, Vol 43, 1977, p 93-102. 3 tab, 7 fig, 38 ref.

Descriptors: *Rainbow trout, *Salinity, *Bioassay, Laboratory tests, *Fish diets, Fish farming, *Aquiculture, *Fish physiology, Fish food, Water temperature, Growth, *Nitrogen compounds, Proteins, Food intake, Growth rate, Absorption efficiency, Total nitrogen, Energy conversion.

In rainbow trout (Salmo gairdneri Richardson) which had been acclimatised to the experimental salinity and temperature, food intake was maximal in the intermediate salinities of 15.0 and 28.0 o/oo, less in fresh water and 7.5o/oo and minimal, by a statistically significant margin, in 32.5o/oo. When salinity was abruptly increased by 7.5 or 13.0o/oo, there were decreases in growth rate which were related to decreases in food intake. Recovery of food intake and growth rate to pre-increase levels was complete within 14 days. Absorption efficiency, in terms of total dry matter, total energy and total nitrogen, was negatively related to salinity. Total nitrogen was absorbed considerably more efficiently than either energy or dry matter. Conversion efficiency (K1 and K2) was estimated, also in terms of dry matter, energy and total nitrogen, in trout of the 0+ and 1+ year groups weighing from 50 to 150 g. There was tendency for conversion efficiency to decline with salinity, especially between 28.0 and 32.5o/oo. Dry matter and energy conversion were significantly lower than nitrogen conversion efficiency. (Katz)
W78-02690

SOME ASPECTS OF THE THERMAL TOLERANCE OF TRICHOMYA HIRSUTA (MOLLUSCA: BIVALVIA) OF EASTERN AUSTRALIA,
New South Wales Univ., Kensington (Australia). School of Zoology.
R. L. Wallis.
Marine Biology, Vol 43, 1977, p 217-223. 4 tab, 4 fig, 22 ref.

Descriptors: *Bioassay, *Thermal pollution, *Thermal stress, Thermal water, Water pollution effects, Molluscs, *Clams, *Australia, Animal physiology, Food, Temperature, Mussels, *Upper temperature tolerance range, Bivalve molluscs, Trichomya, Thermal resistance, Incipient lethal temperatures, Eurythermal incipient sublethal temperature.

The upper temperature tolerance range for Trichomya hirsuta L. is described for acclimation temperatures of 10 to 32C at 30 o/oo S. Changes in thermal resistance with time are described along with the incipient lethal temperatures. The eurythermicity for the species is 240.7C degrees-squared. The ultimate upper incipient lethal temperature is 35.1C. Definition of the incipient sublethal temperature is given, and is equal to 32C. Diet effects are shown not to be significant in short-term lethal experiments, but indicate that unfed mussels reduce their resistance after prolonged exposure to high temperatures. Size was also shown to have no effect on resistance and tolerance. A comparison of the tolerance triangle of T. hirsuta with those of the temperate species Mytilus edulis and Mya arenaria revealed that the 24-h LT50 minus 2.2C approximates the incipient lethal temperature. The eurythermicities of the temperate species are Mytilus edulis, 363C degrees-squared; and Mya arenaria, 415C degrees-squared. (Katz)
W78-02691

EFFECTS OF TEMPERATURE ON PHOTOSYNTHESIS AND RESPIRATION IN HERMATYPIC CORALS,
Hawaii Inst. of Marine Biology, Honolulu.
S. L. Coles, and P. L. Jokiel.
Marine Biology, Vol 43, 1977, p 209-216. 1 tab, 2 fig, 31 ref.

Descriptors: *Hawaii, Photosynthesis, Respiration, *Bioassay, *Thermal pollution, *Thermal stress, Thermal water, Water pollution effects, Animal physiology, Temperature, Invertebrates, *Coral, *Pacific Ocean, *Reefs, Laboratory tests, Respiration rates, *Reef corals, Pocillopora, Montipora, Porites, Fungia, *Coral metabolism, Tropical corals, Hawaiian corals, *Enewetak corals, Hermatypic corals, *Enewetak.

Photosynthesis and respiration rates of the reef corals Pocillopora damicornis, Montipora verrucosa, Porites compressa and Fungia scutaria were measured under controlled temperatures. Results indicate that coral metabolism is closely adapted to ambient temperature conditions. Tropical corals measured at Enewetak, Marshall Islands, showed greater primary production compared to maintenance requirements at elevated temperatures than did subtropical varieties of the same species in Hawaii. Photosynthesis:respiration (P:R) ratios were significantly and negatively related with temperature between 18 and 31C for all Hawaiian corals, whereas at Enewetak this ratio generally showed a curvilinear relationship for this temperature range. Extrapolations of P:R regressions on temperatures to a value of 2.0 (estimated as a minimum required for long-term functional autotrophy) coincide for Hawaiian specimens with published upper lethal temperatures. Extrapolation of P:R regressions for Enewetak specimens at temperatures above 25C suggests lethal temperatures for these corals to be 2 to 5C higher than for Hawaiian corals, in good agreement with recent experimental findings. Interspecific differences in P:R temperature regressions for Hawaiian corals

correlating with upper lethal temperature tolerances are described. (Katz)
W78-02692

EFFECTS OF MERCURY ON THE BEHAVIOUR AND OXYGEN CONSUMPTION OF MONODONTA ARTICULATA,
Royal Univ. of Malta, Valleta. Dept. of Biology.
L. J. Saliba, and M. G. Vella.
Marine Biology, Vol 43, 1977, p 277-282. 3 tab, 2 fig, 20 ref.

Descriptors: *Metals, *Mercury, Water pollution effects, *Animal behavior, Pathology, Animal physiology, Molluscs, *Snails, *Bioassays, Laboratory tests, Oxygen, Oxygen requirements, Sea water, Laboratory tests, Respiration, Oxygen consumption, Trochid snail, Mercuric sulphate.

The trochid snail Monodonta articulata Lamarck was exposed to mercuric sulphate at concentrations of 0.2, 0.5, 0.8 and 1 ppm Hg++. At 24 h, retraction into the shell was observed in 0.8 and 1 ppm Hg++; this retraction increased in these concentrations at 36 h. Retracted snails died if retained in the solutions, but generally recovered within 24 to 48 h if transferred to uncontaminated sea water. Immersion-emersion behaviour and interface activity were studied over 24 h by means of an aktograph; snails in normal sea water spent more time below than above the water surface, and exhibited frequent periods of activity. Exposure to mercuric sulphate at concentration of 0.25, 0.5, 0.8 and 1 ppm Hg++ progressively reduced both the length and frequency of activity periods. From 0.5 ppm Hg++ upwards, emersion periods increased, and immersion periods decreased. Oxygen consumption of snails was measured in sea water and in mercuric sulphate at concentrations of 0.2, 0.5, 0.8 and 1 ppm Hg++. Oxygen consumption decreased significantly with each progressive rise in mercury concentration. It is considered that mercury affects M. articulata by interfering with respiration, initially reducing interface activity, then forcing the snail for longer and longer periods out of the water. (Katz)
W78-02693

EFFECTS OF TEMPERATURE ON THE MORTALITY AND GROWTH OF HAWAIIAN REEF CORALS,
Hawaii Inst. of Marine Biology, Honolulu.
P. L. Jokiel, and S. L. Coles.
Marine Biology, 43(1977), p 201-208. 4 tab, 3 fig, 28 ref.

Descriptors: *Coral, *Temperature, *Bioassay, Mortality, *Hawaii, *Reefs, Water pollution effects, Thermal pollution, *Thermal stress, Thermal water, Animal physiology, Invertebrates, Pacific Ocean, Laboratory tests, Sea-water, Animal physiology, *Hawaiian reef corals, Pocillopora, Montipora, Fungia, Continuous flow bioassay, Clacification.

Three common species of Hawaiian reef corals, Pocillopora damicornis, Montipora verrucosa, and Fungia scutaria, were grown in a temperature-regulated, continuous-flow sea water system. The skeletal growth optimum occurred near 26C, coinciding with the natural summer ambient temperature in Hawaii, and was lowest at 21 to 22C, representing Hawaiian winter ambient. Levels of approximately 30C eventually caused loss of photosynthetic pigment, increased mortality, and reduced calcification. Corals lived only 1 to 2 weeks at 18C. The corals showed greater initial resistance at the lower lethal limit, but ultimately low temperature was more deleterious than high temperature. Results suggest that a decrease in the natural water temperature of Hawaiian reefs would be more harmful to corals than a temperature increase of the same magnitude. (Katz)
W78-02694

SOME LABORATORY CULTURED CRUSTACEANS FOR MARINE POLLUTION STUDIES,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
For primary bibliographic entry see Field 5A.
W78-02695

UPTAKE OF CADMIUM AND LEAD BY A ROOTED AQUATIC MACROPHYTE (ELODEA CANADENSIS),
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.
R. A. Mayes, A. W. McIntosh, and V. L. Anderson.
Ecology, Vol. 58, p 1176-1180, 1977. 3 tab, 2 fig, 15 ref.

Descriptors: *Path of pollutants, *Rooted aquatic plants, *Cadmium, *Lead, *Trace elements, *Absorption, *Aquatic plants, *Sediments, *Water pollution sources, Heavy metals, Metals, Submerged plants, On-site investigations, Elodea, Bioaccumulation, Mineral cycling.

The role of roots in the uptake of nonessential trace metals by aquatic macrophytes was investigated using Elodea canadensis. Plants were grown in 2 lakes in which metal concentrations in the water differed. Specimens in each lake were anchored in either control sediment or in sediment contaminated with Cd and Pb. Plants grown in the same water but in sediment from different sources had significantly different concentrations of the 2 metals. Elodea samples rooted in sediments from the same source but grown in water with different levels of metals also accumulated significantly different amounts of Cd and Pb. Thus the importance of both sediment and the surrounding water as sources of metals for aquatic plants was demonstrated. Samples grown in water and sediments containing low levels of metals had minimal concentrations of 0.32 microg/g Cd and 5.2 microg/g Pb, while plants grown in metal-contaminated water and sediment accumulated up to 32.33 microg Cd/g and 160.9 micro Pb/g. (Katz)
W78-02696

PHYSIOLOGICAL RESPONSE OF JUVENILE STRIPED BASS, MORONE SAXATILIS, TO LOW LEVELS OF CADMIUM AND MERCURY,
National Marine Fisheries Service, Milford, CT. Experimental Biological Investigations.
M. A. Dawson, E. Gould, F. P. Thurberg, and A. Calabrese.
Chesapeake Science, Vol. 18, No. 4, p 353-359, December 1977. 2 fig, 2 tab, 29 ref.

Descriptors: *Cadmium, *Mercury, *Heavy metals, *Striped bass, *Bioassay, *Enzyme, Biochemistry, Environmental effects, *Fish physiology, Respiration, Animal physiology, Metals, Commercial fish, Sport fish, Bass, Estuarine fisheries, Inhibitors, Toxicity, Morone, Enzyme activity, Sublethal effects.

Juvenile striped bass, Morone saxatilis, were exposed to 0.5, 2.5, and 5.0 parts per billion (ppb) cadmium chloride for 30-90 days and to 1.0, 5.0, and 10.0 ppb mercury as mercuric chlorides for 30-120 days. Following the longest exposure to each metal, the fish were allowed to recover for 30 days in running seawater. Gill-tissue respiration, glucose-6-phosphatase, malic enzyme, aspartate aminotransferase, and magnesium activation of AAT were measured. Animals exposed to wither metal exhibited changes in gill-tissue respiration. There was no significant difference in enzyme activity during exposure to either metal; however, fish cleared for 30 days following exposure to cadmium exhibited a slight drop in liver AAT and G6PdH. (Katz)
W78-02697

EFFECT OF PHOSPHAMIDON ON HEPATIC AND RENAL CATALASE OF A FRESHWATER BONY FISH,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
P. C. Thomas, and T. L. Murthy.
Indian Journal of Fisheries, Vol. 21, No. 2, p 594-597, 1974. 1 tab, 10 ref.

Descriptors: *Organophosphorus compounds, *Pesticides, *Freshwater fish, *Fish physiology, *Toxicity, *Enzymes, *Organophosphorous pesticides, Organic compounds, Laboratory tests, Analytical techniques, Proteins, Biochemistry, Inhibitors, Metabolism, Inhibition, Enzymes, Phosphamidon, Tissue analysis, Catalases, Hepatic catalase, Renal catalase, Bioaccumulation.

Results obtained from invivo experiments indicated that catalase activity in liver and kidney were reduced remarkably by the action of phosphamidon. Invivo inhibition of hepatic and renal calase were 30.9% and 28.5% respectively. Studies on the invitro effect of phosphamidon (50 micro l/ml in the final dilution) indicated 53.9% and 65.3% inhibitions of the enzyme activity in the liver and kidney homogenates. It was concludes that phosphamidon was a partial inhibitor of the enzyme catalase. There was no significan change in hemoglobin content of blood from treated and control fishes. (Klein)
W78-02698

RELATIONSHIP OF SCARLET PRAWNS (PLESIOPENAEUS EDWARDSIANUS) TO A BENTHIC OIL DEPOSIT OFF THE NORTH-WEST COAST OF ARUBA, DUTCH WEST INDIES,
National Marine Fisheries Service, Miami, FL. Southeast Fisheries Center.
H. C. Thompson, Jr, R. N. Farragut, and M. H. Thompson.
Environmental Pollution, Vol. 13, p 239-253, 1977. 4 fig, 2 tab, 42 ref.

Descriptors: *Crustaceans, *Commercial shellfish, *Oil, *Oil pollution, *Organic compounds, Metabolism, Toxicity, Sampling, Benthos, Analytical techniques, Oil industry, Productivity, *Shrimp, Commercial shellfish, Scarlet prawns, Prawns, Plesiopenelaeus edwardsianus, Tissue analysis, Paraffins, Bioaccumulation, Dutch West Indies, Aruba.

Catch data resulting from sampling efforts off the north-west coast of Aruba, Dutch West Indies, demonstrated a greater catch rate of crustacea in areas where benthic oily material was collected as compared to adjacent areas where there was no oil. Scarlet prawns (Plesiopenaeus edwardsianus) were three times more abundant in the areas where benthic oil was found. They contained no isoprenoid hydrocarbons of the type common to most biological material or the type common to petroleum. However, they did contain an unusual n-paraffin hydrocarbon series (n-C22, n-C25, n-C28, n-C31, n-C34), and in the areas where the benthic oily material was collected the prawns contained much greater quantities of the five n-paraffins given in the above sequence. A probable explanation for the greater abundance of crustacea in the area affected by the oily material was discussed. The accumulation and metabolism of hydrocarbons by marine organisms and how these processes relate to scarlet prawns were also discussed. (Klein)
W78-02699

SILVER IN SOILS, STREAM SEDIMENTS, WATERS, AND VEGETATION NEAR A SILVER MINE AND TREATMENT PLANT AT MARATOTO, NEW ZEALAND,
Massey Univ., Palmerston North (New Zealand). Dept. of Chemistry, Biochemistry and Biophysics.
For primary bibliographic entry see Field 5B.
W78-02700

5D. Waste Treatment Processes

HIGH NITRATE DENTRIFICATION IN CONTINUOUS FLOW-STIRRED REACTORS,
Oak Ridge National Lab., TN.
C. W. Francis, and J. B. Mankin.
Water Research, Vol 11, No 3, p. 289-294, 1977. 4 fig, 3 tab, 14 ref.

Descriptors: *Nitrates, *Denitrification, *Waste water treatment, Kinetics, Continuous flow, Industrial wastes, Fuels, Waste treatment, Equations, Coal, Biological treatment, *Continuous flow-stirred reactors.

Continuous flow-stirred reactors were used to determine the maximum denitrification specific removal rate for NH4NO3, CaNO3, and UO2 solutions from fuel fabrication waste water. UO2 fuel fabrication plants using the ammonium diuranate UO2 recycling process may generate nitrate wastes as high as 25-50,000 g NO3/cu m. Biological denitrification in columns packed with fine particles of anthracite coal has been suggested as an effective method for nitrate removal from UO2 plant waste water. Denitrification kinetics are difficult to evaluate in such units because of the inverse relationship between the substrate nitrate concentration and the height of used to determine the maximum specific substrate nitrate concentration and the height of the upward flow column. Graphical solutions to the Lineweaver-Burk equations were mass per day (U sub max). For NH4No3 at nitrate substrate concentrations < 6 kg NO3/cu m, the value of U sub max was found to be 1.73/day. At concentrations > 6 kg NO3/cu m, a nonlinear relationship was observed, indicating nitrate substrate inhibition. Specific removal rates at nitrate concentrations > 6 kg NO3/cu m averaged < 1.0/day. Ammonia toxicity may have occurred, as the pH of the mixed liquor was near denitrification rates. (Lynch-Wisconsin)
W78-02217

TEMPERATURE EFFECTS ON BOD STOICHIMETRY AND OXYGEN UPTAKE RATE,
Caldwell Consulting Engineers, Walnut Creek, CA.
For primary bibliographic entry see Field 5B.
W78-02220

WASTEWATER TREATMENT AND REUSE BY THE SOIL-PLANT SYSTEM,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
J. R. Gilley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 595, Price codes: A02 in paper copy, A01 in microfiche. Nebraska Water Resources Center, Lincoln, Completion Report, October 1, 1977. 23 p, 6 fig, 6 tab, 6 ref. OWRT A-041-NEB(2), 14-34-0001-7058.

Descriptors: *Waste water disposal, *Water reuse, *Municipal wastes, Sewage effluents, Sprinkler irrigation, Infiltration, Waste water treatment, Irrigation practices, Land application, Soil profiles, Nitrogen.

An evaluation of irrigation management practices for land application of sewage effluent was made to determine the potential groundwater pollution by nitrate nitrogen resulting from effluent disposals. An average nitrogen removal rate of 58 percent was measured when applications (10.2 cm per week) well in excess of most crop needs were applied to soil columns with a layered soil profile. The layered soil profile created conditions favorable for the denitrification process which is important in minimizing the nitrogen movement to groundwater. No significant difference in nitrogen removal was obtained between treatments, when the application of 10.2 cm per week was divided among applications of one, two or five times a week. The frequency of applications in wastewater effluent would, therefore, be best determined by other factors such as problems with crop diseases, soil aeration and local climatic conditions.
W78-02223

U.S. ARMY CORPS OF ENGINEERS CLEVELAND-AKRON THREE RIVERS WATERSHED, WASTEWATER MANAGEMENT SURVEY SCOPE STUDY.
Wright-McLaughlin Engineers, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-02233

HYDROGEN SULFIDE PROBLEMS,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5F.
W78-02283

UNDERGROUND TANK USED FOR STORM WATER DETENTION.
For primary bibliographic entry see Field 8A.
W78-02296

WATER REUSE,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 3C.
W78-02297

STORM OVERFLOW DESIGNERS NEED GREATER FEEDBACK.
For primary bibliographic entry see Field 5B.
W78-02298

SEWAGE COLLECTION SYSTEM RELIEVES THREAT TO FLORIDA OYSTER INDUSTRY.
For primary bibliographic entry see Field 5G.
W78-02301

SEA BED INSTALLATION FOR SEWAGE PIPELINE.
For primary bibliographic entry see Field 5E.
W78-02302

SEWERAGE OUTFALL PROTECTED.
For primary bibliographic entry see Field 8G.
W78-02303

CAN THIS SEWER PROJECT HAVE RECREATIONAL BENEFITS,
Board of Water and Sewer Commission, Northborough, MA.
For primary bibliographic entry see Field 5G.
W78-02304

AN OLD BRICK SEWER FINDS A SILVER LINING,
For primary bibliographic entry see Field 8G.
W78-02305

SEWER REHABILITATION CUTS INFILTRATION,
For primary bibliographic entry see Field 8G.
W78-02307

I/I STUDY TURNS TO T. V.,
Larkin and Associates, Kansas City, MO.
For primary bibliographic entry see Field 8G.
W78-02308

BENEFITS FROM GROUTING AN ENTIRE SEWER SYSTEM,
Lower Allen Township Authority, Camp Hill, PA.
For primary bibliographic entry see Field 8F.
W78-02309

BEAM BEHAVIOR OF BURIED RIGID PIPELINES,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 8B.
W78-02310

BEACH, HIGHWAY AND SEWER PLAN ROLLED INTO ONE.
For primary bibliographic entry see Field 8D.
W78-02311

SEWERS VERSUS SEWERLESS METHODS--A REPORT BY A CONGRESSIONAL COMMITTEE,
For primary bibliographic entry see Field 5G.
W78-02312

R7-M JOHANNESBURG SEWER TUNNEL.
For primary bibliographic entry see Field 8F.
W78-02313

PLASTIC LINED CONCRETE CHANNEL FOR WASTE WATER PURIFICN. PLANT - ASSEMBLED FROM PREFABRICATED MODULAR ELEMENTS WITH SEALED PLASTIC JOINTS.
For primary bibliographic entry see Field 8F.
W78-02315

BIOLOGICAL PURIFICATION OF INDUSTRIAL AND DOMESTIC WASTE WATER - BY PERIODIC FLOODING OF FILTRATION BEDS TO A SPECIFIED DEPTH.
Soviet Patent SU 529-128. Issued December 14, 1976. Derwent Soviet Inventions Illustrated, Vol. Y, No. 37, p 5, October, 1977.

Descriptors: *Biological treatment, *Filtration, *Patents, *Oxidation, *Self-purification, Filters, Aerobic treatment, Sewage lagoons, Waste water treatment, Flooding.

A waste water treatment process which involves periodic flooding of filtration beds for municipal and industrial wastes has been patented. During the flooding period waste water is applied to a depth of 0.5-1.0 m relative to the depth of the filter bed, to increase treatment efficiency and equalize winter and summer performance. In later stages waste water is applied at a rate of 0.2-0.3 m until the initial depth of 0.5-1.0 m is reached on a daily loading basis of 300-500 cu m/hectare. The periodic nature of the flooding preserves aerobic conditions, inhibits the growth of microorganisms and other aquatic life, and insures the presence of algae in the water. Oxidation and self-purification in the bed is continuous through summer and winter. (Schulz-FIRL)
W78-02316

WASTE WATER FILTRATION PROCESS - WHICH DOES NOT BLOCK THE FILTER, EFFECTED BY SEQUENTIAL ADDN OF ALUMINATE, SILICATE AND AMMONIUM/POLYVALENT CATION SOURCE.
French Patent FR 2334-632. Issued August 12, 1977. Derwent French Patents Abstracts, Vol. Y, No. 39, p 5, November, 1977.

Descriptors: *Filtration, *Alumina, *Filters, *Patents, *Silicates, Coagulation, Waste water treatment.

In a recently patented waste water filtration process, 0.004-0.04 moles/liter of an alkali aluminate are added to the waste water, followed by 0.006-0.2 moles/liter of an alkali silicate, 0.001-0.2 moles of a soluble ammonium source and/or a source of soluble Ca, Mg, Fe, Al, Ba, Co, Cd, Sr,

and/or Cu. The waste water should have a pH of more than 5.5 before any chemicals are added. The treatment process, which uses readily available chemicals, does not block the filter and produces a highly dewatered complex of recovered solids for safe storage, handling, and benefical use. The filtrate which is produced is free from particulate matter, many dissolved substances, and microorganisms. (Schulz-FIRL)
W78-02317

PHOSPHATE STRIPPING OF SEWAGE.
Australian Patent 485,436. Issued August 11, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 47, No. 29, p 2674, August, 1977.

Descriptors: *Nutrient removal, *Activated sludge, *Phosphates, *Separation techniques, *Patents, Sludge treatment, Anaerobic conditions, Sewage treatment, Waste water treatment, *Phosphate removal.

A phosphate stripping process has been patented by the Union Carbide Corporation for use in conjunction with activated sludge treatment. Mixed liquor which includes phosphate-containing influent sewage and activated sludge passes through an aeration zone, where the BOD is reduced and microorganisms take up phosphate. The phosphate-enriched sludge is separated from the substantially phosphate-free supernatant and passed to a phosphate stripping zone, where anaerobic conditions are maintained to cause the release of the phosphate to the liquid phase of the settled sludge. The sludge containing the phosphate-enriched liquid is contacted with a lower phosphate content medium to remove the phosphate from the anaerobic sludge liquid phase. A portion of the sludge is returned to the phosphate stripping zone. (Schulz-FIRL)
W78-02318

GRAVITY DRAINAGE FILTER FOR SEWAGE SLUDGE ETC.--HAS SIMPLE UNBLOCKABLE OUTLET FOR DISCHARGING DEHYDRATED SLUDGE.
Belgian Patent BE 854-385. Issued September 1, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 36, p 3, October, 1977.

Descriptors: *Filters, *Dewatering, *Sludge treatment, Equipment, *Patents, Filtration, Sewage treatment, Waste water treatment.

The gravity drainage filter which has been patented consists of a vertically suspended, flexible tube of porous material such as textile fabric. The bottom of the fabric sleeve can be closed to form a container into which the sludge is poured, and is equipped with a dehydrated sludge outlet which can be opened to a diameter equal to the full width of the sleeve. The sleeve extends below the container bottom which is created by the clamping of internal and external rigid reinforcing rings. The sleeve extension is folded back onto itself to form an annular pocket, with the outer edge of the pocket forming a border which is attached to a mobile support ring. Opening and closing of the container bottom is accomplished by rotation of the mobile support ring relative to the reinforcing rings. (Schulz-FIRL)
W78-02319

INVENTORY OF ENERGY USE IN WASTEWATER SLUDGE TREATMENT AND DISPOSAL,
For primary bibliographic entry see Field 5E.
W78-02320

FILTER SYSTEM SUCCESSFUL.
For primary bibliographic entry see Field 8C.
W78-02321

OXYGEN AERATION ADDS TREATMENT CAPACITY, UPS EFFICIENCY.
The American City and County, Vol 92, No 8, p 55-56, August, 1977.

Descriptors: *Aeration, *Dissolved oxygen, *Aerobic treatment, *Dissolved oxygen analyzers, *Aerated lagoons, Oxidation lagoons, Sewage treatment, Oxygenation, Equipment, Design data, Activated sludge, Waste water treatment, Oxygen aeration, Wayne(NJ), Detroit(MI).

Applications of the Arico F(3)O (Forced Free Fall Oxygen) system to sewage aeration are described. An Airco Model 1000 is being used at the Sheffield Hills waste water treatment plant in Wayne, New Jersey, to provide 1000 lbs of oxygen to two aeration basins. A gas-tight concrete module containing an axial flow pump, a system of weirs, and a nozzle is submerged in the covered aeration basin with the pump intake below the surface. Sewage is drawn downward into a distribution well and through a zone of oxygen-rich gas. Oxygenated mixed liquor is then returned to the aeration basin via a nozzle-like orifice at the base of the module, and unabsorbed oxygen is recycled through the module. High dissolved oxygen levels in the basin are maintained by continuous cycling through the module. A high-purity oxygen treatment system produced by the FMC Corporation for use in uncovered aeration basins is described. Oxygen is transferred to waste water by a horizontal rotating diffuser. Diffuser impellers maintain mixing and solids suspension and a dissolved oxygen probe monitors mixed liquor oxygenation in the FMC system. (Schulz-FIRL)
W78-02322

ELECTRIC EQUIPMENT FOR MUKOGAWA RIVER SEWAGE TREATMENT PLANT,
Hanshin City Improvement Bureau, Hyogo (Japan).
For primary bibliographic entry see Field 8C.
W78-02323

BASIC CONCEPTS IN DISINFECTION WITH OZONE,
Miami Univ., Coral Gables, FL. Dept. of Civil Engineering.
S. Farooq, E. S. K. Chian, and R. S. Engelbrecht.
Journal Water Pollution Control Federation, Vol 49, No 8, p 1818-1831, August, 1977. 14 fig, 1 tab, 24 ref.

Descriptors: *Ozone, *Disinfection, *Microorganisms, *Acid bacteria, *Mycobacterium, Sewage bacteria, Activated sludge, Yeasts, Sewage treatment, Sludge treatment, *Waste water treatment, Candida parapsilosis, Mycobacterium fortuitum, Ozonation.

Inactivation studies with Candida parapsilosis and Mycobacterium fortuitum were conducted to examine the various parameters which might affect the disinfection efficiency of ozone in continuous flow systems. Parameters examined include pH, mixing, density of organisms, and organic matter. Results of laboratory studies indicated that the ozone residual in waste water controlled the degree of inactivation of microorganisms and that the presence of ozone bubbles enhanced disinfection. Greater ozone stability at low pH aided inactivation. Decreases in inactivation with more intense mixing were attributed to lower ozone residuals. Ozone demand and organism survival were greater at a high density of organisms, with more efficient disinfection at low densities. Studies on secondary waste water effluent with different fractions of organic material indicated that secondary effluents exerted much higher ozone demands than the deionized-buffered water which had been seeded with microorganisms for the laboratory studies. Greater ozone demands were observed for waste water which contained organic compounds with molecular weights in the fulvic acid range (150-18,000) than in the humic acid range (less than 150 or greater than 18,000). Low food:microorganism ratio in an activated sludge unit resulted in more efficient ozone disinfection. (Schulz-FIRL)
W78-02324

REDUCTION OF SALMONELLA, E. COLI, COLIFORMS AND FECAL STREPTOCOCCI BY CHLORINATION OF SEWAGE TREATMENT PLANT EFFLUENTS,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. voor Stralingsonderzoek.
E. H. Kampelmacher, A. W. Fonds, and L. M. Van Noorle Jansen.
Water Research, Vol 11, No 7, p 545-550, 1977. 9 tab, 5 ref.

Descriptors: *Salmonella, *Coliforms, *Streptococcus, *Chlorination, E coli, Sewage bacteria, Sewage treatment, Disinfection, Bioassay, Pollutant identification, Effluents, *Waste water treatment.

The reduction in bacteria during chlorination and phosphate removal was investigated for three sewage treatment plants in the Netherlands (Harderwijk, Elburg, and Bunschoten-Spakenburg). Influent samples from the facilities were monitored for Salmonella; effluent samples were measured for Salmonella, Escherichia coli, coliforms, and fecal streptococci. Concentrations of various Salmonella serotypes found in influent at the three facilities are listed. Concentrations of the serotypes in effluent before and after chlorination and in the receiving lake are presented. Disinfection efficiencies for Salmonella varied for the three plants, with the plant at Bunschoten-Spakenburg having the highest reduction (2.22 logs). The reductions in E. coli, coliforms, and fecal coliforms at the three plants were similar, and were dependent on the total residual chlorine content of the effluent. MPN's of E. coli, coliforms, and fecal streptococci in effluent before and after chlorination are presented for the three facilities. (Schulz-FIRL)
W78-02325

BATCH AEROBIC TREATMENT OF A COLLOIDAL WASTEWATER,
Worcester Polytechnic Inst., MA. Dept. of Civil Engineering.
H. A. Kharajian, and J. H. Sherrard.
Journal Water Pollution Control Federation, Vol 49, No 9, p 1985-1992, September, 1977. 6 fig, 2 tab, 9 ref.

Descriptors: *Activated sludge, *Stabilization, *Degradation(Decomposition), *Aerobic treatment, *Colloids, Chemical oxygen demand, Biodegradation, Organic loading, Oxygen requirements, Flocculation, Analytical techniques, Biological treatment, Sludge treatment, *Waste water treatment, Contact stabilization.

Treatment with contact stabilization, a modification of the activated sludge process, is normally indicated for waste water containing a large percentage of colloidal organic matter. Since the percentage of colloids may indicate that contact stabilization processes are necessary for a given facility, studies were conducted to determine whether there was a substantial release of substrate after an initial rapid uptake. Batch experiments were used to examine the biodegradation of waste water as a function of its percentage of colloidal material, based on a test for chemical oxygen demand. Colloid concentrations of 0, 23, 43 and 54% were prepared by adding beef extract and yogurt to synthetic sludge. Initial loading conditions were 0.158-1.083 mg/liter COD per mg/liter MLSS. Samples collected at various time intervals were analyzed for COD, MLSS, and oxygen uptake. No immediate uptake and substantial organic material were noted with concentrations under 54%. Biodegradation was similar to that of the soluble substrate. (Schulz-FIRL)

W78-02326

DALLAS PAYS THE PRICE OF CLEANER EFFLUENT,
Dallas Water Utilities Dept., TX.
I. M. Rice, and C. A. Mauck.
Water and Wastes Engineering, Vol 14, No 9, p 42-45, September, 1977.

Descriptors: *Activated sludge, *Filtration, *Tertiary treatment, *Trickling filters, *Settling basins, Aeration, Biological treatment, Aerobic treatment, Treatment facilities, Texas, Equipment, Municipal wastes, *Waste water treatment, Dallas(TX).

The 1-mgd Dallas Wastewater Reclamation Research Center was constructed to provide design data for an advanced waste water treatment plant needed by the city of Dallas. Data obtained during the first year of operation of the Research Center indicated that treatment with the completely-mixed activated sludge process, followed by filtration before discharge into the Trinity River, was probably the most economical and efficient method of treatment for the proposed expanded facilities at the Dallas Central Wastewater Treatment Plant. In the expansion of the Central plant from a capacity of 100 mgd with secondary treatment to a capacity of 150 mgd with tertiary treatment, the addition of the completely-mixed activated sludge process followed by mixed media filters resulted in an effluent with less than 10 mg/liter BOD and 10 mg/liter total suspended solids. A 180-mgd capacity pumping station pumps effluent from the secondary treatment facility to a series of splitter boxes which divert the flow to 12 aeration basins. Each 70 x 26-ft aeration basin is equipped with four 75-hp mechanical surface aerators. Twelve associated sedimentation basins which remove the suspended solids are equipped with scum and sludge removal equipment. A 4.5-million-gal aerobic digester treats waste activated sludge and scum from the sedimentation basins. An emergency settling basin was constructed to provide 5 hrs of additional settling time under high flow conditions. Chemically treated effluent is filtered with 14 mixed media filters before discharge to the Trinity River at the White Rock pump station. (Schulz-FIRL)
W78-02328

FOREWORD, OZONE SYMPOSIUM,
Air Products and Chemicals, Inc., Allentown, PA.
J. C. Tao, and C. S. McDowell.
AIChE Symposium Series, Vol 73, No 166, p 186-187, 1977. 10 ref.

Descriptors: *Ozone, *Disinfection, *Chemical reactions, *Chlorination, *Toxicity, Municipal wastes, Industrial wastes, Environmental effects, *Waste water treatment.

Various aspects of the use of ozone for disinfection of municipal and industrial waste water are discussed. The possible toxicity and carcinogenicity of compounds produced during chlorination have led to research into alternative means of disinfection. Studies on chemical reactions occurring between waste water constituents and ozone and on the environmental effects of ozonated effluents are described. The effects of pH, temperature, and the presence of ammonia in the waste water on ozone disinfection efficiency are discussed. The use of ultraviolet light or ultrasound in conjunction with ozone to degrade organic materials is described for waste waters which contain particularly toxic or resistant substances. Design criteria, cost-effectiveness, and disinfection efficiency requirements which may influence the application of ozone as a disinfectant are discussed. (Schulz-FIRL)
W78-02329

EFFECT OF SEWAGE TREATMENT BY STABILIZATION POND METHOD ON THE SURVIVAL OF INTESTINAL PARASITES,
King Inst. of Preventive Medicine, Gindy (India).
K. M. Veerannan.
Indian Journal of Environmental Health, Vol 19, No 2, p 100-106, April, 1977. 1 tab, 24 ref.

Descriptors: *Animal parasites, *Sewage treatment, *Oxidation lagoons, *Disinfection, *Public health, Sewage lagoons, Treatment facilities, On-site data collections, Waste water treatment, Madras(India), Entamoeba coli, Entamoeba histolytica, Ascaris lumbricoides, Enterobius vermicularis, Giardia lambia.

The survival of pathogenic intestinal parasitic protozoans and helminths in sewage stabilization ponds was evaluated in a sampling program at three stabilization pond sites near Madras, India. Each pond held waste water from a different source: a tuberculosis sanatorium, the Indian Institute of Technology, and the Kodungaiyur sewage farm. Composite samples of sewage before and after treatment were collected bi-weekly throughout the study. Concentrations of Entamoeba coli, Entamoeba histolytica, Giardia lambia, Ascaris lumbricoides, and Enterobius vermicularis were measured in samples of pond influent and effluent. The study results indicated that the concentration of protozoan cysts and ova varied up to 844/liter and that removal efficiencies ranged from 38.5% at the Indian Institute of Technology to 100% at the sanitorium. A comparison of relative removal efficiencies for various organisms indicated the stabilization pond at the sanitorium in Tambaram was more efficient at removing protozoan cysts, while the pond at Kodungaiyur was more efficient at removing helminthic ova. (Schulz-FIRL)
W78-02330

PROCESS ARRANGEMENTS FOR ION EXCHANGE AND ADSORPTION,
California Univ., Berkeley. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5F.
W78-02331

JET FLUID GAS/LIQUID CONTACTING AND MIXING,
Houdaille Industries, Inc., Ceder Falls IA. Penberthy Div.
M. G. Mandt, and P. R. Bathija.
AIChE Symposium Series, Vol. 73, No. 167, p 15-22, 1977. 9 fig, 8 ref.

Descriptors: *Aeration, *Mixing, *Eddies, *Circulation, Equipment, Mass transfer, Flow measurement, Gases, Bubbles, Aerobic treatment, Mathematical studies, Model studies, Equations, Waste water treatment, Jet mixers, Jet gas/liquid contactors, Directional mix jet systems.

The use of jet gas/liquid contactors in tank mixing systems to enhance the gas-liquid interface was investigated in a testing program with the Eddy Mix Jet System. The system consists of a series of gas jets mounted in a radial pattern or cluster on the unit. A plume in which small bubbles have been entrained is injected into the mixing tank. The plume momentum produces eddy currents which force tank turnover and increase mass transfer. The Eddy Mix Jet System was evaluated in a testing facility equipped with 12-, 30-, and 55-ft diameter tanks. Flow velocity was measured at various jet submergence depths and air flow rates. A series of equations to describe flow characteristics in the basin with respect to basin design, jet position, and operating parameters are presented. An example in which the expected turn time, total pumpage, and average velocity are calculated is presented for a 50-ft diameter basin with a 22-ft side water depth and a 12-jet cluster. The directional mix jet system in which jet gas/liquid contactors are arranged longitudinally along the axis of a closed loop flow channel is described. A series of equations to estimate channel velocity at given operating parameters and design data is presented. A method for calculating the total loss coefficient is presented. (Schulz-FIRL)
W78-02332

EPA RELAXES ITS STANDARDS ON SEWAGE SETTLING PONDS.
For primary bibliographic entry see Field 5G.
W78-02333

SOLID-LIQUID SEPARATION: AN OVERVIEW,
Houston Univ., TX. Dept. of Chemical-Petroleum Engineering.
For primary bibliographic entry see Field 5G.
W78-02334

UV-OX(TM) PROCESS FOR THE EFFECTIVE REMOVAL OF ORGANICS IN WASTEWATERS,
Westgate Research Corp., Marina del Rey, CA.
J. D. Zeff.
AIChE Symposium Series, Vol. 73, No. 167, p 206-220, 1977. 8 fig, 5 tab, 7 ref.

Descriptors: *Ozone, *Oxidation, *Irradiation, *Ultraviolet radiation, *Organic wastes, Urea, Pilot plants, Design data, Disinfection, Tertiary treatment, Operation and maintenance, Industrial wastes, Municipal wastes, Water treatment, Waste water treatment.

The UV-OX(tm) process was developed for the oxidation of dissolved organics, particularly refractory organic compounds in waste water. The process is based on a combined ozonation-irradiation process. The water is agitated at high speed and irradiated by 253.7-nm UV light which is also used to produce ozone. Background information is presented for various methods of decomposition and oxidation, including photochemical decomposition, ozone oxidation, ionic oxidation, free radical oxidation, and ultraviolet-ozone oxidation. Laboratory tests are used to evaluate the system for the degradation of selected organic compounds, including hydroquinone, pyrogallol, xylenol, sodium acetate, and urea. Batch and continuous tests are conducted with a modified reactor and synthetic waste water. The process efficiency was measured in terms of the amount of energy required to completely oxidize each mg of carbon per liter. Process variables which may affect performance include residence time, ozone concentration, ozone mass flow, ultraviolet intensity, and total organic carbon concentration. A stimulated, two-stage continuous system was used to determine the maximum total organic carbon efficiency:ozone efficiency with minimum expenditures of ultraviolet energy. The effects of ultraviolet intensity and the reactor diameter were also examined. An evaluation of process scale-up requirements indicated that to treat 100,000 gal/day, 210 reactor units with six 43-watt lamps per unit would be required and daily operating costs would be approximately $72.33. (Schulz-FIRL)
W78-02335

BIOLOGICALLY ACTIVE FILTER COMBINED WITH ENZYME TREATMENT,
MicroChem Development Lab., Stockholm (Sweden).
M. E. Refaat.
AIChE Symposium Series, Vol. 73, No. 167, p 166-171, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Filtration, *Porous media, *Trickling filters, *Enzymes, *Catalysts, Anaerobic conditions, Biological treatment, Filters, Biochemical oxygen demand, Chemical oxygen demand, Municipal wastes, Industrial wastes, *Waste water treatment, Anaerobic fiber bundle filter, Extracellular enzymes.

A waste water treatment process in which anaerobic treatment is improved by the addition of a rapid enzyme-enhanced filter is described. The process is based on the anaerobic fiber bundle filter, a packed bed of individual fibers supported at the top of the filter. The low-weight fiber bundle material can be used in beds up to 120 cm in height without the need for supporting intermediate partitions. In comparison to the conventional stone media used in trickling filters, the fibrous material has a surface area 2-3 times greater, and due to the large free volume can handle high organic loadings. Extracellular enzymes added to the filter act as catalysts during the anaerobic processes. Municipal wastes, waste activated sludge, and waste water from a polyvinyl acetate manufacturing plant were used in an evaluation of the anaerobic filter system. The construction of the filter reactor, fiber pretreatment, enzyme production, operating parameters, cleaning, and analyses of filtrate are described. COD, BOD, and turbidity in the filtrate were used to evaluate filter performance. Tests with the enzyme-anaerobic filter system indicated that flow resistance did not increase during filter operation and that the stabilization capacity of the system was 9.1 g COD/sq m per hr. The addition of extracellular enzymes increased both the BOD and COD removal rates. The BOD in the filter bed decreased with depth and the COD fluctuated, indicating continuous biologic activity through the filter. (Schulz-FIRL)
W78-02336

DEWATERING MACHINE SOLVES SLUDGE DRYING PROBLEMS,
Water Pollution Control Dept. Medford, NJ.
B. W. Eichmann.
Water and Sewage Works, Vol. 124, No. 10, p 99-100, October, 1977. 1 tab.

Descriptors: *Filters, *Dewatering, *Sludge treatment, *Filtration, Equipment, Flocculation, Suspended solids, Costs, Municipal wastes, Waste water treatment, Sludge dewatering, Belt filter press, Coil spring vacuum filter, Medford Township(NJ).

Medford Township, New Jersey, has installed a belt filter press to dewater aerobically digested sludge resulting from contact stabilization. The waste water treatment plant in Medford includes two 500,000-gpd contact stabilization units to handle a flow of 0.9 mgd. The belt filter press, Flocpress, manufactured by Infilco Degremont Inc. of Richmond, Virginia, is used in addition to an existing coil spring vacuum filter which was left in place for emergency situations. The installation of the Flocpress allowed dewatering of sludge in one shift 3-4 days per week. The belt filter press results in 98% solids capture with a filtrate suspended solids of less than 100 ppm as compared to 1000-2000 ppm produced with the coil filter. Flocpress also requires a smaller dosage and horsepower for operation than the coil filter. In the dewatering process, polymer conditioned sludge is fed to the flocculator and is then spread across a slow-moving, woven synthetic fiber belt. After compression, a flexible scraper or doctor blade removes the sludge from the conveyor belt. Schematic diagrams for the Flocpress sludge dewatering unit and the sludge handling system are presented. An operating log for 1976 is presented for sludge quantities handled, costs, and polymer dosages. (Schulz-FIRL)
W78-02337

SOLAR ENERGY USED TO CONVERT WASTEWATER TO PROTEIN.
Water and Wastes Engineering, Vol. 14, No. 10, p 37, October, 1977.

Descriptors: *Feeds, *Algae, *Sewage treatment, *Oxidation lagoons, *Photosynthesis, *Nutrient removal, Pulp wastes, Pilot plants, Australia, Waste water treatment, *Proteins, Algae harvesting.

Brown and Caldwell has developed a system in which a waste water substrate and solar energy are used to produce a high-quality single cell protein harvested in the form of algae and a usable liquid effluent. Primary treated waste water is subjected to secondary treatment in shallow, high-rate oxidation ponds and the resulting algae is harvested with a device which uses a paper-precoated filter to entrap the dense algae product. In a year-long study in Melbourne, Australia, the initial objective was to use waste paper for the harvester belt fabric; used belts were then recycled as a composite feed for ruminant livestock, the paper providing roughage and energy and the algae providing protein. The algae-laden paper product was reported as having a protein content of 15% by weight. Problems associated with the smaller size of individual algae cells produced in winter and with the high cost of waste paper in Australia led to the development of a two-stage vacuum and rinsing cycle for the separation of algae from pond effluent. In this case a concentrated algae slurry is produced rather than a dried, algae-laden paper. The algae recovery system is recommended for situations where feed supplies are in demand and high-quality sewage treatment is indicated. (Schulz-FIRL)
W78-02338

RADIATION TREATMENT OF SLUDGE TO BE EXPLORED.
For primary bibliographic entry see Field 5E.
W78-02339

ORE. PLANT WILL MEET REQUIREMENTS.
Water and Wastes Engineering, Vol. 14, No. 10, p 77, October, 1977.

Descriptors: *Activated sludge, *Treatment facilities, *Trickling filters, *Energy, *Design data, Flocculation, Heat exchangers, Sludge treatment, Sewage treatment, Municipal wastes, Waste water treatment, Corvallis(OR).

The Corvallis municipal waste water treatment plant in the Willamette Valley in Oregon has been designed by Brown and Caldwell to meet effluent discharge requirements which call for not more than 10 mg/liter of BOD or suspended solids in treated effluents. In the treatment process at Corvallis diffused-air activated sludge process is designed for operation in three modes: sludge reaeration, step-feed, and conventional activated sludge. Existing trickling filters were incorporated into the activated sludge system to protect the system from shock loads. The secondary clarifiers are equipped with centerwell flocculators. An alum feed system is provided to insure adequate sludge settling characteristics. Energy requirements were considered in the design of the plant, and a heat recovery coil in the aeration air blower discharge line is used to provide heat in the operation and maintenance building. The plant has a design capacity of 10 mgd, which was created with hydraulic designs allowing the addition of the activated sludge process to increase the design flow rate from 5 to 10 mgd without repumping. (Schulz-FIRL)
W78-02340

DYE-SENSITIZED PHOTO-OXIDATION--A NEW APPROACH TO THE TREATMENT OF ORGANIC MATTER IN SEWAGE EFFLUENTS,
Volcani Inst. of Agricultural Research, Bet-Dagen (Israel). Dept. of Soil and Water.
A. J. Acher, and I. Rosenthal.
Water Research, Vol. 11, No. 7, p 557-562, 1977. 4 fig, 1 tab, 15 ref.

Descriptors: *Oxidation, *Organic wastes, *Chemical oxidation demand, *Dyes, *Solar radiation, Energy transfer, Bentonite, Coliforms, Effluents, Disinfection, Arid climates, Semiarid climates, *Waste water treatment, Photo-oxidation, Rose bengal, Methylene blue, Dye-sensitized photo-oxidation, Israel.

Sewage treatment with dye-sensitized photo-oxidation may be competitive with other methods of oxidation in climates with a large number of sunlight hours per day. The general mechanism of photo-oxidation by the combined action of visible light ant molecular oxygen on organic matter is described. Effluents from circulated oxidation ponds at municipal waste treatment plants in Haifa, Tel Aviv, and Nazareth in Israel were used in experiments on photo-oxidation with rose bengal (RB) and methylene blue (MB) as dye sensitizers. COD, fecal coliform counts, and suspended solids were used to evaluate oxidation efficiency. Initial experiments on the reduction of COD by the exposure of aerated sewage to solar radiation resulted in higher COD reductions with MB. A concentration of MB of 12 mg/liter resulted in the minimum COD values of 120 in sunlight and 112 in ultraviolet radiation. Decreases in removal efficiency above 15 mg MB/liter were attributed to reduced light penetration in the darker medium. Less effective removal below 10 mg MB/liter was attributed to decreases in the dissolved MB concentration by physical adsorption and chemical reactions. Studies on the effect of radiation time indicated that COD levels were constant after 60 min, and that coliforms were completely destroyed after 30 min. MB was successfully removed from treated effluent by adsorption onto bentonite. (Schulz-FIRL)
W78-02341

USE OF OZONE IN THE DISINFECTION OF COLIPHAGE T-7 VIRUS,
Abbott Labs., Crystal Lake, IL.
For primary bibliographic entry see Field 5F.
W78-02343

COMPOUNDS RESISTANT TO CARBON ADSORPTION IN MUNICIPAL WASTEWATER TREATMENT,
Weyerhauser Co., Tacoma, WA.
For primary bibliographic entry see Field 5A.
W78-02344

PRETREATMENT AND CLEANING OF HYPERFILTRATION (REVERSE OSMOSIS) MEMBRANES IN MUNICIPAL WASTEWATER RENOVATION,
Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
G. Belfort.
Desalination, Vol. 21, No. 3, p 285-300, September, 1977. 2 fig, 2 tab, 56 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Tertiary treatment, *Water reuse, *Operation and maintenance, Filtration, Membranes, Transport depletion, Osmosis, Municipal wastes, Liquid wastes, Waste water treatment.

Substances contained in municipal waste water such as BOD, COD, TOC, and suspended solids can contribute to membrane fouling when using reverse osmosis or hyperfiltration as a means of treating waste water for reuse. Alternative methods for pretreatment and cleaning of membrane surfaces used in municipal waste water treatment to reduce effects associated with fouling or flux decline in reverse osmosis are reviewed. The roles that various municipal waste water constituents play in membrane fouling are described. Pretreatment methods which can be used to remove hazardous constituents from the feed to extend membrane life include pH adjustments, chemical coagulation, filtration, activated carbon adsorption, chlorination, and ultrafiltration. Geometric considerations which may affect membrane operations are discussed, including brine channel dimensions, the shear rate at the membrane-brine interface, and the ease of cleaning for the various commercially available module designs. Criteria used in the selection of membranes for hyperfiltration are described for various types of waste water. Product-flux decline of

hyperfiltration membranes may be caused by membrane hydrolysis, compaction, and fouling. Physical, chemical, and other techniques for membrane cleaning are described. (Schulz-FIRL)
W78-02345

PHYSICOCHEMICALLY-AIDED BIOLOGICAL TREATMENT OF SEWAGE,
Bostock, Hill and Rigby, Birmingham (England).
S. H. Jenkins, M. Sane, and T. Wallbank.
Chemistry and Industry, Vol. 20, p 821-834, October, 1977. 13 fig, 9 tab, 13 ref.

Descriptors: *Activated sludge, *Lime, *Coagulation, *Pilot plants, *Tertiary treatment, Activated carbon, Magnesium, Color, Filtration, Heavy metals, Nutrient removal, Industrial wastes, Municipal wastes, *Waste water treatment, Manchester(UK).

A pilot plant for physicochemically-aided biological treatment at the Davyhulme Works in Manchester, England, was constructed to handle an average waste water flow of 382,000 cu m/day, of which 100,000 cu m/day is of industrial origin. Process units in the seven modes of operation tested include primary sedimentation with sludge extraction; activated sludge treatment; final clarification; flash mixing and flocculation facilities for pH control and chemical coagulation; intermediate clarification; activated carbon adsorption; automatic pH control with lime and HCl; provisions for the addition of at least three chemical coagulants at any one time; automatic sampling of raw and treated waste water throughout the plant; and primary and secondry sludge holding vessels. After a viable activated sludge process was established, studies focused on tertiary treatment of activated sludge effluent and the effects of lime and magnesium on sewage. Primary and tertiary lime sludges and return activated sludges produced during various modes of operation were measured for dry solids content, heavy metals, capillary suction time, filtration resistance, and volume. Tertiary treatment of the activated sludge effluent included sand filtration and activated carbon adsorption. Results of operation of the pilot plant from August 1975 to February 1977 are presented. Studies on lime addition indicated that addition of lime to raw sewage was more effective at reducing BOD, COD, and suspended solids in the final effluent than addition to activated sludge effluent. Removal of heavy metals, ammonia, and phosphorus were also investigated during various stages of treatment. (Schulz-FIRL)
W78-02346

CONTACT FILTRATION FOR PHOSPHORUS REMOVAL,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
M. Kavanaugh, J. Eugster, A. Weber, and M. Boller.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2157-2171, October, 1977. 8 fig, 6 tab, 25 ref.

Descriptors: *Filtration, *Nutrient removal, Phosphorus, *Porous media, *Chemical precipitation, Flocculation, Polymers, Suspended solids, Filters, Flow rates, SeparatioN technique, Municipal wastes, *Waste water treatment, Contact filtration, *Phosphorus removal.

Pilot studies on the use of granular media filtration for removal of particulate phosphorus and organic carbon following mechanical-biological treatment are presented. Objectives of the studies were to examine the effects of filter media design, filtration rate, and chemical addition on the performance of granular media filters used for phosphate removal following precipitation; and to evaluate process feasibility of contact filtration for municipal waste water treatment. The study concluded that contact filtration was a viable alternative to coagulation/sedimentation or flotation, but the permissible influent filter solids concentration was dependent on the individual situation. The addition of a polyelectrolyte such as a non-ionic polymer was necessary to increase the shear resistance of flocculant solids to produce adequate solids retention. Solids removal with the three-layer and two dual-media filters was greater than 95% in runs of approximately 6 hr. Removal efficiencies were increased with an increase in the upper:lower medium depth ratio which produced a decrease in the time-averaged rate of headloss increase. Inverse relationships were observed between filtration rate/break through time and the time to exhaust available head. Sand, anthracite, and pumice comprised the media used in the three-layer filter, and sand-anthracite and sand-Magnofilt were used in the dual-media filters. Of the media tested the porous granular solids, pumice and Magnofilt, exhibited lower solids capacities than anthracite at a given filtration rate and size fraction. (Schulz-FIRL)
W78-02347

FACTORS INFLUENCING ACTIVATED SLUDGE PROPERTIES,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
J. T. Novak, H. Becker, and A. Zurow.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 815-828, October, 1977. 17 fig, 30 ref.

Descriptors: *Dewatering, *Sludge treatment, *Polymers, *Coagulation, *Filtration, Activated sludge, Chemical reactions, Aeration, Dissolved oxygen, Clays, Particle size, Waste water treatment.

In studies with sludge conditioners, cationic polymers greatly improved sludge filtration rates while anionic polymers decreased rates, indicating that activated sludge probably contained an excess of anionic polymers. An increase in filtration rate with additions of kaolinite which was more apparent with fine clay than coarse clay suggested that the anionic polymers were of large enough molecular weight for interparticle bridging. Aeration of the activated sludge initially improved filtration rate and decreased the concentration of extractable biopolymers. Studies conducted to develop a method for estimating polymer concentrations in solution on the basis of electrophoretic mobility indicated that maximum filtration rates occurred with zero colloid charge, and that the optimal polymer dose was dependent only on the supernatant liquor volume and not on the sludge solids concentration. Aeration of activated sludge in a plug flow basin was used to examine the effects of anaerobiosis on sludge characteristics. Data suggested tha anaerobiosis increased polymer concentrations and decreased filtration rates. The lower optimal cationic polymer dose and filtration times observed during aeration with oxygen instead of air verified the influence of dissolved oxygen concentrations in aeration basins on the natural polymer decay rate. Experiments on sludge thickening indicated that calcium carbonate and clay were capable of drastically increasing sludge settling velocities, and that every method of sludge conditioning to improve filtration also improved sludge settling. (Schulz-FIRL)
W78-02348

NEW SLUDGE DIGESTORS AT MARITZBURG.
The Civil Engineer in South Africa, Vol. 19, No. 9, p 195-196, August, 1977.

Descriptors: *Treatment facilities, *Sludge digestion, *Construction materials, *Design data, *Sludge treatment, Sewage treatment, Foreign countries, Equipment, Waste water treatment.

International Combustion (Africa) Ltd. was contracted by the city of Pietermaritzburg in South Africa to design and construct facilities to increase the capacity of the Darvill Sewage Purification Works from a dry-weather flow of 27 million liters/day to a capacity of 54 million liters/day, with provisions for later expansion to 117 million liters/day. Since conventional sludge digestion followed by drying beds required too much land and was ineffective during periods of high rainfall in the area, high-rate digestion of sludge and treatment of settled sludge by activated sludge processes were chosen. The facility includes two 9-story high, 4500-cu-m, high-rate digestors which were developed by Messrs Oswald Schultze of Germany and constructed by Bridge and Structures Ltd. The egg-shaped design of the digestors and the fact that they will be completely filled at all times should minimize scum formation. Construction of the digestors was accomplished in three stages: a lower conical section below ground, a median double-curved section, and an upper conical super structure. A six-sector shuttering system was used to pour the double-curved section. The method designed by Messrs Oswald Schultze uses an internal curved shutter, springing from a central trunnion axis with adjustable jacks to locate the inner curve of the surface. The digestors utilize a sludge retention time of 26 days, injection of influent raw sludge into the continuously circulating flow of heated sludge, and recovery of methane. (Schulz-FIRL)
W78-02349

PUMP APPLICATIONS IN SEWAGE SLUDGE DEWATERING PROCESSES,
For primary bibliographic entry see Field 8C.
W78-02350

AREAWIDE WASTEWATER MANAGEMENT FOR METROPOLITAN DES MOINES,
Kirkham Michael and Associates, Omaha, NE.
For primary bibliographic entry see Field 5G.
W78-02351

LIQUID WASTE EFFLUENT INSTALLATION UNVEILED IN FLA.
For primary bibliographic entry see Field 5E.
W78-02352

IMPROVING SLUDGE FILTER PERFORMANCE.
Water and Waste Treatment, Vol. 20, No. 9, p 36, September, 1977. 1 fig.

Descriptors: *Filtration, *Filters, *Sludge treatment, *Dewatering, *Flocculation, Sewage treatment, Equipment, Waste water treatment, Performance.

Chemical conditioning has been used to reduce sludge volume so that sludge dewatering equipment can be used to its full potential. Laporte Industries Ltd. in Widnes, England, provides two flocculants, aluminum chlorohydrate and Lapofloc P.A.C., for use in the water and waste water treatment industries at 15% (w/w) and 10% (w/w) A1303, respectively. Lapofloc, a polyelectrolyte, is suggested for use with secondary sludges. Conditioning of sludge on a rotary vacuum filter designed to use aluminum chlorohydrate with 2.6% A1203 and 10% lime provided a yield of 1.8 lg/sq ft/hr, while conditioning with Lapofloc at a dose level of 1.5% A1203 produced a cake discharge of 2.5 lb/sq ft/hr. The addition of hydrogen peroxide, available from Interox Chemicals Ltd., a joint Laporte-Solvay company, suggested for alleviation of problems associated with the production of hydrogen sulfide during sludge handling. (Schulz-FIRL)
W78-02353

HOSPITAL'S WASTE.
For primary bibliographic entry see Field 8C.
W78-02354

MAINE'S PERSPECTIVE ON COMPOSTING TOILETS AND ALTERNATE GREYWATER SYSTEMS,
Maine Dept. of Human Services, Augusta. Div. of Health Engineering.
For primary bibliographic entry see Field 5E.
W78-02355

FACTORY-BUILT PLANTS AID EXPANSION PLANS,
Reclamation Center, Carol Stream, IL.
G. Schnulle.
Public Works, Vol. 108, No. 11, p 73-74, November, 1977. 1 fig.

Descriptors: *Activated sludge, *Treatment facilities, *Water reuse, *Construction materials, Filters, Tertiary treatment, Municipal wastes, Industrial wastes, Waste water treatment.

Three steel factory-built units manufactured by Smith and Loveless Division of Ecodyne Corporation were used in the construction of waste water treatment facilities which included secondary treatment followed by tertiary treatment with filtration. Each unit includes an activated sludge contact-stabilization chamber and integral arrangements for sludge reaeration, settling, and aerobic digestion. The units, which have capacities of 1.0, 1.0, and 0.5 mgd, were designed with concentric circular shells. After aeration and retention for 4-5 hrs, waste water flows by gravity to a clarifier in the center of each unit where it is retained for 4-5 hrs. The settled sludge is then pumped to either the aerobic digester or reaeration section. Clarifier overflow passes to one of three concrete settling tanks and then to one of six dual-media filters which contain anthracite and sand. Filter backwash is recycled through the plant and the effluent is disinfected with chlorination before discharge to Klein Creek. A belt filter press with an integral chemical conditioning unit is used to dewater the sludge to a solids concentration of 10-12%. The sludge cake is disposed by landfilling. While the domestic wastewater has an average BOD of 250 mg/liter and suspended solids of 200 mg/liter, the plant also receives 0.7 mgd of waste water at a BOD of 350 mg/liter from a nearby industrial park which includes a jam and jelly manufacturer. BOD and suspended solids in the final effluent average 1-2 mg/liter, and ammonia about 0.4 mg/liter. (Schulz-FIRL)
W78-02356

KEEP YOUR DIGESTER IN GOOD SHAPE,
Church and Dwight Co., Inc., Piscataway, NJ.
N. R. Barber.
Water and Waste Engineering, Vol. 14, No. 9, p 55, 59, September, 1977. 1 fig.

Descriptors: *Anaerobic digestion, *Chemical reactions, *Chemical precipitation, *Sludge treatment, Lime, Hydrogen ion concentration, Alkalinity, Toxicity, Sludge digestion, Waste water treatment.

Sodium bicarbonate has been used to safeguard against chemical malfunction of anaerobic digestion caused by the accumulation of volatile acids and carbon dioxide. Since NaHCO3 can directly shift the equilibrium to any desired value without first reacting with soluble CO2, it has been used as an alternative to lime, which can produce undesirable side effects such as vacuum and/or precipitation. With lime addition, the removal of CO2 from the digester head room to replenish the CO2 taken out of the solution can create an instantaneous vacuum which places stresses on tank structures. This may, in turn, allow oxygen to enter the system with resulting toxicity to the anaerobic organisms in the digester. Scale formation due to the precipitation of CaCO3 after it reaches its solubility limit can also present problems. An equation representing the increase in bicarbonate alkalinity caused by the reaction of lime with soluble CO2 is presented. Calculations indicated that scale formation is likely at CaCO3 concentrations greater than 500 mg/liter or at lime concentrations greater than 370 mg/liter. An equation to estimate the required alkalinity for buffering the pH at different levels of CO2 partial pressure is presented. NaHCO3, a natural pH control buffer in all aqueous systems, has a toxicity level in anaerobic digestion systems of 0.2 moles Na/liter for slug wastes when other ions are at concentrations below 10 mg/liter. The presence of antagonistic ions such as K and Ca may increase the tolerable level of Na to digester organisms. (Schulz-FIRL)
W78-02357

BIG SQUEEZE FOR SLUDGE KEEPS CAKE ON THE GO.
New Scientist, Vol. 76, No. 1077, p 349, November, 1977.

Descriptors: *Filters, *Dewatering, Equipment, *Filtration, *Sludge treatment, Flocculation, Sludge disposal, Waste water treatment.

Edward and Jones of Stoke-on-Trent in England have developed a continuous filter press for large-scale dewatering of slurries encountered in the sewage treatment industry. A flocculating agent is first used to create small solid particle aggregates in the sludge to facilitate dewatering. The slurry is then screened with a rotating drum equipped with fine mesh steel walls to produce a slurry solid enough for handling on a moving belt. The second stage of dewatering is accomplished by sludge compression between two belts and two sets of rollers. During the third and final stage of dewatering, the sludge passes between two caterpillar tracks made of PBC slats. High-pressure hydraulic jacks compress the upper track, which runs on rollers attached to a moveable frame, against the lower track which is mounted on rollers attached to a rigid frame. The hydraulic sludge press is reported to produce a sludge cake of comparable consistency to that produced by a conventional filter press. (Schulz-FIRL)
W78-02358

ANTIGONISH CHOOSES AERATED LAGOONS FOR WASTEWATER TREATMENT SYSTEM,
Office of the Mayor, Antigonish (Nova Scotia).
C. H. Chisholm.
Water and Pollution Control, Vol. 115, No. 9, p 25-26, September, 1977.

Descriptors: *Aeration, *Treatment facilities, *Oxidation lagoons, *Sewage lagoons, Sewage treatment, Odor, Design data, Municipal wastes, *Waste water treatment.

A. H. Roy and Associates Ltd. have designed a 1-mgd waste water treatment facility for the town of Antigonish in Nova Scotia, Canada. A system of three aerated lagoons was chosen for the 18-acre available site which would provide sewage treatment for the town's 6,000 residents, for the 4,000 residents of St. Francis Xavier University, and for other nearby towns. Designed for a BOD loading of 1700 lb/day, the combined capacity of the three lagoons is 29.6 million gal with an average retention time of 29.6 days to allow for shock conditions created by storm water flows. The 10-ft deep lagoons provide a total surface of 9.8 acres, the first lagoon being the largest at 3.5 acres with bottom dimensions of 250 x 508 ft. Aeration of the system is accomplished by three 25-hp blowers with one of the units serving as a standby. The town managed the $518,000 project, saving well over $100,000 in construction costs by hiring nine specialized contractors for individual phases of the project. Problems with odor after start-up were alleviated by removal of grease which had accumulated on the surface of the first lagoon. Blower noise was muffled by the installation of a sound plenum in the air intake. Operation of the aerated lagoon system has improved the water quality of the West River and Antigonish Harbor. (Schulz-FIRL)
W78-02359

REACTOR CLARIFIERS.
For primary bibliographic entry see Field 5F.
W78-02360

EFFECTS OF SODIUM BENTONITE AND FERRIC CHLORIDE ON ACTIVATED SLUDGE TREATMENT OF WASTEWATER,
Arya-Mehr Univ., of Technology, Tehran (Iran). Biochemical and Bioenvironmental Research Center.
A. Mirzadeh, Y. Maeda, and A. Fazeli.
Journal of Fermentation Technology, Vol 55, No 3, p 258-264, 1977. 4 fig, 4 tab, 17 ref.

Descriptors: *Activated sludge, *Bentonite, *Chlorides, *Iron compounds, *Flocculation, Microorganisms, Respiration, Oxygen demand, Settling basins, *Sludge treatment, Clays, Waste water treatment.

The enhancement of microbial flocculation in the activated sludge system by the addition of sodium bentonite and ferric chloride was investigated in batch and continuous tests with activated sludge and artificial sewage. Sodium bentonite and ferric chloride were added to mixed liquor in an aeration tank and the oxygen uptake rate of the activated sludge was monitored. Other parameters examined include specific filtration resistance, sludge volume index, settling rate, and the specific substrate (COD) utilization rate. The addition of sodium bentonite did not significantly affect the sludge respiration activity. The loss of sodium bentonite was reduced by the addition of ferric chloride, enhancing the settling rate, filtration resistance, and sludge volume index. Reductions in substrate utilization rates and activated sludge volume index. Reductions in substrate utilization rates and activated sludge respiration with the addition of ferric chloride were attributed to physiological effects on sludge bacteria and protozoa. Although the use of bentonite and ferric chloride did not significantly enhance microbial flocculation, the data obtained in this study may be useful in the treatment of wastes which contain these chemicals. (Schulz-FIRL)
W78-02361

CATALYTIC OZONATION IN AQUEOUS SYSTEM,
Southern Illinois Univ. at Carbondale.
J. H. Chen, C. Hui, T. Keller, and G. Smith.
AIChE Symposium Series, Vol 73, No 167, p 206-212, 1977. 14 fig, 1 tab, 9 ref.

Descriptors: *Ozone, *Oxidation, *Catalysts, *Chemical oxygen demand, *Iron oxides, Chemical reactions, Model studies, Phenols, Disinfection, Organic wastes, Industrial wastes, Waste water treatment.

A steady-state packed bed reactor was used in the investigation of catalytic ozonation with Fe203 as a catalyst for municipal and industrial waste waters. Dilute solutions of phenol and ethyl acetoacetate were used to simulate wastes, and TOC and COD were continuously monitored in the liquid effluent. The system was run at various gas flow rates, ozone concentrations, liquid retention times, and feed concentrations. Studies with aqueous phenol solutions indicated that removal efficiency increased with retention time and decreased with influent COD concentrations. Operating conditions for a percentage of COD removal equal to the percentage of ozone consumed were an ozone concentration of 16 mg/liter and a liquid retention time of 33 min, or at 30 mg/liter and 20 min. The stoichiometric relationship for ozonation of aqueous phenols is presented as 1 mole of C6H50H and 14 moles of 03 yielding 6 moles of CO2, 3 moles of H20, and 14 moles of 02. Experiments on catalytic ozonation of industrial wastes supplied by Nalco Chemical Company

were conducted with wastes which had a TOC of 459 mg/liter and a pH of 6.8. Analyses of TOC in the ozonated effluent indicated that the presence of a catalyst during exposure to ozone significantly enhanced TOC removal. (Schulz-FIRL)
W78-02362

CITY REAPS INCOME FROM SLUDGE PROCESSING SYSTEM,
For primary bibliographic entry see Field 5E.
W78-02363

CHIPPING NORTON STW -- INAUGURATION OF CONTRACT.
Water Services, Vol 81, No 978, p 454, August, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, *Costs, *Sludge treatment, *Municipal wastes, Oxidation, Aeration, Storm water, Suspended solids, Biochemical oxygen demand, Waste water treatment.

The Chipping Norton sewage treatment works are being constructed for the Thames Water Authority at a cost of more than 500,000 pounds. Principal contractor for the facility which will provide sewage treatment for a population of 13,000 is Kimbell Construction Ltd. of South Northampton, England. The facility should produce effluent with a BOD of 15 mg/liter and suspended solids of 12 mg/liter. The plant will incorporate new sludge pressing facilities completed earlier in 1977. The proposed Chipping Norton plant includes preliminary treatment, an aeration ditch, circular storm and settling tanks, a storm irrigation area, and various pumping stations. Whitehead and Poole Ltd. is the principal mechanical contractor for the project. Screw pumps and tank scrapers will be provided by New Haden Pumps. The pista grit trap and classifier are produced by Jones and Attwood Ltd. and the sludge pump by Pegson Ltd. The booster set to be used at the plant is manufactured by Megator Pumps and Compressors Ltd. Scheduled for completion in the latter part of 1978, the new facility will completely replace the existing works. (Schulz-FIRL)
W78-02364

POLIO-VIRUS ADSORPTION FROM WATER ONTO SILICATE MINERALS,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-02365

INFLUENCE OF TEMPERATURE AND U.V. LIGHT ON DISINFECTION WITH OZONE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-02366

SPECTROPHOTOMETRIC DETERMINATION OF RESIDUAL HYDROGEN PEROXIDE,
Brussels Intercommunal Water Co., (Belgium).
For primary bibliographic entry see Field 5A.
W78-02367

EVALUATION OF A NITRATE-SPECIFIC ION ELECTRODE,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W78-02368

CHEMICAL REGENERATION OF GRANULAR ACTIVATED CARBON,
Rome Univ. (Italy). Ist. di Chimica Fisica ed Elettrochimica.
M. Beccari, A. E. Paolini, and G. Variali.
Effluent and Water Treatment Journal, Vol 17, No 6, p 290-294, June, 1977. 4 fig, 4 tab, 20 ref.

Descriptors: *Adsorption, *Activated carbon, *Chemical properties, *Thermodynamics, *Kinetics, Thermodynamic behavior, Enthalpy, Tertiary treatment, Separation techniques, Chemical reactions, Waste water treatment, Chemical oxygen demand, Activated carbon regeneration, Desorption.

Regeneration of the adsorption capacities of granular activated carbon which had been exhausted by peptone was investigated. Peptone solutions with various COD levels were percolated through beds of activated carbon. Tests were carried out at 20C and 30C. Langmuir and Freundlich isotherms relating the COD of the solution and the weight of adsorbate and adsorbent with equilibrium conditions were calculated. Batch and continuous testing procedures were outlined. Thermodynamic analysis and adsorption isotherms indicated that the relationship between adsorbate and adsorbent followed the van't Hoff-Arrhenius equation with a change in enthalpy of -6.36 kcal/mole. An examination of adsorption kinetics revealed that the rate-limiting step was intraparticle diffusion. Regenerating capacities were measured for various oxidizing and non-oxidizing agents. In batch tests, oxidants did not have appreciable chemical regenerating abilities, while non-oxidizing agents exhibited regenerative efficiencies of not more than 50%. The extractive capacities of non-oxidizing agents were improved by alkaline pretreatment at 80C, with alkaline pretreatment itself having an extractive efficiency of 50%. Continuous studies with several regenerative cycles showed a decrease in regenerative efficiency after the first two cycles. (Schulz-FIRL)
W78-02369

THE PROMISES OF ION EXCHANGE,
Shell Development Co., Houston, TX.
For primary bibliographic entry see Field 5F.
W78-02371

WOONSOCKET, RHODE ISLAND SEEKS SOLUTION TO ALUM SLUDGE DISPOSAL PROBLEM,
Metcalf and Eddy, Inc., Boston, MA.
For primary bibliographic entry see Field 5E.
W78-02372

COMPUTERS AND INSTRUMENTATION--PARTNERS IN TREATMENT PLANT OPERATION,
For primary bibliographic entry see Field 7C.
W78-02373

A MORE PRECISE METHOD OF DETERMINATION OF SPECIFIC RESISTANCE TO FILTRATION,
For primary bibliographic entry see Field 7B.
W78-02374

LEVEL INSTRUMENTATION IN EFFLUENT TREATMENT PLANTS.
For primary bibliographic entry see Field 5A.
W78-02375

MASS TRANSFER AND MIXING IN THE KENICS AERATION SYSTEM,
Kenics Corp., North Andover, MA.
S. J. Chen, and R. G. Gilbert.
AIChE Symposium Series, Vol. 73, No. 167, p 23-32, 1977. 11 fig, 3 tab, 11 ref.

Descriptors: *Aeration, *Oxygenation, Equipment, *Analytical techniques, *Dissolved oxygen, Model studies, Mathematical studies, *Mass transfer, Activated sludge, Dissolved oxygen analyzers, Municipal wastes, Industrial wastes, Waste water treatment, *Mixing, Aeration system performance.

The full-scale test facility used in the evaluation of the Kenics Aeration System includes a 38.5-ft dia, 32-ft deep cylindrical steel tank; an aeration system with 46 Kenics aerators; a 2000-scfm rotary positive; a distribution piping system; air flow meters; a chemical feed system for deoxygenation; and dissolved oxygen analyzers. Oxygen transfer efficiency is measured with the clean water sodium sulfite method. Four methods of analysis used to evaluate oxygen transfer efficiency are described: direct analysis, exponential curve fitting, the rapid estimate (time constant) technique, and log deficit (semilog). An equation for the standard oxygenation rate (SOR) is presented. The analytical techniques were tested in three aeration tests under conditions representing a typical completely-mixed activated sludge aeration system. Methods for determining direct pumping capacity and mixing are described. Field tests to determine the solids suspension characteristics of Kenics Aeration Systems are described. An expression for oxygen transfer as a function of SOR and the wire or line electric horsepower (LHP) is presented. (Schulz-FIRL)
W78-02376

MASS TRANSFER IN LARGE SECONDARY TREATMENT AERATORS,
V. W. Uhl, R. L. Winter, and E. L. Heimark.
AIChE Symposium Series, Vol. 73, No. 167, p 33-41, 1977. 6 fig, 5 tab, 17 ref.

Descriptors: *Mass transfer, *Oxygenation, *Aeration, *Model studies, Mathematical studies, Analytical techniques, Dissolved oxygen analyzers, Absorption, Waste water treatment.

A 40-ft square basin filled to a depth of 20 ft with tap water was used in studies to provide values for oxygen uptake rate and mass transfer coefficient for large-scale aeration systems such as those used in secondary waste water treatment. Procedures for power consumption tests and oxygen transfer measurements are described. Tests with the aeration basin were run at mixer drive output speeds of 30 and 56 RPM; with impellers of 66 in, 72 in, 75 in, 122 in diameters; and with blower gas rates from 280 to 1570 scfm. Regression analyses of semi-log plots of the oxygen saturation deficit data acquired during 18 tests were used to calculate mass transfer coefficients. Five correlation schemes incorporating various configurations of gas turbine input, liquid volume, impeller speed, superficial gas velocity, impeller shaft torque, and impeller discharge rate were evaluated in terms of yielding a 'best fit' for the experimental data. An optimization procedure to maximize the amount of oxygen transferred in lb/hr per total horsepower is presented. (Schulz-FIRL)
W78-02377

INVESTIGATION OF MUTAGENIC EFFECTS OF PRODUCTS OF OZONATION REACTIONS IN WATER,
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W78-02378

APPLICATION OF THE RAPID LYSINE DECARBOXYLASE TEST FOR EARLY ISOLATION AND DETECTION OF SALMONELLAE IN SEWAGE AND OTHER WASTEWATERS,
National Environmental Engineering Research Inst., Nagpur (India). Life Sciences Div.
For primary bibliographic entry see Field 5A.
W78-02379

COMPUTER CONTROL OF LARGE-SCALE WASTEWATER TREATMENT PLANT,
Tokyo Sewerage Bureau (Japan).
S. Kato, R. Nagasaki, T. Ohto, S. Nogita, and M. Tanuma.
Hitachi Review, Vol. 26, No. 7, p 229-234, 1977. 10 fig, 6 ref.

Descriptors: *Automation, *Dissolved oxygen analyzers, *Mathematical models, *Computer control, *Data processing, Dissolved oxygen, Data storage and retrieval, Activated sludge, Aeration, Pumping, Butterfly valves, Waste water treatment, Tokyo(Japan).

Results of experiments with analog and digital DO/air control systems conducted at the Mikawashima activated sludge treatment plant in Tokyo, Japan, are presented. The analog control system includes a controller with proportional and integral functions, a valve-opening control element, and a power-actuated butterfly valve. Studies on DO control with the analog system for four parallel aeration tanks resulted in DO values within 0.3 mg/liter of the desired value of 2 mg/liter. Lower control precision at 4 mg/liter DO was attributed to nonlinear characteristics of the butterfly valve. Functions of the MINIDIC direct digital control system used in the study includes filtering of input data, feed-forward control based on a flow meter, feedback compensation of valve opening angle, feedback control based on a DO meter, and compensation of nonlinear characteristics between valve opening angle and flow rate. Experiments with the digital controller were conducted with MLSS levels of 1,000 or 2,000 mg/liter and DO levels of 2, 4, and 6 mg/liter. The digital controller was effective in reducing valve actuating frequency to one-fifth of the frequency when the analog controller was used. The AQUAMAX-80F system, a computer control system for a large-scale waste water treatment plant, has been devised by Hitachi Ltd. of Japan for controlling flow rate, electrical devices, and water quality and for providing a data bank of treatment plant operations. Three mathematical models are presented for use in feed-forward control and waste water treatment process stimulation, including models for water quality, transparency, and dissolved organic matter concentrations. (Schulz-FIRL)
W78-02380

OZONE EFFECT ON NITROGENOUS MATTER IN EFFLUENTS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
N. Narkis, A. M. Wachs, and M. Schneider.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 877-891, October, 1977. 6 fig, 7 tab, 16 ref.

Descriptors: *Nitrification, *Ozone, Analytical techniques, *Chemical reactions, *Nitrogen compounds, Ammonia, Nitrates, Nutrient removal, Chemical oxygen demand, Disinfection, Laboratory tests, Hydrogen ion concentration, Lime, Oxidation, Waste water treatment.

Experiments with lime-treated effluent from a biological municipal waste water treatment plant and solutions of nitrogenous compounds were used to examine the effects of ozone on nitrogenous matter in effluents. The pH of the solutions was adjusted to values from 2.8 to 12.2 and ozonation was carried out at a concentration of 20 mg 03/liter 02, a gas mixture flow rate of 0.4 liter/min, and contact periods of 15-120 min. In studies with lime-treated secondary effluents, ozonation produced nitrates which never increased above a concentration of 12 mg/liter, and total oxidation of organic nitrogen and ammonia was not achieved. At pH values below 6 nitrates were not produced, while nitrification increased significantly above pH 9 to reach a plateau level of 8.0 mg/liter beyond pH 10. The buffering capacity of lime treatment lowered the pH of the effluent during ozonation and inhibited nitrification. Increasing the length of the ozonation period decreased TKN, ammonia-N, and organic-N with a concurrent increase in nitrates in the treated effluent. Studies on the effects of the presence of ammonia on COD removal indicated that the oxidation of ammonia during ozonation did not affect the degree of removal nor the oxidation of organic compounds responsible for COD in the lime-treated effluent. The effects of ozonation on specific nitrogenous compounds in aqueous solutions were examined in experiments with NaNO2, NH4Cl, amino acid leucine solutions, borate and phosphate buffers, and bovine serum albumin. (Schulz-FIRL)
W78-02381

SONICATION OF ACTIVATED SLUDGE FLOCS AND THE RECOVERY OF THEIR BACTERIA ON SOLID MEDIA,
York Univ. (England). Dept. of Biology.
C. J. Banks, and I. Walker.
Journal of General Microbiology, Vol. 98, No. 2, p 363-368, February, 1977. 5 fig, 1 tab, 12 ref.

Descriptors: *Sewage bacteria, *Activated sludge, *Ultrasonics, *Analytical techniques, *Microorganisms, Sludge treatment, Municipal wastes, Separation techniques, Water analysis, Waste water treatment.

Since the enumeration of activated sludge bacteria is dependent on the ability to release them undamaged from sludge, the optimal conditions for bacteria recovery were investigated with ultrasound and sludges grown under different nutrient and hydraulic conditions. Samples of mixed liquor from the aeration tanks of an activated sludge plant were diluted and sonicated for periods ranging from 20 to 240 sec at five different intensities. Floc breakage was assessed according to the absorbence of the supernatant at 400 and 610 nm. Changes in temperature were used as a measure of energy input, and plating techniques were used to quantify the release of viable organisms during floc disruption. Experiments indicated that floc breakage depended on the intensity rather than the duration of sonic input, although bacteria release was controlled by intensity and duration. A sonication period of 80-100 sec at an intensity of 26 J/sec yielded the most viable bacteria. Measurements of the heating effect of sonication indicated that the creation of temperatures lethal to bacteria was unlikely, since sonication over 140 sec at maximum power output only increased the temperature from 0 to 13C. Bacteria determinations conducted in diluted sonicated mixed liquor from six municipal treatment works with CGY, MP, and TGEVA agars indicated that recovery was dependent on the particular sludge and its suspended solids and viable bacteria count. (Schulz-FIRL)
W78-02384

STUDY OF A SEPTIC TANK SYSTEM ON A LAKE SHORE: TEMPERATURE AND EFFLUENT FLOW PATTERNS,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.
For primary bibliographic entry see Field 5B.
W78-02385

LOW-TEMPERATURE ORGANIC REMOVAL AND DENITRIFICATION IN ACTIVATED CARBON COLUMNS,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
R. Maqsood, and A. Benedek.
Journal Water Pollution Control Federation, Vol 49, No 10, p 2107-2117, October, 1977. 14 fig, 6 tab, 17 ref.

Descriptors: *Bacteria, *Activated carbon, *Pilot plants, *Filtration, *Denitrification, Temperature, Nutrient removal, Organic compounds, Microorganisms, Sewage bacteria, Mathematical models, Sewage treatment, Waste water treatment.

Results of parallel pilot studies at 5 and 25C on low-temperature organic removal and denitrification in activated carbon columns are presented, with special emphasis on the monitoring of microbial life in activated carbon columns and the mathematical modelling of these columns in the presence of biooxidation. A series of equations are presented for the modelling of fixed-bed adsorbers in the presence of bacterial activity. Results of pilot studies at the Dundas Water Pollution Control Center indicated that physical-chemical treatment with granular activated carbon columns was capable of delivering high quality effluents at both temperatures examined and that microbial degradation enhanced the adsorptive capacities of the carbon columns. Dentrification was observed in the inside aerobic beds, and anaerobic bioactivity was attributed to localized flow conditions in pockets within the columns. The higher treatment efficiency at 25C was attributed to the greater proliferation of bacterial life in the column at higher temperatures. Studies on bacterial densities indicated that concentrations were similar to that of mixed liquor in an activated sludge plant. Denitrification rates were increased by at least 25% with the addition of organic substrate in studies with methanol addition in plastic media and GAC fluidized beds. The study concluded that the removal of organics by activated carbon was a biological rather than a physico-chemical phenomenon and that bacterial action did, in fact, prolong the life of the carbon bed. (Schulz-FIRL)
W78-02386

OPTIMAL CONTROL OF SEWAGE AND RAIN PUMPS BASED ON INFLUENT FLOW PREDICTION,
Tokyo Sewerage Bureau (Japan).
For primary bibliographic entry see Field 8C.
W78-02387

DYNAMO 1: A COST EFFECTIVE SOLUTION TO TREATMENT PROBLEMS,
Weston Environmental Consultants-Designers, Richmond, VA.
For primary bibliographic entry see Field 5G.
W78-02389

SURVEY FORECASTS FLOOD IN 1978 SEWERAGE MARKET.
For primary bibliographic entry see Field 5G.
W78-02393

RISING SEWAGE PLANT OPERATION COSTS BEG ENGINEERED SOLUTIONS.
For primary bibliographic entry see Field 5G.
W78-02394

CONCRETE FORMING FOR WATER AND WASTE TREATMENT PLANTS.
For primary bibliographic entry see Field 8F.
W78-02395

ADVANCED SEWAGE TREATMENT PLANTS, AN EPA PLANNING FLOP.
For primary bibliographic entry see Field 5G.
W78-02396

AGAT SEWAGE TREATMENT PLANT: IMPACT OF SECONDARY TREATED EFFLUENT ON GUAM COASTAL WATERS,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-02398

REGIONAL PLANNING FOR LAND APPLICATION OF WASTEWATER,
Pirnie (Malcolm), Inc., White Plains, NY.
For primary bibliographic entry see Field 5E.
W78-02439

A CLOSED WATER REUSE SYSTEM FOR POWER PLANT COOLING AND DIGESTER HEATING,
Nihon Suido Consultants Co., Tokyo.

For primary bibliographic entry see Field 3E.
W78-02443

COMPARING DESIGN MODELS FOR ACTIVATED SLUDGE,
Oklahoma State Univ., Stillwater. Bioenvironmental Engineering Labs.
A. F. Gaudy, Jr., and D. F. Kincannon.
Water and Sewage Works, Vol 124, No 2, p 66-70, February 1977. 1 fig, 7 tab, 16 ref.

Descriptors: *Waste water treatment, *Water quality, *Activated sludge, *Model studies, Design, Biomass, Aeration, Data collections, Equations, Operations research, Design, *Model comparisons, Substrate balance.

Secondary biological treatment processes, such as activated sludge, have the major responsibility for meeting stricter effluent standards regarding organic pollutants and treated wastewaters. Designers have therefore been migrating away from older 'rules of thumb' techniques and have been recognizing the need for employment of models which attempt to describe the functional behavior of the process. A comparison of the similarities and differences among four of these models is presented. The models are identified according to the names of the investigators who had major rules in their development: (1) Eckenfelder; (2) McKinney; (3) Lawrence and McCarty; and (4) Gaudy. Discussed are substrate balance and biomass balance. Compared are the reactor size and excess sludge production according to each model. It is concluded that there are no tremendous differences in required reactor volume or sludge production, but that there are indeed differences in the models which may affect their usefulness as operational and design tools and which may affect their utility in predicting effluent quality under changing environmental conditions. (Bell-Cornell)
W78-02449

FACTORS AFFECTING THE DENITRIFICATION RATE IN TWO WATER-SEDIMENT SYSTEMS,
Agricultural Univ., Wageningen (Netherlands).
J. F. Van Kessel.
Water Research, Vol 11, No 3, p 259-267, 1977. 9 fig, 4 tab, 33 ref.

Descriptors: *Denitrification, *Sediments, *Waste water treatment, Dissolved oxygen, Nitrates, Nitrites, Nitrogen, Effluents, Waste water(Pollution), Agricultural runoff, Nutrients, Water temperature, Slurries, Nitrification, Sediment thickness, Sediment nitrification.

Denitrification in a water-sediment system is affected by temperature, dissolved oxygen and nitrate concentrations in the water overlying the sediment, and the thickness of the sediment layer; the process is known to be strongly impaired by oxygen at approximate neutrality. These factors were tested in laboratory experiments using sediments from the 10 cm upper layer and water from two ditches. Effluent from a meat slurry purification plant (consisting of an activated sludge aeration tank and final clarification tank) was discharged into ditch A; ditch B received runoff from arable land. At 4C denitrification started after a prolonged lag period; nitrification did not occur to a significant degree. At 15C and particularly at 25C both processes proceeded rapidly. Increasing the dissolved oxygen concentration in the overlying water from zero to about 2 mg/l reduced the denitrification rate slightly, but a further increase in dissolved oxygen had no effect. The denitrification rates in both types A and B were dependent on the nitrate concentrations in the overlying water, at lower concentrations approximating first order kinetics, and gradually becoming independent of the nitrate concentration at higher nitrate content (zero order kinetics). With a nitrate-nitrogen concentration of 25.2 mg/l, a sediment layer of roughly 7 mm with A and 14 mm with B was found to be involved in denitrification. (Lynch-Wisconsin)
W78-02460

AQUATIC NITROGEN DETERMINATIONS IN REAL-TIME,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-02515

PL 92-500 V. POLLUTION BY IRRIGATION RETURN FLOW,
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-02524

COMBINED BIOLOGICAL TREATMENT AND UNDERGROUND INJECTION OF REFINERY WASTE WATER,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
F. D. Sutterfield, E. C. Donaldson, and F. S. Manning.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF 750530 4, Price codes: A03 in paper copy, A01 in microfiche. Presented at 2nd National Conference on Complete Water Reuse: Water's Interface with Energy, Air, and Solids, May 4-8, 1975, Chicago, Illinois. 27 p, 6 fig, 6 tab, 7 ref.

Descriptors: *Oil wastes, *Waste water treatment, *Injection wells, *Activated sludge, Waste disposal, Aeration, Costs, *Biological treatment, *Refinery wastes, Refineries.

A combination refinery waste processing system involving both biological treatment and deep well injection is described in this report. The majority of the waste (6.3 million gallons per day) is handled through an aeration basin capable of treating BOD-5, ammonia, and sulfide concentrations of 150, 20, and 10 ppm respectively. The remaining 0.4 million gallons of waste containing ammonia, mercaptans, phenol and sulfides with a 4,000 ppm BOD-5 are injected into a 7,000-foot-deep geologic formation. This latter portion is not readily amenable to activated sludge treatment because of the presence of compounds which are toxic to the functional bacteria maintained in activated sludge systems. The injection system has operated for several years without any major difficulties. Until it becomes technically and more economically feasible to treat this high-concentration, noxious mixture for discharge to surface waters, underground injection seems to offer the best solution for disposal. (Eberle-NWWA)
W78-02548

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
A. V. Bridgwater.
Effluent and Water Treatment Journal, Vol 17, No 7, p 337-347, July 1977. 2 fig, 5 tab, 7 ref.

Descriptors: *Estimated costs, *Capital costs, *Treatment facilities, Waste water treatment, Costs, Methodology, Recycling, Lang factor, Equipment costs, Waste recovery processes.

Methods of cost estimation are applied to waste recovery and treatment processes. One of the most widely established methods, used at both the preliminary stage and for more detailed estimates, is based on multiplying the cost of main equipment by factors to take account of all the additional costs, such as installation, instrumentation, electricals, civil engineering and supervision. Detailed studies of a wide range of chemical processes have shown that the equipment cost is invariably the largest single item and all other costs could be related to this cost. The total of all individual factors for each element of capital cost is known as the Land factor. The factor method of estimating requires an estimate of the delivered equipment cost of the main equipment items. This means a detailed mass balance and equipment schedule is required. Such information may be obtained from a variety of sources, including published information and in-company sources. A representative cost list is presented, with cost stated in pounds, and a number of estimation examples are given, incorporating short cut methods. (Coyle-Wisconsin)
W78-02563

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FISH MEAL, SALMON, BOTTOM FISH, CLAM, OYSTER, SARDINE, SCALLOP, HERRING, AND ABALONE SEGMENT OF THE CANNED AND PRESERVED FISH AND SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W78-02578

SUPPLEMENTAL AERATION SYSTEM DESIGN FOR THE HOUSTON SHIP CHANNEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-02645

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS (CHEMICALS 21-40),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-02659

CONSIDERATION OF SUSPENDED SOLIDS TRANSPORT IN ACTIVATED SLUDGE SYSTEMS SYNTHESIS: II. TOWER TYPE OF ACTIVATED SLUDGE SYSTEMS,
Kansas State Univ., Manhattan.
L. E. Erickson, J. C. Heydweiller, and L. T. Fan.
AIChE Symposium Series, Vol. 73, No. 167, p 112-134, 1977. 7 fig, 4 tab, 9 ref.

Descriptors: *Activated sludge, *Model studies, *Mathematical models, *Analytical techniques, Simulation analysis, Engineering, Design criteria, Biological treatment, Sewage treatment, *Waste water treatment.

The optimal structure and process designs for a co-current multi-stage aeration tower and a secondary clarifier were examined in model studies with the structural parameter method of system synthesis. Schematic diagrams of an activated sludge system with one, two, and three tower stages are presented. A series of equations for mass balances with respect to substrate concentration, flow rates, organism concentration, specific growth rate, and other parameters for each stage is presented. Computation aspects of the model, such as the choice of independent variables, dependent variable constraints, and input requirements, are discussed. A set of dimensionless, nonlinear algebraic equations is derived through the introduction of a series of dimensionless variables into the mass balance equation for organism concentration, substrate concentration, settling velocity, backflow rate, saturation, endogenous organism attrition rate, time, and the linear dispersion equation constant. The effects of the number of tower stages on the clarifier, fermentor, and total volumes are illustrated, as are the fraction of

the system volume allocated to the tower fermentor, and the sludge recycle and wasting rates. Analyses indicated that the three tower stage system achieved the desired effluent quality with the smallest tower, clarifier, and total volumes, and that the fraction of organic waste which was metabolized also increased as the number of tower stages increased. The amount of suspended solids in the overflow increased as the number of tower stages increased. (Schulz-FIRL)
W78-02661

LAB MODERNIZATION CREATES NEW PROBLEMS FOR PLANT OPERATORS,
Water Quality Lab., Las Cruces, NM.
For primary bibliographic entry see Field 5A.
W78-02662

WATER QUALITY MANAGEMENT--PROBLEM AREAS IN SEWERAGE AND SEWAGE DISPOSAL,
Thames Water Authority, London (England). Vales Div.
For primary bibliographic entry see Field 5E.
W78-02663

HEAT EXCHANGE METHOD FOR WET OXIDATION SYSTEMS,
Whirlpool Corp., Benton Harbor, MI. (Assignee).
J. W. Van Kirk.
United States Patent 4,053,404. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol. 963, No. 2, p 623, October, 1977. 1 fig.

Descriptors: *Oxidation, *Heat exchangers, *Patents, *Sewage treatment, *Energy, Incineration, Equipment, Heat treatment, Waste water treatment.

A continuous wet oxidation process has been patented for use with organic waste sewage. The process includes treatmet of the sewage in a reactor at 550-560F and pumping of the waste sewage through two heat exchangers. The treated liquid is passed from the reactor through the second heat exchanger, through a throttling device, and then through the first heat exchanger in the series. The pressure of the effluent upstream from the throttling device maintains the pressure in the second heat exchanger at about 1500-1600 psi and the temperature at about 560F. The pressure downstream from the throttling device and in the first heat exchanger is maintained at less than 500 psi and the temperature at no more than 400F. The influent waste sewage is thus preheated in two stages before entering the reactor. The first stage is carried out at a lower temperature and pressure in the first heat exchanger, and the second at a higher temperature and pressure in the second heat exchanger. (Schulz-FIRL)
W78-02664

METHOD AND SYSTEM FOR WASTE TREATMENT,
Grumman Aerospace Corp., Bethpage, NY. Research Dept. (Assignee).
L. A. Donnelly, L. C. Flocke, V. H. Himel, J. J. Mikals, and A. E. Munier.
United States Patent 4,053,399. Issued October 11, 1977. Official Gazette of the United States Patent Office, Vol. 963, No. 2, p 621-622, October, 1977. 1 fig.

Descriptors: *Separation techniques, *Disinfection, *Ozone, *Foam separation, *Incineration, *Patents, Sewage treatment, Screens, Centrifugation, Waste water treatment, Oxidation.

In a process which has been patented for treating raw sewage, the influent is first screened to separate out the solid materials. The screenings are then incinerated. The screened waste fluid passes through a centrifuge system for separation into sludge and clarified liquid. The sludge is incinerated and the clarified liquid passes to an ozone contact where ozone bubbles produce foam-entrapped solids, solids which adhere to ozone bubbles, and a disinfected liquid. The disinfected liquid is removed from the system and the foam-entrapped solids and bubble-held solids are incinerated. (Schulz-FIRL)
W78-02665

SCUM REMOVAL SYSTEM FOR A SEWAGE SETTLING TANK,
Sybron Corp., Rochester, NY. (Assignee).
R. F. McGivern.
United States Patent 4,054,520. Issued October 18, 1977. Official Gazette of the United States Patent Office, Vol. 963, No. 3, p 993-994, October, 1977. 1 fig.

Descriptors: *Scum, *Skimming, *Settling basins, *Sewage treatment, *Patents, Equipment, Separation techniques, Waste water treatment, Scum removal.

Details of a patent for a scum removal system for sewage settling basins are presented. The system includes a scum trough along the end wall of the basin, a floating beach, and a skimmer assembly. The floating beach extends along the full length of the scum trough and is connected to the trough by a hinge at the upper edge, so that part of the beach extends into the settling tank liquid. The beach has a raised area between the settling basin side and the hinge side to prevent flow into the scum trough. The skimmer assembly moves back and forth across the settling tank, pushing scum towards the trough, and can pivot to push the floating material over the beach into the trough. The depth and distance over which the skimmer assembly travels is adjustable. A modified system includes a time-delay mechanism which can delay the motion of the skimmer back and forth across the tank. (Schulz-FIRL)
W78-02666

ACTIVATED SEWAGE PLANT AND PROCESS,
Dravo Corp., Pittsburgh, PA. (Assignee).
D. F. Heaney.
United States Patent 4,051,039. Issued September 27, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 4, p 1725, September, 1977. 1 fig.

Descriptors: *Filters, *Filtration, *Porous media, *Activated sludge, *Effluents, *Patents, Particle size, Particle shape, Sands, Waste water treatment.

A filter design for use with settled activated sludge process effluent prior to chlorination has been patented. The filter has a perforated false bottom on which a filter bed of not less than 6 ft. is supported. A headspace at the top of the filter is provided for influent, unfiltered water. Gravel-like, rounded quartz particles ranging in size from 1-3 mm comprise the filter media. The particles should be reasonably well sorted, having an average size difference not greater than 1 mm. A valved discharge outlet is located below the fales bottom for removal of filtered water. When the filter is being backwashed, the value outlet is closed and air is forced into the space below the false bottom. The filter is equipped with an overflow weir for receipt of backwash water. (Schulz-FIRL)
W78-02667

APPARATUS FOR THE AEROBIC TREATMENT OF LIQUID WASTE,
Carter (Ralph B.) Co., Hackensack, NJ. (Assignee).
W. O. Boschen, A. V. Annichiarico, and A. L. Johnson.
United States Patent 4,051,035. Issued September 27, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 4, p 1724, September, 1977. 1 fig.

Descriptors: *Aerobic treatment, *Equipment, *Aeration, *Patents, *Design data, Mixing, Liquid wastes, Waste water treatment.

A system for the aerobic treatment of liquid wastes has been patented. The system includes a liquid basin which is equipped with an array of continuous gas distribution lines with orifices for the release of a gas such as air. A mixing-aerator device can be placed above any of the orifices to enhance mixing and aeration of the liquid waste and gas. The system is improved by the addition of a number of brackets to correspond and connect to the array of gas distribution lines. The mixer-aerator can be selectively attached to the brackets. At least two rigid legs extend between the mixer-aerator and the bracket and are equipped with a foot at the end of each leg. The foot is manually fastened to a receptor when the mixer-aerator is in place upon the selected bracket, and can be disengaged without dislodging the gas distribution line. (Schulz-FIRL)
W78-02668

METHOD OF TREATING SEWAGE SLUDGE,
NGK Insulators Ltd., Nagoya (Japan). (Assignee).
S. Hara, and T. Kato.
United States Patent 4,050,390. Issued September 27, 1977. Official Gazette of the United States Patent Office, Vol. 962, No. 4, p 1511, September, 1977. 1 fig.

Descriptors: *Drying, *Dewatering, Equipment, *Incineration, *Heat treatment, *Patents, Fuels, Gases, Sewage treatment, Sludge treatment, Waste water treatment, Multiple hearth furnaces, Pyrolysis, After-burner, Exhaust gases.

A method of sewage sludge dewatering in a multiple hearth furnace has been patented. The sludge is dried in the upper part of the multiple hearth furnace and reduced to ashes by pyrolysis in the lower portion of the furnace. Exhaust gases produced during both operations are collected independently. The exhaust gas produced during the drying state is dehumidified and then mixed with gas resulting from pyrolysis. Preheated gas is added to this mixture and the total mixture is burned in an after-burner. The combustion gas is discharged into the atmosphere and the heat generated in the after-burner is used to produce the preheated gas. (Schulz-FIRL)
W78-02669

PHOSPHATE REMOVAL FROM BOD-CONTAINING WASTEWATER,
Union Carbide Corp., New York. (Assignee).
L. C. Matsch, and R. F. Drnevich.
United States Patent 4,042,493. Issued August 16, 1977. Official Gazette of the United States Patent Office, Vol. 961, No. 3, p 1273, August, 1977.

Descriptors: *Patents, *Phosphates, *Nutrient removal, *Activated sludge, *Aeration, *Separation techniques, Effluents, Anaerobic conditions, Sludge treatment, Waste water treatment, Phosphate removal.

A method of phosphate removal from waste water during the activated sludge process has been patented. The phosphate-containing waste water is mixed with activated sludge and oxygen-containing gas in an aeration zone. While the fluid is circulated, microorganisms take up the phosphate and reduce the BOD content of the waste water. The phosphate-rich sludge is separated from the mixed liquor and passes through a phosphate stripping zone. Anaerobic conditions are maintained for part of the sludge, resulting in a phosphate-rich liquid and a phosphate-poor sludge fraction. The phosphate-rich liquid is removed and a portion of the sludge is recycled to the aeration zone. Phosphate stripping is enhanced by retaining sludge in the stripping zone for 2-10 hrs, introducing a stripping medium which has a low suspended solids and phosphate concentration, and maintain-

ing a flow rate through the stripping zone of 0.7-2.0 times the rate of removal of phosphate-enriched liquid. (Schulz-FIRL)
W78-02670

TREATMENT OF CYANIDE-CONTAINING SLUDGE BY FLUIDIZED BED INCINERATION SYSTEM (RYUDO SO SHOKYAKU SHISUTEMU NI YORU GANSHIAN SURAJI NO SHORI),
K. Kuwahara, and Y. Onishi.
Kankyo Sozo, Vol. 7, No. 8, p 41-44, 1977. 5 fig, 8 tab.

Descriptors: *Nitrogen compounds, *Incineration, *Sludge treatment, *Chemical precipitation, *Separation techniques, Heat treatment, Chemical reactions, Air pollution, Industrial wastes, Waste water treatment, *Cyanide, Fluidized bed incineration systems.

The removal of cyanide from sludge by complete thermal decomposition was tested using a fluidized bed incineration system made by the Japan Dryer Company. A description of the process is given with specifications of pilot incinerator and treatment procedures. The sample sludge containing 60,000 ppm of cyanide was treated using a sand fluidized bed at 400-540C. The total cyanide content was reduced to 26.0-78.1 ppm and that of the dissolved cyanide to 0.195-0.416 ppm. In the treatment of waste water containing a large amount of iron-cyanide complex, the waste water is treated by the Prussian blue method, precipitates produced are separated, and the filtrate containing less than 1 ppm of cyanide is disposed. The precipitate sludge is then treated by fluidized bed incineration. The cyanide concentration in the sludge after incineration was at undetectable levels, and that in the incinerator flue gas was 1.01-2.34 ppm. The sulfur oxides and nitrogen oxides concentrations in flue gas were also reduced by the incineration process. (Fujimoto-FIRL)
W78-02681

THE ELECTROLYTIC RECOVERY OF METALS FROM SLUDGES (SURAJI KARA NO KINZOKU NO DENKAI KAISHU),
Konan Univ., Kobe (Japan). Faculty of Science.
H. Nawafune, S. Mizumoto, and M. Kawasaki.
Kinzoku Hyomen Gijutsu, Vol. 28, No. 4, p 34-37, 1977.

Descriptors: *Heavy metals, *Electrodes, *Electrolysis, *Separation techniques, *Electrochemistry, Anodes, Cathodes, Equipment, Industrial wastes, Metals, Copper, Nickel, Zinc, Waste water treatment.

Laboratory experiments were used to investigate the recovery of metals such as nickel, copper, and zinc from metal processing sludges. The electrolytic system used for recovery included a cell which was divided into two compartments by a diaphragm. One of the compartments contained a cathode while the other compartment contained an insoluble anode. Heavy metals in the sludge were dissolved by acid liberated on the insoluble anode. The electrolytic cell was also equipped with a power source and a coulomb meter. The metal ion concentration and pH of the electrolyte could be maintained at specific values during electrolysis. The quantity of nickel transferred from the anolyte to the catholyte increased from 0 g at 30,000 coulombs to approximately 35 g at 180,000 coulombs. Copper transfer ranged from 0 g at 30,000 coulombs to approximately 20 g at 120,000 coulombs. The process results in recovery of metals which are suitable for reuse as anodes for electroplating. (Schulz-FIRL)
W78-02682

ON THE ORIGINAL LOAD OF THE PROCESS WATER DURING PAPER PRODUCTION BY DISSOLVED SUBSTANCES. PART I: INVENTORY OF STONE GROUNDWOOD PRODUCTION (UEBER DIE DURCH GELOESTE SUBSTANZEN VERURSACHTE BELASTUNG DES FABRIKATIONSWASSERS BEI DER PAPIERHERSTELLUNG. TEIL I: BESTANDSAUFNAHME BEI DER ERZEUGUNG VON STEINSCHLIFF),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Paperfabrikation.
For primary bibliographic entry see Field 5A.
W78-02683

5E. Ultimate Disposal Of Wastes

WASTEWATER TREATMENT AND REUSE BY THE SOIL-PLANT SYSTEM,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-02223

U.S. ARMY CORPS OF ENGINEERS CLEVELAND-AKRON THREE RIVERS WATERSHED, WASTEWATER MANAGEMENT SURVEY SCOPE STUDY.
Wright-McLaughlin Engineers, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-02233

MOVEMENT OF PHOSPHOROUS FROM A SEPTIC SYSTEM DRAINFIELD,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 5B.
W78-02255

INPUT AND FATE OF PETROLEUM HYDROCARBONS ENTERING THE PROVIDENCE RIVER AND UPPER NARRAGANSETT BAY FROM WASTEWATER EFFLUENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B
W78-02257

SEA BED INSTALLATION FOR SEWAGE PIPELINE.
Dock and Harbour Authority, Vol 58, No 680, p 134, July, 1977.

Descriptors: *Sewerage, *Sewers, *Outfalls, *Construction equipment, *Pipelines, Conveyance structures, Sewage treatment, Sewage disposal, Interceptor sewers, Waste water treatment, Sunderland(UK).

An underwater sewage pipeline is being constructed by the Engineering Division of John Laing Construction at Sunderland, Tyne and Wear, England. Commissioned by the Northumbrian Water Authority, the contract includes the supply and fabrication of 300 m of 1.4-m diameter pipe for the outfall site and a marine survey of the sewage outfall area. The pipe will be fabricated, welded into 120-m lengths, and coated with concrete at Hudson Dock. Pipe trenches will be dug by a grab-equipped crane which is mounted on a pontoon. Sections of pipe will be towed to the outfall site by a tug and the trench will be backfilled. The pipeline will lead to a concrete-coated diffuser in the Wear River. Untreated sewage will be screened and sludge removed at the Hendon Treatment Plant before disposal into the sea through the pipeline and outfall system. (Schulz-FIRL)
W78-02302

SEWERAGE OUTFALL PROTECTED.
For primary bibliographic entry see Field 8G.
W78-02303

FEEDSTUFF FROM SLUDGE WASTE.
German Patent DS 1937-580. Issued September 22, 1977. Derwent German Patents Abstracts, Vol. Y, No. 39, p 2, November, 1977.

Descriptors: *Sludge disposal, *Feeds, *Livestock, *Sewage treatment, *Patents, Waste water disposal, Heat treatment, Disinfection.

A process for preparing feedstuff from sewage sludge derived from mechanical, biological, or mechanical-biological breakdown processes has been patented. The sludge is preferably mixed with fresh or partially matured compost in a ratio of 10:1 to 1:2 based on dry weight. The mixture, which should have a moisture content of at least 25%, is then heated continuously or in batches at a temperature of 105-160C, preferably in the range 110-130C, for up to 5 min. The mixture should be heated for time period sufficient to insure sterility of the product. (Schulz-FIRL)
W78-02314

INVENTORY OF ENERGY USE IN WASTEWATER SLUDGE TREATMENT AND DISPOSAL,
J. E. Smith.
Industrial Water Engineering, Vol. 14, No. 4, p 20-26, July/August, 1977. 12 fig, 10 tab.

Descriptors: *Costs, *Energy, *Sludge treatment, *Sludge disposal, *Municipal wastes, *Construction costs, Operation and maintenance, Dewatering, Sewage treatment, Activated sludge, Incineration, Anaerobic digestion, Electric power demand, Fuels, Waste water treatment, Sludge treatment costs, Sludge disposal costs.

Costs of sludge treatment and disposal are dependent on a wide variety of factors, including method, location, climate, scale of operation, and effluent quality desired. Fuel use and energy requirements for various types of municipal waste water treatment and disposal are discussed. The distributions of capital, operating, and maintenance costs for a 30-mgd conventional activated sludge plant are presented. Costs for sludge handling processes, including thickening, stabilization, conditioning, dewatering, and incineration, are discussed and related to plant size. Electrical energy requirements for various phases of sewage treatment, including preliminary treatment, influent pumping, primary sedimentation, trickling filters, activated sludge processing, chlorination, sludge handling and disposal, and miscellaneous operating needs, are described and compared for different plant sizes. The utilization of anaerobic digester gas for power generation is examined. Sludge dewatering and disposal options are examined relative to construction costs, energy consumption and production, and sludge water content. (Schulz-FIRL)
W78-02320

THE OHIO FARM BUREAU'S APPROACH TO LAND APPLICATION OF SEWAGE SLUDGE,
N. M. Musselman.
Compost Science, Vol 18, No 4, p 24-25, July-August, 1977.

Descriptors: *Fertilizers, *Sludge disposal, *Agricultural practices, *Environmental effects, *Waste water disposal, Legal aspects, Return flow, Sewage disposal, Waste water treatment, Sewage sludge.

Opinions of the Ohio Farm Bureau Federation on practices involving the land application of sewage sludge as a means of sludge disposal and soil conditioning are presented. A particular incident in which a municipality of approximately 60,000 people sought to create a 1,000-acre sludge farm is discussed. Actions by the Ohio Farm Bureau were directing toward stopping the project in response to pressure applied by a suburb located between the city and the proposed sludge disposal site.

General ill feeling on the part of farmers and consumers toward land application of sewage sludge is a major stumbling block to this category of waste disposal. The Ohio Farm Bureau has not chosen to endorse the concept totally, in light of potential problems associated with sewage bacteria and pathogens, the question of liability should any incident occur, and objections by its constituents. (Schulz-FIRL)
W78-02327

RADIATION TREATMENT OF SLUDGE TO BE EXPLORED.
Water and Wastes Engineering, Vol. 14, No. 10, p 50, October, 1977.

Descriptors: *Disinfection, *Gamma rays, *Irradiation, *Fertilizers, *Food chain, Pilot plants, Cesium, Equipment, Sludge treatment, Sewage bacteria, Municipal wastes, Waste water treatment, Sludge irradiation.

The economic and scientific aspects of the use of gamma radiation for disinfection of dried or composted sludge will be investigated in pilot-scale studies at Sandia Laboratories in Albuquerque, New Mexico. Gough and Company, Ltd., of Staffordshire, England, have manufactured the 28,000-lb, 22-ft high irradiation system which is capable of handling several tons of dry sludge daily on a continuous basis. The irradiation facility consists of a conveyor system in which 30-60 lb of sludge is loaded into each of a series of rectangular 10 in x 12 in x 24 in buckets. The sludge-filled buckest are conveyed to a high radiation zone where they receive one megacurie of cesium-137 by passing over an d under a gamma radiatio source. The system is designed so that the conveyor spped can be adjusted to vary the radiation dosage and so that 20 buckets can occupy the irradiation zone at any given time. The system was developed to use cesium-137, a waste product of nuclear reactors, to disinfect sludge for use as a fertilizer or soil conditioner in the propagation of food crops. (Schulz-FIRL)
W78-02339

MUNICIPAL SLUDGE DISPOSAL ECONOMICS,
SRI International, Menlo Park, CA.
J. L. Jones, D. C. Bomberger, Jr, F. M. Lewis, and J. Jacknow.
Environmental Science and Technology, Vol. 11, No. 10, p 968-972, October, 1977. 1 fig, 4 tab.

Descriptors: *Cost comparisons, *Incineration, *Sludge treatment, *Sludge disposal, *Energy, Capital costs, Operation and maintenance, Dewatering, Waste water treatment, Waste water disposal.

Capital, operating, and energy costs are compared for five sludge handling alternatives. The options for treatment and disposal include: vacuum filtration of sludge to 20% solids, or filter press dewatering of sludge to 40% solids, prior to incineration; thermal conditioning, vacuum filtration, and incineration; high-pressure wet air oxidation, vacuum filtration, and landfill disposal; aerobic or anaerobic digestion prior to chemical conditioning and landfill disposal; and chemical conditioning, filter press dewatering, and flash drying to produce a dry fertilizer product for sale. Estimated costs for the five options are presented for waste water treatment plants having average dry weather flows of 10, 100, and 500 mgd at estimated base capital investment costs of $5, $27, and $100 million, respectively. Additional costs for the sludge handling options, electric power consumption, and gas or oil usage/production are presented. Cost comparisons indicated that there are variable economies of scale for the different sludge handling options, with aerobic digestion at the lowest capital cost for the 10-mgd plant and the two incineration options more attractive for the larger plants. Direct operating costs are compared with respect to energy costs; costs for chemicals, supplies, and replacement parts; operating and maintenance labor costs; and costs for landfilling of the sludge or ash. The incineration options have the lowest operating costs for plants with capacities of 10-500 mgd. Sensitivities of sludge handling costs are discussed with respect to changes in chemical usage, hauling costs, and energy credits. (Schulz-FIRL)
W78-02342

PUMP APPLICATIONS IN SEWAGE SLUDGE DEWATERING PROCESSES,
For primary bibliographic entry see Field 8C.
W78-02350

LIQUID WASTE EFFLUENT INSTALLATION UNVEILED IN FLA.
Water and Waste Engineering, Vol. 14, No. 9, p 133, September, 1977.

Descriptors: *Return flow, *Nutrient removal, *Sprinkler irrigation, *Waste water disposal, Treatment facilities, Forages, Fertilizers, Sewage treatment, Waste water treatment.

A center pivot irrigation system manufactured by Valmont Industries, Inc., is being used at waste water treatment facilities in Winter Haven, Florida, for spray irrigation of approximately 1500 acres of forage crops with municipal effluents. During treatment of the 5-mgd activated sludge plant, raw waste first passes through an aerated grit chamber for grit removal and odor control. It is then mixed with return activated sludge from the clarifiers and aerated. After aeration and clarification, the sludge is siphoned off the clarifier bottom for mixing with incoming raw waste water. The clarified effluent is chlorinated and pumped to a holding pond. Two aerobic digesters handle the excess sludge, which is then sent to a gravity thickener and centrifuge before disposal to farmland. The treatment process removes 95% of BOD and suspended solids in the raw waste water; remaining organics and nutrients are removed by spray irrigation. The 9 center pivots used to distribute the treated effluent are equipped with 7 drive units per system. The systems, which are electrically propelled, provide coverage for 70 acres each and are capable of distributing 450 gpm. The forage crops which are expected to remove approximaely 550 lbs N/acre/yr will receive approximately 475-500 lbs N/acre/yr from irrigation with waste water effluents. The effects of effluent application are monitored with 36 wells 10-30 ft deep located throughout the irrigation site. (Schulz-FIRL)
W78-02352

MAINE'S PERSPECTIVE ON COMPOSTING TOILETS AND ALTERNATE GREYWATER SYSTEMS,
Maine Dept. of Human Services, Augusta. Div. of Health Engineering.
E. Moreau.
Compost Science, Vol. 18, No. 4, p 18-19, July-August, 1977.

Descriptors: *Domestic wastes, *Septic tanks, *Waste water disposal, *Water reuse, *Water utilization, Equipment, Waste water treatment, *Maine, *Composting toilets, Greywater systems.

After review of extensive studies in Sweden and other countries, the state of Maine in 1974 became the first in the United States to authorize the installation of compost toilets. Although current technology does not favor the replacement of existing household toilet facilities with compost systems, experiences with more than 200 compost toilets installed in Maine have been favorable. An exhibition was held in Augusta, Maine, in 1975 for the introduction of various alternatives to conventional toilet systems. A greywater treatment system is required by the Maine State Plumbing Code when composting or waterless toilets are used in residences with running water under pressure. The system normally includes a septic tank and a soil disposal field, for treatment of greywater which can include grease, fats, food solids, and bacteria in a relatively undiluted form. The drainage field for a separated system is usually 200-1000 sq ft as compared to 300-400 sq ft with a combined system. Changes in Maine's exterior plumbing code to further encourage water conservation are expected. (Schulz-FIRL)
W78-02355

CITY REAPS INCOME FROM SLUDGE PROCESSING SYSTEM,
I. M. Knapp.
Public Works, Vol 108, No 10, p 103-105, 118, October, 1977.

Descriptors: *Fertilizers, *Sludge disposal, *Dewatering, *Nutrient removal, *Costs, *Sludge treatment, Flocculation, Drying, Municipal wastes, Treatment facilities, Sewage treatment, Waste water treatment.

A sludge processing system which would produce a product that could be sold as a soil conditioner/fertilizer has been chosen by the city of Largo, Florida, as a means of waste disposal. Additional cost estimates indicate that the $800,500 facility could be sold at $160-250/ton. The facility is designed to dry and package sludge resulting from the treatment of 9 mgd of municipal wastes. Industrial wastes are excluded from the sludge, eliminating any deleterious effects produced by heavy metals. Nutrients can be added automatically to meet requirements for different soil conditions. The plant is entirely automated and only requires one operator for startup. A digester clarifier increases the influent sludge solids content from 1% to 3%. The sludge is then pumped to a blender for flocculation with a polymer and combined with a portion of previously dried sludge. Filter belt presses further dewater the sludge to a cake form. The remaining water is evaporated in a rotary, three-pass drum dryer through which an air stream at 8 00-900 F passes. The dried sludge is then packaged in three-ply, plastic-lined bags. Actual total operating costs for a 6-month test period were $140/ton and packaged fertilizer was sold at $100-160/ton, depending on the quantity of sludge purchased. The addition of a prethickener/conditioner step to the process is expected to further reduce production costs. (Schulz-FIRL)
W78-02363

WOONSOCKET, RHODE ISLAND SEEKS SOLUTION TO ALUM SLUDGE DISPOSAL PROBLEM,
Metcalf and Eddy, Inc., Boston, MA.
J. Goss.
Journal of the New England Water Works Association, Vol 30, No 3, p 191-198, September, 1976. 4 fig.

Descriptors: *Water treatment, *Sludge treatment, *Sludge disposal, *Clarification, *Treatment facilities, Costs, Filtration, Suspended solids, Sewage treatment, Municipal wastes, Waste water treatment, Woonsocket(RI).

Metcalf and Eddy, Inc., of Boston, Massachusetts, was contracted by the city of Woonsocket, Rhode Island, to design a method of disposal for the alum sludge produced by the 11.25-mgd Woonsocket water treatment plant. Previously, settled sludge from the upflow clarifiers (4,600 mg/liter suspended solids) and spent water used to backwash the filters (170 mg/liter suspended solids) had been discharged directly to the Blackstone River. One of the problems encountered in design of a disposal method was that the wastes, in the form of a small volume of concentrated waste and a large volume of dilute waste, were produced intermittently and

for very short periods. The wastes also had markedly different settling characteristics. An equalization tank to hold the clarifier sludge flow and the settled sludge from a filter backwash water presettling basin was chosen to even out waste concentrations and flow. Variable physical and mechanical processes, including lagooning, sand bed drying, freezing, centrifugation, vacuum filtration, and pressure filtration, were evaluated with respect to producing a sludge cake with 20% or more solids suitable for land disposal. Climatological considerations, land requirements and other factors led to the choice of construction of facilities to discharge the sludge to Woonsocket's sewage treatment plant for treatment and disposal. A schematic diagram of the recommended $1.61-million alum sludge disposal facility is presented. (Schulz-FIRL)
W78-02372

SAMPLES OF RHINE WATER REVEAL ORGANIC CARBON CONTENT,
Karlsruhe Univ. (West Germany). Dept. of Water Chemistry.
For primary bibliographic entry see Field 5B.
W78-02383

OCCURRENCE AND DISTRIBUTION OF BACTERIAL INDICATORS AND PATHOGENS IN CANAL COMMUNITIES ALONG THE TEXAS COAST,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5B.
W78-02391

RECLAIMED WATER FOR CAPE PENINSULA.
The Civil Engineer in South Africa, Vol. 19, No. 7, p 163-164, July, 1977.

Descriptors: *Water reuse, *Return flow, *Artificial recharge, *Hydrogeology, Saline water intrusion, Water resources development, Groundwater, Environmental effects, Waste water disposal.

Limited water resources in the Cape Peninsula region of South Africa have led to an investigation of the reclamation and reuse of treated sewage effluents by the Water Research Commission, the city of Cape Town, and the National Institute for Water Research of the CSIR. Extensive studies have been conducted on the use and hydraulic suitability of the sand beds of the Cape Flats for the storage, infiltration, and abstraction of natural water or purified effluents. Hydrogeologic studies indicated that approximately 75,000 cu m of water, or 3 cu m H2O/day/m of coastline, was being lost daily to False Bay by subterraneous flow. The interception of this water through 50 boreholes to be drilled along the coast has been recommended. Current research has focused on the possible effects of pollutants on this water supply and on operations of a 300-cu-m/day pilot plant at the Athlone Sewage Works. (Schulz-FIRL)
W78-02397

PRELIMINARY DESIGN OF WASTEWATER LAND APPLICATION SYSTEMS,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
D. A. Haith, A. Koenig, and D. P. Loucks.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2371-2379, December 1977. 6 tab, 14 ref.

Descriptors: *Waste water(Pollution), *Economic efficiency, *Alternative planning, *Optimization, *Water pollution control, *Design, Nitrogen, Estimating, Simulation analysis, Equations, Mathematical models, Systems analysis, *Land disposal, Spray irrigation, Cost minimization, Storage ponds, Cost effectiveness.

Developed is a method to aid in the preliminary design and evaluation of alternative spray irrigation land application systems. A mathematical model based on monthly mass balance equations for water and nitrogen in a storage pond and the soil provides estimates of the costs of system components and the nitrogen concentration of water draining the spray irrigation site. The level of analysis corresponds to the second state of a cost-effectiveness study as defined in relevant U.S. Environmental Protection Agency guidelines. An earlier paper outlined a model appropriate for the preliminary planning stage. The relationships in the model presented herein are in the form of monthly inventory equation for water and nitrogen in the pond and soil. Cost equations for the various components of the land application system are presented for costs as of December 1976. The combination of the cost and mass balance equations results in a management model which would determine the least costly combination of storage pond size, irrigation rates, and irrigation site area. The model is highly nonlinear and cannot be solved exactly using mathematical programming methods, but the mass balance equations are readily incorporated into a simple procedure which can be used to evaluate the performance and costs of alternative preliminary designs. This procedure is applied to an example consisting of a wastewater flow from a hypothetical city of 50,000. (Bell-Cornell)
W78-02438

REGIONAL PLANNING FOR LAND APPLICATION OF WASTEWATER,
Pirnie (Malcolm), Inc., White Plains, NY.
C. H. Chiang.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2366-2370, December 1977. 2 fig, 2 tab, 4 ref.

Descriptors: *Waste water(Pollution), *Alternative planning, *Economic efficiency, *Optimization, *Cost analysis, Regional analysis, Evaluation, Treatment facilities, Networks, Mathematical models, Equations, Systems analysis, *Algorithms, *Heuristic algorithm, *Land disposal, *Regional planning, Cost effectiveness, Cost minimization, Regional systems.

Described is a heuristic algorithm for regional wastewater planning problems where land application of wastewater is considered. The algorithm is concerned with which land sites should be developed to serve which treatment plants and with what capacity. By a series of straightforward marginal cost analyses, the algorithm implicitly evaluates most of the solutions to the problem while explicitly evaluation only a few to reach a final solution. The objective of the algorithm is to define a range of good or low-cost solutions close to the least-cost solution. To demonstrate its usefulness, the algorithm is applied to a simplified regional planning problem. In general, the major features of the algorithm include: easy use; flexible computation; and generation of a number of low-cost solutions at very low engineering and computer costs. Indeed, no more information is required than that needed for the preparation of traditional engineering practices. The algorithm provides engineers or planners with a ready tool for cost-effectiveness analysis to generate quickly a number of good, possibly least-cost solutions. (Bell-Cornell)
W78-02439

EFFECT OF WASTEWATER SLUDGE ON SOIL MOISTURE RELATIONSHIPS AND SURFACE,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W78-02454

EFFECTS OF ATHENS POLLUTION OUTFALLS ON MARINE FAUNA OF THE SARONIKOS GULF,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-02479

NUTRIENT-ALGAL RELATIONSHIPS IN LAKE LILLINONAH, DANBURY, CONNECTICUT, JUNE-SEPTEMBER, 1975.
National Enforcement Investigations Center, Denver, CO
For primary bibliographic entry see Field 5C.
W78-02488

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 081, Price codes: A23 in paper copy, A01 in microfiche. Report No. EPA-570/9-77-001, January, 1977. 512 p, 84 fig, 80 tab, 360 ref, 5 append.

Descriptors: *Groundwater, *Waste disposal, *Water pollution sources, *Water quality control, Water wells, Water supply, Aquifers, Industrial wastes, Impoundments, Lagoons, Landfills, Septic tanks, Cesspools, Municipal wastes, Waste treatment, Sludge, Brines, Mine wastes, Injection wells, Groundwater movement, Sewerage, Legislation, Administrative agencies, Feedlot wastes, Land spreading.

This report is an evaluation of the impact of waste disposal practices upon present and future underground sources of drinking water, a study carried out persuant to Section 144(a)(4) of the Safe Drinking Water Act. Waste disposal practices included in this study are those activities which result in the actual collection and disposal of liquid, semi-solid, and solid wastes. The first few sections of the report describe the use and occurrence of the ground water resource along with the mechanisms of contamination. These are followed by a discussion of each of the major waste disposal practices responsible for either localized or regional ground water pollution. The next section deals with the importance of non-waste disposal practices as they affect ground water quality. The final two sections define the present status of Federal legislation that applies to ground water protection and the various regulatory options and strategies available to state and local agencies. (Eberle-NWWA)
W78-02537

DEEP WELL INJECTION OF INDUSTRIAL WASTES: GOVERNMENT CONTROLS AND LEGAL CONSTRAINTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W78-02538

COMBINED BIOLOGICAL TREATMENT AND UNDERGROUND INJECTION OF REFINERY WASTE WATER,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5D.
W78-02548

FEASIBILITY OF RETURNING FLY ASH TO WESTERN MARYLAND FOR MINE RECLAMATION.
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5G.
W78-02620

PROCEEDINGS OF THE NINTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.

For primary bibliographic entry see Field 5C.
W78-02646

WATER QUALITY MANAGEMENT–PROBLEM AREAS IN SEWERAGE AND SEWAGE DISPOSAL,
Thames Water Authority, London (England). Vales Div.
V. H. Lewin.
The Public Health Engineer, Vol. 5, No. 4, p 125-127, September, 1977.

Descriptors: *Water quality management(Applied), *Equipment, *Multi-purpose projects, *Planning, *Water pollution control, Municipal wastes, Industrial wastes, Water treatment, Waste water treatment.

Various topics are discussed in response to the newly organized tri-purpose regional water and waste treatment authorities in England. The need for more effective communications systems, telemetry, data acquisition, and information storage and retrieval systems is discussed. Specialized training and education programs are cited as important in assuring adequate water and waste water treatment by regional authorities. Sewer rehabilitation programs are suggested to relieve overloading of treatment plants produced by infiltration and inflow in deteriorated sewage systems. Adjustments in unit processes according to pollutant load is suggested. Various aspects of water quality planning and waste water management are discussed, including the development of long-term plans which are periodically reevaluated. The need for better maintenance and a greater understanding of the workings of mechanical and electrical equipment is described. (Schulz-FIRL)
W78-02663

METHOD OF TREATING SEWAGE SLUDGE,
NGK Insulators Ltd., Nagoya (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W78-02669

GROUND-WATER CONTAMINATION: PROBLEMS AND REMEDIAL ACTIONS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W78-02675

5F. Water Treatment and Quality Alteration

HIGH NITRATE DENTRIFICATION IN CONTINUOUS FLOW-STIRRED REACTORS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5D.
W78-02217

HYDROGEN SULFIDE PROBLEMS,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 31, No. 12, p 26-7, December, 1977.

Descriptors: *Hydrogen sulfide, *Water treatment, Taste, Sulfur bacteria, Corrosion, Oxidation, Ozone, Sulfur, *Impaired water quality, Odor, Chlorination, Potassium compounds, *Activated carbon, *Filters, *Filtration, Potassium permanganate, Maganese-greensand filter.

Domestic water supplies containing more than 1.0 ppm of hydrogen sulfide taste and smell like rotten eggs and are extremely corrosive. H2S solubility increases as water temperature increases. It occurs near coal and oil fields, and where sulfate-reducing bacteria exist. H2S concentrations less than 1.0 ppm require only a one-cubic-foot, activated carbon filter. Greater concentrations require chemical oxidation and filtration. Chlorine oxidation requires a 20-minute contact time and a 0.5-10 ppm chlorine residual. Potassium permanganate needs less contact time and utilizes a manganese-greensand filter to remove solid sulfur particles. These filters require regular maintenance for effective performance. Although ozonation oxidizes H2S most effectively, its initial cost is high. This cost is competitive with other chemical treatments when amortized over several years. (Palmer-NWWA)
W78-02283

BASIC CONCEPTS IN DISINFECTION WITH OZONE,
Miami Univ., Coral Gables, FL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-02324

EFFECT OF SEWAGE TREATMENT BY STABILIZATION POND METHOD ON THE SURVIVAL OF INTESTINAL PARASITES,
King Inst. of Preventive Medicine, Gindy (India).
For primary bibliographic entry see Field 5D.
W78-02330

PROCESS ARRANGEMENTS FOR ION EXCHANGE AND ADSORPTION,
California Univ., Berkeley. Dept. of Chemical Engineering.
T. Vermuelen.
Chemical Engineering Progress, Vol 73, No 10, p 57-61, October, 1977. 7 fig, 5 ref.

Descriptors: *Ion exchange, *Separation techniques, *Membrane processes, *Adsorption, *Tertiary treatment, Filtration, Anion exchange, Cation exchange, Water treatment, Desalination, Operation and maintenance, Chemical wastes, Municipal wastes, Water reuse, Reverse osmosis, Waste water treatment.

The use of various resin types and process arrangements can maximize performance and minimize operating costs of ion exchange and adsorption in water and waste water treatment. The use of ion retardation materials, ion-exclusion agents, electron-exchange resins, and polymeric resin membranes to enhance ion exchange processes is discussed. Several process arrangements are described, including large-scale 'swimming-pool' systems for water treatment, mixed bed deionization, cyclic multi-bed systems, continuous ion exchange, reverse-flow regeneration, combination fixed-bed and fluidized-bed systems for water softening, and the Sirotherm or thermal-cycling process for desalination. Schematic flow diagrams are provided for each of the process configurations. (Schulz-FIRL)
W78-02331

UV-OX(TM) PROCESS FOR THE EFFECTIVE REMOVAL OF ORGANICS IN WASTEWATERS,
Westgate Research Corp., Marina del Rey, CA.
For primary bibliographic entry see Field 5D.
W78-02335

USE OF OZONE IN THE DISINFECTION OF COLIPHAGE T-7 VIRUS,
Abbott Labs., Crystal Lake, IL.
D. S. Hacker, and T. Lockowitz.
AIChE Symposium Series, Vol. 73, No. 166, p 242-251, 1977. 6 fig, 3 tab, 16 ref.

Descriptors: *Ozone, *Virus, *Disinfection, *Mass transfer, *Kinetics, Analytical techniques, Microorganisms, Mathematical models, Model studies, Sewage treatment, Water treatment, Waste water treatment, Virus deactivation, Ozone disinfection mechanisms.

Results of investigations on the deactivation kinetics of E. coli bacteriophage virus with gaseous ozone in a batch, semiflow, gas-liquid reactor are presented. Virus models which have been used to explain the observed rates of virus disinfection by chemical treatment are described. Descriptions of the experimental procedures, cultures used in the study, the three-layer agar technique used for plaque assays of the bacteriophage T-7 titer, and the sterility tests on primary effluent are presented. The survival percentage of virus with time is illustrated for isothermal and constant pH systems, and compared with the pseudo-first-order decay of virus. The studies indicated that virus deactivation was governed by two general rate processes: mass transfer in the saturation of the solution by the disinfectant; and the kinetic first-order deactivation rate of the virus. The viscosity and the presence of impurities in the media did not effect the reaction rate. A mathematical model to describe the trend observed in experimental reaction data for the initial phase of deactivation and the induction period is presented. (Schulz-FIRL)
W78-02343

REACTOR CLARIFIERS.
Effluent and Water Treatment Journal, Vol 17, No 8, p 427, August, 1977.

Descriptors: *Clarification, *Flocculation, Equipment, *Suspended solids, Design data, Suspended solids, Polyelectrolytes, Waste water treatment, Water treatment.

Flocculation and clarification have been widely used in the water and waste water treatment industries for removal of suspended solids, algae, and color. High rate solids-contact reactor clarifiers have been developed by Emico. The top diameter of a bell-shaped reactor for a 200-ft dia clarifier would be approximately 50 ft with a turbine diameter of 28 ft. Influent is fed horizontally through the tank side wall and reactor well wall into the recirculation cylinder. The unit combines flocculation, coagulation, clarification, and positive sludge removing capability in a single tank. The unit's other functions include removal of silica, suspended solids, BOD, and COD; precipitation; and lime-soda or brine softening. In handling raw water from rivers and wells, the high rate solids contacting unit is capable of reducing turbidity from 20 ppm to 1 ppm. Additional applications of the Emico units are described. (Schulz-FIRL)
W78-02360

POLIO-VIRUS ADSORPTION FROM WATER ONTO SILICATE MINERALS,
Maine Univ. at Orono. Dept. of Civil Engineering.
S. H. Lo, and O. J. Sproul.
Water Research, Vol 11, No 8, p 653-658, 1977. 6 tab, 19 ref.

Descriptors: *Adsorption, *Viruses, *Silicates, *Mineralogy, *Waste assimilative capacity, Microorganisms, Filtration, Geochemistry, Organic wastes, Soil properties, Separation techniques, Effluents, Waste water treatment, Water treatment.

Batch studies and column experiments were used to investigate virus adsorption on silicate minerals in natural water and treated domestic waste water under controlled conditions. In the first phase of the experiments, the degree of adsorption of poliovirus type I was examined with secondary effluent from the University Park Sewage Plant in Orono, Maine, and six silicate minerals: actinolite, enstatite, kyanite, microcline, olivine, and sillimanite. In batch experiments, virus removal ranged from 51% to 78% for the different silicate species, and only a minor part of the surface area of the granular particles was occupied by viruses. Actual adsorption capacities ranged from 642,000 to 895,000 PFU per mg of silicate mineral. When organic material was added to the system, virus

adsorption decreased to about 15-20% as a result of competitive adsorption. In the second series of experiments polio-virus movement through a microcline-filled column was investigated with biologically treated domestic waste water effluent applied at a rate of 0.61 cu m/day-sq m. With a natural water system, virus started to appear in the column effluent after 6 days and 99% removal was still being achieved after 13 days. With waste water, virus appeared in the column effluent after 1.33 days. The lower removal efficiency with waste water was attributed to competitive adsorption in the presence of organic materials. Comparisons of the adsorptive capacities of the individual silicate minerals revealed that olivine adsorbed more viruses per unit weight than the other mineral species. It was suggested that the degree of adsorption was greater for minerals with higher acidity. (Schulz-FIRL)
W78-02365

INFLUENCE OF TEMPERATURE AND U.V. LIGHT ON DISINFECTION WITH OZONE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
S. Farooq, R. S. Engelbrecht, and E. S. K. Chian.
Water Research, Vol 11, No 8, p 737-741, 1977. 6 fig, 11 ref.

Descriptors: *Disinfection, *Ozone, *Sewage bacteria, *Ultraviolet radiation, *Mycobacterium, Aerobic bacteria, Activated sludge, Effluents, Acid bacteria, Microorganisms, Water pollution control, Sewage treatment, Waste water treatment, Water treatment.

Laboratory studies with the acid-fast bacteria, Mycobacterium fortuitum, were used to examine the effects of temperature and ultraviolet light on the degree of inactivation of microorganisms by ozone. De-ionized buffered water innoculated with test organisms was fed to a continuous flow-type reactor. The partial pressure of gaseous ozone was kept at 16.8 mg/liter with an ozone-air gas flow rate of 0.51/min. The effect of temperature on the survival of M. fortuitum was examined at a constant rate of applied ozone and at varying ozone residuals at 9, 20, 30, and 40C. Studies indicated that the degree of inactivation increased with the ozone residual and with temperature. The second series of experiments on the effect of temperature were conducted at constant ozone residuals maintained by varying the partial pressure of applied ozone. Results indicated that the disinfection efficiency increased significantly with temperature. A value of 18.3 Kcal was calculated from temperature data for the activation energy for ozone disinfection. The chemical reaction rate between ozone and bacterial cells was suggested as the rate-limiting step in ozone disinfection at pH 7.0. The effect of ultraviolet light on ozone disinfection was investigated with activated sludge effluent equilibrated with M. fortuitum. Studies indicated that although ultraviolet light did not enhance ozone efficiency, ultraviolet light alone did have significant disinfecting abilities. (Schulz-FIRL)
W78-02366

THE PROMISES OF ION EXCHANGE,
Shell Development Co., Houston, TX.
F. G. Helfferich.
Chemical Engineering Progress, Vol 73, No 10, p 53-55, October, 1977.

Descriptors: *Separation techniques, *Ion exchange, *Membrane processes, *Absorption, *Anion exchange, Desalination processes, Permselective membranes, Ion transport, Municipal wastes, Filtration, Industrial wastes, Waste water treatment, Water treatment.

The historical background and development of ion exchange technology are described. Prior to 1935, most of the interest in ion exchange was directed toward developing a theory to explain the process. From 1935 into the 1950s research was directed toward developing ion exchange materials, leading to the introduction of more stable styrene polymers and the strong base anion exchange resins. Around 1955 commercial ion exchange membranes were introduced and the separation technique of ligan exchange was developed. Developments led to practical applications of ion exchange technology with emphasis on water treatment. Theoretical studies examined alkali metal equilibria on strong acid ion exchangers. Current research emphasizes conservation of the environment, energy, and raw materials. The need for research into the use of ion exchange in situations where other physical phenomena such as adsorption, ionic association, neutralization, or complex formation complicate treatment processes is emphasized. (Schulz-FIRL)
W78-02371

INVESTIGATION OF MUTAGENIC EFFECTS OF PRODUCTS OF OZONATION REACTIONS IN WATER,
Environmental Protection Agency, Washington, DC. Office of Water Supply.
J. A. Cotruvo, V. F. Simmon, and R. J. Spanggord.
Annals of the New York Academy of Sciences, Vol. 298, p 124-140, 1977. 5 ref.

Descriptors: *Ozone, *Bioassay, *Disinfection, *Environmental effects, *Organic compounds, Chemical reactions, Municipal wastes, Oxidation, Chemical wastes, Waste water treatment, Humic acids, Aldrin, Aroclors, DDT, Urea, Aromatic compounds, Organic acids, Mutagenicity.

Potential hazards posed by chlorinated organic chemicals in waste water and drinking water after disinfection by chlorination have led to an evaluation of potential biological activitiy of products of ozonation, an alternate means of disinfection. Rapid in vitro microbiologic bioassays of 28 selected organic compounds subjected to high levels of ozone, as well as similar analyses on municipal secondary treated waste water which had been disinfected with various agents, were used to evaluate mutagenic activity in Saccharomyces cerevisiae D3, Salmonella, and a rat liver homogenate. Process conditions were more severe than those in conventional ozone treatment. Only seven of the 28 organic compounds tested showed any mutagenic activity, and in those cases the activity was not dose-related and usually resulted from prolonged ozone exposure. (Schulz-FIRL)
W78-02378

CONCRETE FORMING FOR WATER AND WASTE TREATMENT PLANTS.
For primary bibliographic entry see Field 8F.
W78-02395

OPTIMAL CAPACITY EXPANSION WITH OFF-DESIGN COSTS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3A.
W78-02450

ASTP CHEMICAL AND MICROBIOLOGICAL ANALYSIS OF POTABLE WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 5A.
W78-02621

5G. Water Quality Control

A MULTI-PARAMETER WATER QUALITY MANAGEMENT MODEL FOR RIVER BASINS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
R. J. Hughto, and D. P. Loucks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 588, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, November 1977. 73 p, 8 fig, 8 tab, 25 ref, 4 append. OWRT A-070-NY(1), 14-34-0001-7067, 7068.

Descriptors: *Water quality, Management, *Linear programming, *Optimization, Dissolved oxygen, Algae, Biochemical oxygen demand, Finite element analysis, System analysis, Nutrients, *Model studies, River basins, *Simulation analysis.

The QUAL II multi-parameter water quality simulation model, developed by Water Resources Engineers, Inc., is modified to become part of a preliminary steady-state, multi-parameter water quality management model. Seven constituents of water quality are considered: algae, ammonia, nitrite, nitrate, phosphorus, BOD, and DO. The model formulation is in terms of coupled partial differential equations for the seven constituents. The nonlinear, partial differential equations are linearized by the quasilinearization technique. These equations are solved numerically by the Galerkin finite element method. The management model is used to determine the required wastewater treatment that will meet both effluent and stream quality standards and satisfy management objectives. The model is applied to a sample hypothetical river. In the example, the least cost combination of biochemical oxygen demand (BOD) treatment levels at point source locations along the river is determined subject to dissolved oxygen quality standards in the river. Results from both simulation and optimization problems are compared.
W78-02202

BIOLOGICAL AND WATER QUALITY EFFECTS OF WHOLE LAKE MIXING,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
D. W. Toetz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 646, Price codes: A05 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1977). 78 p, 13 fig, 35 tab, 6 ref. OWRT A-068 OKLA(1).

Descriptors: Lakes, Reservoirs, *Aeration, *Impaired water quality, Algae control, Algae, Fish food organisms, Water pollution control, *Productivity, *Oklahoma, *Mixing, *Destratification, *Arbuckle Lake(Okla), *Ham's Lake(Okla), Artificial destratification, *Principal component analysis.

An axial flow pump designed by James Garton offers a cost-effective solution to water quality problems. The goal of this research was to describe water quality and biological effects of the Garton pump. The pump advanced fall turnover by one month and reduced vertical thermal differences during the summer in Arbuckle Lake (950 ha.). There was no effect of mixing on the vertical distribution of reducing compounds, algal biomass or transparency. Ham's Lake (40 ha.) was destratified each summer during 1973-1976. Algal biomass and fish growth were unchanged. The Allen-Bartell-Koonce model demonstrated that algal community response to destratification occurred more than four days after the physicochemical environment was altered. The species composition did not settle into a new circular pattern until six weeks later. The effects of lake mixing on the biota were investigated using isolated columns of water. Community production (P) and respiration (R) declined in isolated columns of lake water and mixing reduced both still further, but the ratio P/R was unchanged. The effects of mixing on fish predation on zooplankton could not be demonstrated.
W78-02203

OPTIMAL LOCATION OF A POLLUTING PLANT ON A LINE UNDER UNCERTAINTY,
Bar Ilan Univ., Rama-Gan (Israel). Dept. of Economics.
J. Paroush, and C. S. Tapiero.
Journal of Regional Science, Vol 16, No 3, p. 365-374, 1976. 2 fig, 2 tab, 15 ref.

Descriptors: *Mathematical models, *Statistical models, *Stochastic processes, *Optimization, *Industrial plants, *Human population, Pollution, Sites, Pollution abatement, Distance, Industrial wastes, Distribution patterns, Location theory, Location analysis.

The probable impact of a polluting plant on a lineally-distributed human population is assessed and the necessary and sufficient conditions for optimum location are determined. Probable interaction effects of distance and the case of randomly-distributed populations are considered. The probable pollution impact is resolved by representing diffusion effects of pollution through a stochastic process leading to a hypothetical binomial model for the interaction effects of distance. Optimum location is determined by establishing conditions for the expected damage case as well as for the expected cost case when the population may or may not be distributed randomly on the line. Because of the central limit theorem and the signs of the derivatives of loss functions, the relatively simple results may be generalized to more complicated situations. To study comparative static effects of population movements on optimum location, a novel technique is suggested based on localized population shifts. This approach can be extended to the investigation of taxation and zoning problems. The essential contribution of this paper is to recognize the probabilistic effects of distance and diffusion on, and interaction of those elements with, population distribution, of primary importance to environmental economics. (Lynch-Wisconsin)
W78-02211

INTERACTION OF SOLUBLE PHOSPHATE WITH ALUMINUM HYDROXIDE IN LAKES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W78-02222

U.S. ARMY CORPS OF ENGINEERS CLEVELAND-AKRON THREE RIVERS WATERSHED, WASTEWATER MANAGEMENT SURVEY SCOPE STUDY.
Wright-McLaughlin Engineers, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 902, Price codes: A09 in paper copy, A01 in microfiche. Formulation Final Report, March 1973. 199 p, 18 fig, 34 tab, 7 ref.

Descriptors: *Waste water treatment, *Planning, *Ohio, *Lake Erie, Evaluation, Sewage treatment, Water treatment, Water pollution, Water pollution control, Lakes, Rivers, Effluents, Industrial wastes, Industrial waters, Cities, Municipal wastes, Urban runoff, *Water Pollution Control Act.

This study was undertaken to identify and to recommend one or more regional wastewater management systems capable of achieving the water quality goal intended by the Water Pollution Control Act Amendments of 1972, commonly termed the 'Clean Water Bill.' The natural goal has been interpreted in a set of specific effluent criteria to be met by 1985. The present study showed the national goal and the proposed date of compliance to be a feasible objective for the Study Area with present waste-water treatment technology. The results of the Cleveland Area Survey Scope Study will help to define the various regional and national impacts of the Clean Water Bill. (Sims-ISWS)
W78-02233

SCANNER, ORIENTER HELP FIND CASING LEAKS,
For primary bibliographic entry see Field 8G.
W78-02287

WATER POLLUTION LAW: CONGRESS CONCEDES SOME 'MID-COURSE CORRECTIONS'.
For primary bibliographic entry see Field 6E.
W78-02292

DESIGNING RETENTION BASINS FOR SMALL LAND DEVELOPMENTS,
McElhanney Surveying and Engineering Ltd., Surrey (British Columbia).
H. G. Kelly.
Water and Sewage Works, Vol. 124, No. 10, p 78-80, October, 1977. 3 fig, 1 tab.

Descriptors: *Design criteria, *Mathematical models, *Storm water, *Retention, *Model studies, Rainfall-runoff relationships, Rational formula, Storm runoff, Urban drainage, Storm water retention basins.

An expanded model to provide design criteria for estimation of retention basin volumes for small land development projects has been reviewed. The time of concentration in the developed catchment basin and the attenuation of runoff intensity with time following the instantaneous peak rate of catchment basin discharge are incorporated. The model is recommended for use where analysis with synthetic hydrographs is not practical and where controlled rates of discharge are required. Intensity, duration, and frequency rainfall curves may be linearized in natural or logarithmic form. An equation for the outflow volume to the condition peak storage in the retention basin is derived. Equations for the volume of inflow during the period of increasing storage and for the volume of storage are presented. The model is used in the calculation of a design for a cul-de-sac in a 7.7-acre development intended for single family occupancy. (Schulz-FIRL)
W78-02299

SEWAGE COLLECTION SYSTEM RELIEVES THREAT TO FLORIDA OYSTER INDUSTRY.
Water and Sewage Works, Vol 124, No 8, p 64-65, August, 1977.

Descriptors: *Sewerage, *Sanitary engineering, *Plastics, *Sewers, *Pipes, Pipelines, Plastic pipes, Clay pipes, Hydraulic transportation, Municipal wastes, Sewage treatment, Florida, Water pollution control, Flood protection, Valves, Construction equipment, Waste water treatment, Vacuum sewage collection systems.

An AIRVAC vacuum sewage collection system was installed at Eastpoint, Florida, to relieve pollution of Apalachicola Bay and eliminate environmental hazards to the area's oyster industry. Cost estimates for the vacuum system were $375,000 or 42% less than for an equivalent gravity line collection system, because of the area's low topography and water table. Because Eastpoint is in a flood-prone area, valves will operate totally submerged with above-ground venting. Also, several pits were installed above grade to prevent valve flooding. Additional cost savings were realized by shallower trenching, the use of small-diameter PVC pipe instead of large-diameter clay pipe, and the omission of a series of expensive pumping stations. Three-inch PVC lines brought to grade and enclosed in water boxes have replaced standard sewer manholes. Field experience has indicated that valves should require minimal maintenance and should last for 50 yrs with little or no repair. Two collection stations, 15 miles of PVC vacuum lines, and 456 individual hookups comprise the system which will handle 165,000 gpd of municipal waste. (Schulz-FIRL)
W78-02301

CAN THIS SEWER PROJECT HAVE RECREATIONAL BENEFITS,
Board of Water and Sewer Commission, Northborough, MA.
J. Tracy, and C. Simmons.
Public Works, Vol 108, No 10, p 96-98, October, 1977.

Descriptors: *Sewerage, *Multi-purpose projects, *Recreation facilities, *Interceptor sewers, *Sewers, Construction, Paging, Conveyance structures, Rivers, Waste water treatment, Northborough(MA).

A sewer construction project for 5 miles of interceptor sewers 15-30 inches in diameter was designed by Camp, Dresser and McKee, Inc., of Boston for the town of Northborough, Massachusetts. Preliminary studies were conducted to determine whether any recreational benefits could be derived from the project for the Assabet River through reclamation of disturbed lands. The study concluded that the installation of an interceptor system could be coordinated with the construction of a recreational trail system. Studies on the physical feasibility of such a system indicated that the pipeline could be located within the undeveloped river margins without incurring high land acquisition costs or displacing residents and businesses. Specific design recommendations for the proposed trail system included a 250-ft separation between the trail and any dwellings, continuation of the trail on sidewalks and streets in densely populated areas, a large number of trail access points, prohibition of recreational vehicles on the trail, and possible connection with the Wachusett aqueduct right-of-way. (Schulz-FIRL)
W78-02304

SEWERS VERSUS SEWERLESS METHODS--A REPORT BY A CONGRESSIONAL COMMITTEE,
H. H. Leich.
Compost Sciences, Vol. 18, No. 4, p 26, August, 1977.

Descriptors: *Sewers, *Sewage effluents, *Sanitary engineering, *Water utilization, *Sewerage, Domestic wastes, Waste water treatment.

The advantage and disadvantages of centralized waste water treatment and home disposal systems were evaluated in a congressional report by the Subcommittee on the Environment and the Atmosphere, a division of the House Committee on Science and Technology. Conservative attitudes in sanitary engineering are cited as a stumbling block in the use of innovative technology in municipal waste water treatment. The need for consideration and development of viable alternatives to costly sewage treatment facilities which require a great deal of land is discussed. Self-contained household waste water treatment and disposal systems have been suggested as reasonable alternatives to regional collection and treatment systems. Current trends, however, are against the continuing use of septic tanks and the acceptance of sewerless toilet systems. Studies which define current individual and small unit technology, as well as costs, are recommended. (Schulz-FIRL)
W78-02312

EPA RELAXES ITS STANDARDS ON SEWAGE SETTLING PONDS.
Engineering News-Record, Vol. 199, No. 16, p 15, October, 1977.

Descriptors: *Oxidation lagoons, *Sewage lagoons, *Federal Water Pollution Control Act, *Suspended solids, *Biochemical oxygen demand, Water quality standards, Municipal wastes, Sewage treatment, Waste water treatment.

Since compliance with secondary waste water treatment standards set by the 1972 Federal Water

Pollution Act may require small communities to build elaborate sewage treatment plants and abandon existing settling ponds, the EPA has modified its effluent quality standards. Under the new regulations, communities which meet the BOD standard of 30 ppm over a 30-day average will not be required to comply with the equally strict standard for suspended solids. The relaxed standards will be adjusted to accomodate variations in climate and geography. Lagoon treatment of sewage or decomposition in an artificial pond exposed to air and sunlight is considered by the EPA as a viable alternative to more expensive means of secondary treatment. (Schulz-FIRL)
W78-02333

SOLID-LIQUID SEPARATION: AN OVERVIEW,
Houston Univ., TX. Dept. of Chemical-Petroleum Engineering.
F. M. Tiller, and J. R. Crump.
Chemical Engineering Progress, Vol. 73, No. 10, p 65-75, October, 1977. 14 fig, 2 tab, 15 ref.

Descriptors: *Separation techniques, *Filtration, *Mathematical models, *Dewatering, Equipment, Centrifugation, Clarification, Flocculation, Porous media, Flow measurement, Darcy's Law, Equations, Pumping, Chemical precipitation, Municipal waste, Industrial wastes, Water treatment, Waste water treatment.

Solid-liquid separation techniques have been used in a wide variety of situations, including mining, waste, and water treatment operations. Solids separation involves pretreatment to increase particle size, thickening, clarification, filtration, centrifugation, and post-treatment to remove soluble materials and reduce average porosity. Product specifications in terms of filtrate clarity, permissible solubles content of the cake, and average porosity or liquor content of the cake are discussed as criteria for equipment selection. Pretreatment methods used in solid-liquid separation include chemical pretreatment to enhance flocculation or coagulation; pH control; surface charge neutralization; and physical pretreatment with filter aids such as diatomaceous earth, fly ash, expanded perlite, and other filter aids. Filtration theory related to the flow within the cake and the external conditions imposed upon the cake by pumping and by filter design are discussed. Porosity variation and flow resistance are examined with respect to filtration mechanisms. Mathematical equations for the calculation of resistances and the definition of flow through porous media are presented. Material-balance and rate equations are derived for filtration at constant pressure and rate and at variable pressure and rate. Various techniques for cake washing are described. (Schulz-FIRL)
W78-02334

AREAWIDE WASTEWATER MANAGEMENT FOR METROPOLITAN DES MOINES,
Kirkham Michael and Associates, Omaha, NE.
C. L. Weber.
Public Works, Vol. 108, No. 10, p 72-74, October, 1977. 1 fig, 1 tab.

Descriptors: *Water management(Applied), *Planning, *Surveys, *Regional economics, Waste water treatment, Sewerage, Water pollution control, Municipal wastes, Waste water treatment, Water quality standards.

The Des Moines Areawide Waste Treatment Management Planning Program was created in response to water quality standards imposed by Public Law 92-500 and by the Iowa Water Quality Commission. An embargo placed on all new sanitary connections within the Des Moines area was later suspended for 90 days, to allow the 23 local governments to develop a framework in which to meet sewer planning agreements. The Central Iowa Regional Association of Local Governments (CIRAIG) in conjuction with state, local, and federal agencies set goals for the program: to protect surface and groundwater quality; to implement and carry out an areawide waste treatment planning program; to examine current population trends in the area; to construct new and rehabilitate existing waste water and drainage facilities; and to examine costs and land use requirements. Specific problems addressed by the planning program were the alleviation of combined sewer overflows and basement backups during wet weather, and the resolution of problems associated with assessment of sewage treatment charges to participating municipalities. The technical plant recommended for a population of 400,000 included individual waste water collection systems for 13 communities in the planning and the construction of a regional treatment facility adjacent to the existing Des Moines main treatment plant. The regional treatment plant has a design capacity of 50 mgd and includes several large equalization basins to store sanitary flows during periods of heavy rainfall. (Schulz-FIRL)
W78-02351

DYNAMO 1: A COST EFFECTIVE SOLUTION TO TREATMENT PROBLEMS,
Weston Environmental Consultants-Designers, Richmond, VA.
K. E. Patterson.
Water and Wastes Engineering, Vol 14, No 9, p 121-124, 126, September, 1977. 4 fig, 2 tab.

Descriptors: *Cost comparisons, *Water quality standards, *Model studies, *Mathematical studies, Analytical techniques, Computer models, Cost-benefit analysis, Energy, Municipal wastes, Treatment facilities, Sewage treatment, Waste water treatment.

DYNAMO-1, a first-generation dynamic computer programming model, was developed to evaluate and select the optimum waste water treatment alternative for a given raw waste load and effluent quality requirements from a series of 3,000 treatment alternatives. A multi-stage decision system which incorporates five factors per stage is used to find the maximum/minimum return configurations. Each stage examines the input state, output state, a decision variable, a stage return, and a stage transformation. Decision-making is based on a 'backwards' approach to find the optimal policy for each stage of a given state. A design/cost algorithm was developed to select the most cost-effective alternative from the range of possibilities. Since the program was designed to begin at the last step in the treatment process and end with a treatment stage representing raw waste entering the plant, the choice of treatment scheme is based on the raw waste load which the alternative is designed to handle and on the most cost-effective solution. A summary of alternatives considered by DYNAMO-1 in the analysis of designs is presented for a 10-mgd municipal waste water treatment plant on the basis of raw waste characteristics of BOD at 220 mg/liter and TSS at 150 mg/liter and effluent requirements of 20 mg/liter for both constituents. (Schulz-FIRL)
W78-02389

DOES POLLUTION ABATEMENT IMPROVE AQUATIC LIFE,
Normandeau Associates, Bedford, NH.
For primary bibliographic entry see Field 5B.
W78-02390

SURVEY FORECASTS FLOOD IN 1978 SEWERAGE MARKET.
Engineering News-Record, Vol. 199, No. 14, p 40-41, October, 1977. 1 tab.

Descriptors: *Costs, *Construction costs, *Planning, *Regional economics, *Sewerage, Financing, Forecasting, Municipal wastes, Waste water treatment.

A survey of 66 major sanitary districts in the United States indicated that they intended to spend approximately $2 billion for sewer and waste water treatment projects in 1978, with half of the funds slated for new, upgraded, or expanded treatment plants. Much of the support of these projects will be provided by the EPA's sewerage construction grants program. Estimates by the 66 districts of expenditures during fiscal 1979 totalled $1.1 billion, 40% less than the anticipated 1978 expenditures. The districts also reported an increase in the number of bidders per project in fiscal 1977 and the receipt of contract bids which averaged 12% below the engineer's projected cost. (Schulz-FIRL)
W78-02393

RISING SEWAGE PLANT OPERATION COSTS BEG ENGINEERED SOLUTIONS.
Engineering News-Record, Vol. 199, No. 14, p 71, October, 1977.

Descriptors: *Costs, *Sewage treatment, *Operation and maintenance, *Energy, Cost analysis, Capital costs, Planning, Waste water treatment.

Through analyses of current trends in sewage treatment costs, the EPA has predicted annual sewage treatment expenditures in the United States of $148.4 billion by 1990. The Water Pollution Control Federation's estimates are even higher at $150 million for operating costs and $450 billion for construction of municipal and industrial facilities. Current high costs for operation and maintenance as well as for energy, chemicals, and labor have indicated the need for engineered improvements in sewage plants' operating efficiency with particular emphasis on reducing costs. A survey revealed that in 38 sewage treatment plants annual operating and maintenance costs exceed amortized capital costs at 21 of the plants, and that in 18 secondary plants cumulative operation and maintenance costs exceeded their design and construction costs in less than 4 yrs. For primary plants costs for operation and maintenance exceeded costs for initial design and construction after an average of 13.4 yrs, and for all the plants in the survey after an average of 6.1 yrs. (Schulz-FIRL)
W78-02394

ADVANCED SEWAGE TREATMENT PLANTS, AN EPA PLANNING FLOP.
Engineering News-Record, Vol. 199, No. 19, p 12-13, November, 1977.

Descriptors: *Costs, *Treatment facilities, *Planning, *Tertiary treatment, Legislation, Waste water treatment.

A study by the General Accounting Office (GAO) that challenged the EPA's funding of advanced municipal waste water treatment plants and the corresponding reply by the EPA are discussed. A study of Vertex Corporation of McLean, Virginia, for EPA called for a temporary moratorium on federal funding for advanced plants, thereby agreeing with the GAO's recommendations. Current estimates suggest that approximately $21 billion in federal funds will be required to construct tertiary treatment plants for the estimated 1990 United States population. Fundamental defects in advanced waste water treatment policy cited by Vertex included the lack of planning based on technical information rather than on water quality standards, mathematical models, and wasteload allocations; and the apparent funding inequities among the states. The Vertex report also recommended the acquisition of more information on hydrodynamics, waste water discharges, water quality, sediments, and aquatic biology, along with an extensive cost-benefit analysis of advanced wastewater treatment. Review of areas of the 1972 Federal Water Pollution Control Act amendments which concern advanced waste water treatment is suggested. (Schulz-FIRL)

W78-02396

RECLAIMED WATER FOR CAPE PENINSULA.
For primary bibliographic entry see Field 5E.
W78-02397

HYDRAULIC MODELING OF THE RESERVOIR, LOCAL DESTRATIFICATION PHENOMENON,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
D. K. McLaughlin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 778, Price codes: A02 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1977). 13 p, 5 fig, 6 ref. OWRT A-070-OKLA(1), 14-34-0001-7076.

Descriptors: *Stratified lakes, *Hydraulic modeling, *Local destratification, *Plume penetration, *Water quality enhancement, Pumps, Conductivity measurements, Flow fisualization, Global destratification, Pumping, Mississippi, Garton propeller pump, Lake Okatibbee(Miss).

A new hydraulic model facility has been designed and constructed in which to study the hydrodynamics of local destratification of reservoirs. Experiments have been performed using a model of the Garton type of propeller used to destratify a reservoir (Lake Okatibbee, Mississippi) in the near vicinity of the release structure. The results of the experiments demonstrated the feasibility of modeling the local destratification of reservoirs using the Richardson number as the basic modeling parameter.
W78-02403

HYDROLOGIC CONSIDERATIONS ASSOCIATED WITH DREDGING SPRING PONDS IN WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 4D.
W78-02421

INTERNALIZATION IN A STOCHASTIC POLLUTION MODEL,
Tel-Aviv Univ., (Israel). Dept. of Economics.
E. Hochman, D. Zilberman, and R. Just.
Water Resources Research, Vol. 13, No. 6, p 877-881, December 1977. 6 fig, 10 ref.

Descriptors: *Water pollution control, *Stochastic processes, *Model studies, *Dairy industry, *Probability, *Economics, Investment, Methodology, Effluents, Runoff, Optimization, Shellfish farming, Standards, Water policy, Regional analysis, Equations, Systems analysis, Profit maximization, San Francisco Bay(Cal).

A stochastic model has been developed for internalizing pollution externalities. Pollution occurs or does not, depending on factors related to a stochastic environment and human error. But the probability of pollution can be altered by adopting various technologies. The model is described in detail in terms of industries located within a river basin, wherein the objective function is that of profit maximization. The model is applied to the problem of effluent runoff from dairies near the San Francisco Bay, which can prevent shellfish harvest in the bay. With runoff holding areas, pollution occurs if a rainstorm is severe enough to cause overflow. Standards rather than taxes are used as policy instruments in the model. Results generally indicate that an accurate approximation of stochastic distribution is a necessity. Specific implications for the dairy problem are that present regulations are too lenient. The methodology presented may be of critical importance for examining other problems, such as oil spills and nuclear power plant explosions. (Bell-Cornell)
W78-02440

STATISTICAL MODELS OF RIVER LOADINGS OF NITROGEN AND PHOSPHORUS IN THE LOUGH NEAGH SYSTEM,
Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5B.
W78-02441

A MODELLING METHOD FOR EVALUATING WATER QUALITY POLICIES IN NONSERIAL RIVER SYSTEMS,
Calgary Univ., (Alberta). Faculty of Business.
M. B. Bayer.
Water Resources Bulletin, Vol. 13, No. 6, p 1141-1151, December 1977. 5 tab, 14 ref.

Descriptors: *Water quality, *Pollution abatement, *Water policy, *River systems, *Efficiencies, *Thermal pollution, Evaluation, Methodology, Optimization, Dissolved oxygen, Biochemical oxygen demand, Temperature, Constraints, Waste water treatment, Treatment facilities, Standards, Mathematical models, Equations, Systems analysis, *Nonlinear programming, Temperature decay.

Described is a mathematical method which simplifies the evaluation of water quality policies for nonserial (branching) river systems. The method introduces dummy facilities at the junctions of the major tributary branches with the mainstream as replacements for the facilities and activities on the tributaries. The cost functions for the dummy facilities and the DO and BOD concentrations at the junctions as determined for each tributary are introduced into the mainstream serial system model which is then solved for the optimal values of the mainstream treatment plant efficiencies, the dummy facility effeciencies, and the tributary system DO and BOD concentrations using nonlinear programming. Given the optimum values for the dummy facility efficiencies and the values for the tributary system DO and BOD concentrations, the optimum values for the tributary treatment plant efficiencies are found using nonlinear programming. The method is applied to a river system with a mainstream and one major tributary which contain industrial and municipal organic and thermal polluters and their associated wastewater treatment plants. The objective function combines thermal pollution and cost minimization. (Bell-Cornell)
W78-02442

SENSITIVITY ANALYSIS OF STREETER-PHELPS MODELS,
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro di Teoria dei Sistemi.
For primary bibliographic entry see Field 5B.
W78-02444

EFFECTS OF ACID MINE WASTES ON AQUATIC ECOSYSTEMS,
Southern Illinois Univ. at Carbondale. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-02456

RECOVERY OF AQUATIC BACTERIAL POPULATIONS IN A STREAM AFTER CESSATION OF CHEMICAL POLLUTION,
Texas Univ. Health Science Center, Houston. School of Public Health.
D. S. Cherry, R. K. Guthrie, F. L. Singleton, and R. S. Harvey.
Water, Air and Soil Pollution, Vol. 7, No. 1, p 95-101, 1977. 2 fig, 1 tab, 6 ref.

Descriptors: *Bacteria, *Water pollution, *Chemical wastes, *Stream improvement, *Streams, Pollutants, Aquatic bacteria, *South Carolina, Effluents, Water pollution effects, Tims Branch(SC), *Chromogenic bacteria, Savannah River Project(SC).

Tims Branch, on the Savannah River Project in Aiken, SC, a small stream which for about ten years received 229,900 kg/yr of waste chemicals in the effluent from a chemical production site, was evaluated for recovery of its bacterial population after the chemical discharges were stopped early in 1973. The stream, which flowed at a rate of 2,200 l/min, carried the effluent for about 10 km before emptying into the pollution-free Upper Three Runs Creek, with a flow rate of 370,000 l/min. Upper Three Runs was sampled as a non-polluted control stream. Chemical pollution seriously affected only the percentage of chromogen bacteria, and did not significantly alter the total colony-forming units nor the diversity as measured by colony types. At no time during the study were there significant differences between the counts of culturable bacteria in the two streams. In Tims Branch, chromogens increased from 15% of the bacterial populaton while polluted, to 25% one year after the discharges were halted. In the control stream, the figure was 28% during the study. Diversity in both systems was more affected by seasonal temperatures than the presence of chemical pollution. Mean total counts dropped from 187,000 in the polluted stream to approximate those of the control stream (170,000) after pollution stopped. No genus was consistently isolated from one stream and not the other; most common, in decreasing frequency, were: Bacillus sp., Flavobacterium sp., and Brevibacterium sp. (Lynch-Wisconsin)
W78-02477

CONTROLLING AQUATIC WEEDS,
New York Sea Grant Advisory Service, Albany.
M. Duttweiler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 370, Price codes: A02 in paper copy, A01 in microfiche. Marine Trader Flyer, No. 7, Excepted from a speech given at the St. Lawrence River Regional Marina Conference, December, 1975. 2 p. NYSS-GI-AS-75-002.

Descriptors: *Aquatic weed control, *New York, *Eutrophication, Nutrients, Harvesting, Water pollution, Water pollution control, Chemcontrol, Mechanical control, Mulching, Foods, Fertilizers, Beneficial use.

An increasing awareness of aquatic weed control problems in New York State has resulted in: (1) surveys of the extent of the problem, including in the Finger Lakes, St. Lawrence River, and Lake Ontario; (2) legislative action, principally through hearings and cooperation with citizen's groups; and (3) direct appropriations by the state legislature for aquatic weed control, for example $50,000 to treat weeds in Oneida Lake. Under New York State law, special assessment districts for water quality maintenance can be set up; such a district was formed under impetus of a Fair Haven Bay landowner's group. Control efforts are at present focussed on chemical treatment and harvesting. Because of inadequate information regarding the effects of chemicals, few can currently be applied. Harvesting is very expensive, and, like chemical control, must be repeated indefinitely. Some possible uses of harvested weeds include as a pulp base, in the paper industry cattle and sheep fodder, mulch, and fertilizer. The only long-term control measure is prevention of nutrient and sediment pollution in the water. (Lynch-Wisconsin)
W78-02500

LABORATORY TRIALS OF A NEW TRIAZINE HERBICIDE (DPX 3674) ON VARIOUS AQUATIC SPECIES OF MACROPHYTES ALGAE,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
M. C. Fowler.
Weed Research, Vol. 17, No. 3, p 191-195, June 1977. 1 tab, 3 ref.

Descriptors: *Triazine herbicide, *DPX 3674, Myriophyllum verticillatum, Potamogeton pectinatus, Vaucheria dichotoma, Rhizoclonium hieroglyphicum, Cladophora glomerata, *Aquatic weed control, *Herbicides, *Laboratory tests, *Environmental effects, Chemcontrol, Triazine pesticides, Dissolved oxygen.

A new triazine herbicide, DPX 3674, was tested for effectiveness against aquatic weeds. The compound is formulated as either a 90% soluble powder or a 10% granule. It controls many terrestrial broadleaved weeds, grasses and a number of shrub and tree species and has low toxicity to fish and birds. Species used in the experiments were Myriophyllum verticullatum, Potamogeton pectinatus, Vaucheria dishotoma, Rhizoclanium hieroglyphicum and Cladophora glomerate. DPX 3674 was effective against all the species. A 1.0 ppm concentration was sufficient to kill Myriaphyllum verticillatum, Potamogeton pectinatus and Vaucheria dichotoma. Cladophora glomerata and Rhizoclonium hieroglyphicum were susceptible at 0.5 ppm. Compared to proven triazines terbutryne and cyanatryn, DPX 3674 is less active, requiring up to ten times the dosage to control these plants. A rapid decline of dissolved oxygen in the water, showing an inhibition of photosynthesis, is typical of triazines. The herbicide might be a useful growth regulatory chemical in situations where a complete kill is not wanted. Continued field testing under natural conditions is recommended. (Coyle-Wisconsin)
W78-02516

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA. PHASE II.
Mathematical Sciences Northwest, Inc., Bellevue, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 706, Price codes: A13 in paper copy, A01 in microfiche. Report No. BLM-SE-77-02 to Bureau of Land Management, Washington, D.C., October 15, 1976, 369 p, 9 fig, 121 tab, 4 maps, 57 ref. MSNW/AC-76-2074, 08550-CT5-46.

Descriptors: *Alaska, *Oil, *Natural gas, *Economic impact, *Forecasting, Economics, Social aspects, Offshore platforms, Baseline studies, Model studies, Future planning(Projected), Analytical techniques, Social impact, Regression analysis, Yakutat(AK), Dillingham(AK), Naknet(AK), Kotzebue(AK), Input-output modelling.

Impact models developed in Phase I of this study using the experience of hydrocarbon exploitation in the Kenai-Cook Inlet region of Alaska are applied to future exploitation of potential offshore petroleum and natural gas resources in Yakutat, Dillingham-Naknet, and Kotzebue, Alaska. I/0 modelling was considered the best available technique; a regression model devised during Phase I which successfully estimated historical impacts in the Kenai region proved inapplicable in Phase II. A major difference between the Kenai region and the Phase II communities is that the former is linked to Anchorage in terms of geography, communication, and transportation, while the latter are logistically related more to the lower 48 states. For the communities studied, demography, labor force, employment, income level, community facilities (cultural, health, public safety, education, recreation, and utilities), transportation, land use and capability, housing, government, and community financial status were analyzed for the impact of oil and natural gas development. A composite model measured the overall effect of OCS development on the Alaskan economy. OCS direct output by 1993 represents 95% of the output of all other sectors, and 83.7% of the total employment impact of 21,890 is due to indirect and induced employment effects. If full employment at the start is assumed, wages would be pulled up. (Lynch-Wisconsin)
W78-02517

ECONOMIC AND FINANCIAL IMPACTS OF FEDERAL AIR AND WATER POLLUTION CONTROLS ON THE ELECTRIC UTILITY INDUSTRY.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 308, Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA 230/3-76-013, May, 1976, 539 p, 134 exhibits, 11 append. EPA 68/01/2803.

Descriptors: *Electric power industry, *Economic impact, *Pollution abatement, *Capital costs, Air pollution, Water pollution control, Utilities, Baseline studies, User rates, Financing, Equipment, Costs, Projections.

An assessment is made of changes in the financial profile of the electric utility industry due to federal air and water pollution controls for 1975-90. The report covers the following: (1) historical overview 1960-75; (2) baseline projections 1975-85 excluding the effects of pollution control expenditures; (3) direct economic and financial effects of pollution control in terms of capital expenditures, external financing, and operating expenses; (4) availability of required capital financing; (5) regional variations in direct effects of pollution control; and (6) secondary effects resulting from increased costs and the operation of pollution control equipment. Major direct effects of pollution control regulations foreseen include: (1) capital expenditures will increase by $14.5 billion over the baseline from 1975-80 (a 12.3% increase), and by $25 billion from 1975-85 in 1975 dollars (10.5% increase); (2) scrubbers will account for over 50% of the $25 billion increase, followed by precipitators (25%) and cooling towers (16%); (3) external financing will increase by $14.5 billion from 1975-80 (16.1% increase), and $21.9 billion from 1975-85 (11.5%) (4) operating and management expenditures will annually increase 4% by 1980 and 6% 1985; (5) operating revenues and consumer charges will increase 5.4% by 1980 and 6.7% by 1985; (6) residential electric bills will increase by about $1.80 in 1980 and $2.80 in 1985 (excluding inflation). (Lynch-Wisconsin)
W78-02518

CHOOSING THE OPTIMUM FINANCIAL STRATEGY FOR POLLUTION CONTROL INVESTMENTS.
Environmental Protection Agency, Cincinnati, Ohio. Office of Technology Transfer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 443, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-625/3-76-005, June 1976. 59 p, 6 fig, 11 tab, 4 append.

Descriptors: *Pollution abatement, *Costs, *Economics, *Depreciation, *Taxes, Water pollution control, Industrial wastes, Equipment, Decision making, Waste water treatment, Industries, Management, Non-structural alternatives, *Financing, Tax incentives.

Various aspects of financing pollution control investment costs are discussed. Incentive or cost-reduction programs now available do not significantly reduce investment costs; but they can affect a company's cash flow and profit position. To a certain extent, the government passes industrial pollution control costs on to the public by exempting pollution control devices from certain sales, use, and property taxes, by permitting tax-exempt financing, and by special depreciation allowances. Moreover, the company's wastewater treatment costs can be reduced if a municipality treats the wastewater, due to federal construction grants to municipalities. The net present value (NPV) financial analysis technique is used frequently in this report. In a section on tax strategies several depreciation methods are evaluated, and it is shown that in most cases the double-declining balance and sum-of-the-years digits method is superior. In financing pollution control investments, the tax-free bond method is superior to both ordinary bank loans and SBA loans. Using the NPV technique, effects of combining various tax and financing strategies in three business situations are analyzed: (1) a manufacturer mainly interested in maximizing long-term profit; (2) a manager concerned with short-term profit impairment; and (3) a manufacturer with weak working capital. Financing and tax incentives in five states are described. (Lynch-Wisconsin)
W78-02519

THE COST OF CLEAN WATER IN AMMONIA, CHLORALKALI AND ETHYLENE PRODUCTION,
National Economic Models of Industrial Use and Waste Treatment Project, Houston, TX.
R. G. Thompson, S. A. Calloway, and L. Nawalanic.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 508, Price codes: A07 in paper copy, A01 in microfiche. Report No. NSF/RA-760234, 1976. 129 p, 30 fig, 23 tab, 54 ref, 3 append. GI-344592.

Descriptors: *Industrial wastes, *Water pollution control, *Chemical industry, *Ammonia, Industrial production, Costs, Pollution abatement, Model studies, Economic impact, Effluents, Waste water disposal, Cost-benefit analysis, Analytical techniques, Recycling, *Chlor-alkali, *Ethylene.

National economic policy models of three of the most important constituents of the chemical industry--ammonia, alkalies and chlorine (chlor-alkali), to eliminate discharge of pollutants to water, in terms of costs and alternate forms of pollution which could result. Zero discharge of pollutants to water was possible in the models through total recycle of wastewater, at production cost increases lower than generally supposed. The production cost increase in newly designed ammonia plants would be 3% ; in chlor-alkali plants (diaphragm cell process) the increase would be 5.6%, and in ethylene plants 7.7%. Establishing the zero discharge goal might stimulate investments in lower-cost production processes. An effluent stanard or tax for control of total dissolved solids was found to be the most cost-effective method of achieving zero discharge. Models of newly designed plants were developed to evaluate substitution possibilities in production, resource and energy use, input water treatment, wastewater treatment, and solid waste and brine managment. A new feature of these models is that they synthesize important technical data into a comprehensive economic analysis, enabling planners to evaluate effects of possible policy decisions on the use of resources, discharge of wastes, and production costs before the decisions are made. (Lynch-Wisconsin)
W78-02521

DIFFERING STATE STANDARDS AND WASTE TREATMENT COST,
Arkansas Univ., Fayetteville. Dept. of Civil Engineering.
D. Mitchell, and D. G. Parker.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 103, No 3, p 389-396, June 1977. 8 tab, 8 ref.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *State governments, *Industrial wastes, *Costs, Descriptors, State governments, Arkansas, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, Texas, Wastewater treatment, Benefits, Water quality control, Environmental effects.

The paper examines the water qulity standards established by seven selected states in an effort to assess how differences may affect the cost of industrial wastewater treatment. State standards examined are those of Arkansas, Louisiana, Mis-

sisippi, Missouri, Oklahoma, Tennessee and Texas. Differences are considered representative of those found in other states. It is concluded that water quality standards of various states are extremely variable with a virtual hodgepodge of minimal values given for almost any stream parameter. While some differences do not appear to significantly affect wastewater treatment cost, some can be shown to severely penalize local industries and may have deleterious effects on the economic stability and social well-being of citizens inhabiting those regions, without any apparent environmental enhancement. It is suggested that no real thought seems to have been given to what should really be the stream conditions that would fully enhance the environment without squandering resources on treatment for treatment's sake. (Coyle-Wisconsin)
W78-02523

PL 92-500 V. POLLUTION BY IRRIGATION RETURN FLOW,
National Enforcement Investigations Center, Denver, CO.
W. C. Blackman, Jr., C. G. Wills, and A. C. Celnicker.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol 103, No 2, p 207-220, June 1977. 3 fig, 14 ref.

Descriptors: *Federal Water Pollution Control Act, *Federal Reclamation Law, *Irrigation districts, Irrigation practices, Pollution abatement, Water pollution control, Irrigation, Permits, Regulation, Administrative agencies, Governmental Interrelations, *National pollutant discharge elimination system, *Irrigation return flow, Effluent limitation.

The paper summarizes the problems of applying the municipal/industrial waste treatment oriented permit approach of the National Pollutant Discharge Elimination System to the control of irrigation return flow as embodied in the Federal Water Pollution Control Act Amendements of 1972. It is held that there must be acceptance and implementation of optimum application of irrigation water, even though optimum application may involve use of less than the prior appropriated water right. In the promulgation of regulations by the Environmental Protection Agency, the EPA should recognize that regional and delegated state administrators must have flexibility to designate permittees on the basis of logic. Since the Bureau of Reclamation plans, administers and operates many newly established irrigation projects, it is uniquely qualified to provide leadership and guidance toward optimum practices within project areas. In established irrigation districts and major irrigated areas, EPA should initiate a program of grants and contracts to enable optimum operation of plots representative of each area. Such recommendations and others will require modified viewpoints of irrigators, legislators, regulatory agencies and others. (Coyle-Wisconsin).
W78-02524

THE WELFARE EFFECTS OF EROSION CONTROLS, BANNING PESTICIDES, AND LIMITING FERTILIZER APPLICATION IN THE CORN BELT,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
C. R. Taylor, and K. K. Frohberg.
American Journal of Agricultural Economics, Vol 59, No 1, p 25-36, February 1977. 1 fig, 5 tab, 25 ref. EPA 68-01-3584.

Descriptors: *Erosion, *Federal Water Pollution Control Act, Pesticides, Herbicides, Insecticides, Water pollution sources, Political constraints, *Corn belt, *Linear program models, *Nonpoint pollution, Nitrogen fertilizer, Straight row cultivation, Soil loss.

A linear programming model of crop production in the Corn Belt was used to make partial welfare estimates of alternative erosion control methods. Reviewed were the partial welfare estimates of a ban on herbicides, a ban on insecticides, restrictions on nitrogen fertilizer, a ban on straight row cultivation, gross soil loss restrictions ranging from two to five tons per acre, and gross soil loss taxes of 50 cents a ton to $4 a ton. Pesticide and nitrogen policies are considered extreme but plausible using a strict interpretation of 1985 water quality goals set out in the amended 1972 Federal Water Pollution Control Act. The model used incorporated stepped demand functions for corn and soybeans, giving an approximate equilibrium solution for these markets. A soil loss tax is the least costly method for gaining soil loss reductions. But a per-acre restriction, considered politically more viable, was only slightly more costly for achieving up to a 50% reduction in erosion. A terrace subsidy policy was substantially less efficient that other policies reviewed. Future research is recommended on agricultural nonpoint pollution, with concentration on finding the optimal mix of point and nonpoint pollution. (Coyle-Wisconsin)
W78-02527

BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, MA.
For primary bibliographic entry see Field 6B.
W78-02530

DEEP WELL INJECTION OF INDUSTRIAL WASTES: GOVERNMENT CONTROLS AND LEGAL CONSTRAINTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 184, Price codes: A08 in paper copy, A01 in microfiche. Report NSF/RA-760316, 1976. 163 p, 2 tab.

Descriptors: *Injection wells, *Industrial wastes, *Waste disposal, Legal aspects, Groundwater, Waste water, Legislation, Institutional constraints, Civil law, Environmental effects, Pollutants, Underground storage, Monitoring, Administrative agencies, Controls, Hazards, Water pollution sources, Federal Water Pollution Control Act, Safe Drinking Water Act, Abandoned wells, Private property, Liabilities.

Although utilization of subsurface injection has increased in recent years as a result of intensified efforts to reduce the discharge of pollutants to surface waters, concern over possible adverse consequences has made this technique highly controversial. Extensive governmental involvement in injection well management has resulted from the inherent potential of such operations to produce negative environmental effects. In addition to government controls, private controls in the form of property rights and civil law bear heavily on the management and feasibility of waste injection programs. In light of federal legislation enacted since 1970 and the frequent changes of state control programs, this report surveys the range of legal options for injection well control and describes the institutional framework within which waste injection must be accomplished. Following a brief discussion of the environmental benefits and hazards of subsurface disposal, a detailed history of legislation and interpretation is presented. The report concludes with recommended guidelines for management and regulation, with reference to areas requiring further investigation. (Eberle-NWWA)
W78-02538

POSSIBLE CONTAMINATION OF GROUND WATERS BY OIL-AND GAS-WELL DRILLING AND COMPLETION FLUIDS,
Energy Research and Development Administration, Bartlesville, OK. Bartlesville Energy Research Center.
For primary bibliographic entry see Field 5B.
W78-02546

ENVIRONMENT--EXTERNALIZING THE INTERNALITIES,
City Univ. of New York. Graduate School and Univ. Center.
A. P. Lerner.
American Economic Review, Vol 67, No 2, p 176-178, March 1977. 5 ref.

Descriptors: *Economics, Pollution abatement, Prices, Allocation(Cost), Economic impact, *Pollution, *Pollution damage.

Abba Lerner debates Jerome Stein on pollution and the definition of pollution damage. Lerner takes pollution damage to mean utility losses for which those who suffer them are not paid or compensated. The appropriate amount would just compensate the victims for the utility losses. He says Stein's definition of pollution damage is not measured in terms of utility but in the environmental argument of the utility function, a physical argument in the utility function, according to Lerner. Lerner holds that the different physical units of environment cannot be treated as units of the same commodity. Each separate act of pollution must be judged and charged according to the damage to the utilities of the people affected. And he argues that no physical measure can be a substitute for this. (Coyle-Wisconsin)
W78-02560

COASTAL BELT TOURISM, ECONOMIC DEVELOPMENT AND ENVIRONMENTAL IMPACT,
For primary bibliographic entry see Field 6B.
W78-02564

LOCAL VERSUS NATIONAL POLLUTION CONTROL: NOTE,
Clarkson Coll. of Technology. Potsdam, NY. Dept. of Economics.
F. C. Menz, and J. R. Miller.
The American Economic Review, Vol 67, No 2, p 173-175, March 1977. 6 ref.

Descriptors: *Pollution abatement, *Prices, Allocation(Cost), Economics, Economic impact, *Social welfare function.

It is maintained that the existence of environmental spillovers from one locality to another is not a sufficient condition for nationwide uniformity of pollution damage prices. This contention is a response to an argument raised in another paper that in order to achieve economic efficiency in pollution abatement, the charge or price per unit of pollution damage must be the same in all localities. To assure this result, according to the earlier study, pollution control pricing decisions should not be the responsibility of local government. The paper holds that the earlier position is based on a rather restrictive specification of the social welfare function that does not allow for differences in regional preferences for environmental quality. If such differences exist, it is held that nationwide uniformity of prices for pollution damage is unlikely to be efficient, even when environmental quality is a national public good. (Coyle-Wisconsin)
W78-02566

CONTROLLING NONPOINT SEDIMENT SOURCES WITH CROPLAND MANAGEMENT: A NATIONAL ECONOMIC ASSESSMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.

J. C. Wade, and E. O. Heady.
American Journal of Agricultural Economics, Vol. 59, No. 1, p. 13-24, February 1977. 6 tab, 11 ref. NSF-RANN GI-32990.

Descriptors: *Land management, Sedimentation, Land use, Water quality, Agriculture, Model studies, Non-structural alternatives, Water management(Applied), Water allocation(Policy), Economics, *Nonpoint pollution.

Use of cropland resources is one of the primary determinants of stream sediment water quality. To provide insights into the agricultural production system and potential requirements for improved water quality, five national sediment control policies were evaluated using models of the economics and physics of sediment to analyze the policies. Each evaluation examines change in U.S. agriculture resulting from the regulation of sediment loads. No single alternative examined gives a 'best' sediment control policy. Even the minimum alternative requires extreme changes in the production system. Optimum control based on cropland management can only be determined by evaluatig societal goals relating to food costs, environmental quality, farmer freedom, among other dimensions of resource use. Use of large scale models might significantly reduce costs of policy choices by anticipatig interactions and costs. But to the degree models are improperly formulated, implications may be wrongly stated. (Coyle-Wisconsin)
W78-02568

CITIZEN PARTICIPATION IN THE YORK RIVER BASIN STUDY: THE USE OF THE VALUE TRADE-OFF QUESTIONNAIRE,
Weston (Roy F.), Inc., Roslyn, NY.
K. J. Phillips.
Journal of Environmental Systems, Vol. 6, No. 3, p. 243-252, 1976-77. 1 fig, 2 tab, 9 ref.

Descriptors: *River basin development, Virginia, Planning, Surveys, Pollution abatement, Decision making, Social values, *Value trade-off questionnaire, *Public involvement, *York River Basin(VA), Public participation.

Effective environmental plans for a river basin can be accomplished only by including the public in the planning process. But conventional methods such as hearings, are not effective screening tools and often produce chaotic, confusing results. The paper describes a four-question value trade-off questionnaire administered to a group of 24 selected citizens, representing six different groups, in Virginia's York River Basin. Each question addressed a different trade-off germane to the selection of a Basin environmental plan. The questionnaire proved easy to administer and interpret, and provided a quantitative measure of people's preferences necessary for effective implementable planning. Among conclusions drawn from analysis of the responses were support for stringent effluent guidelines; a tie between economic development and increased level of clean-up, as no further increase in pollution would be tolerated; and support for the contention that clean-up costs are not excessive. The questions were also answered by the 24-member York Citizen Advisory Committee, formed by the Virginia Water Control Board. Answers by committee members did not differ from responses of other groups tested in the Basin. (Coyle-Wisconsin)
W78-02569

ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOME COMMUNITIES,
Pennsylvania Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6B.
W78-02570

STATUS, PROBLEMS, ADVANCES AND ECONOMICS OF EUCHEUMA FARMS,
For primary bibliographic entry see Field 4A.
W78-02571

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE FISH MEAL, SALMON, BOTTOM FISH, CLAM, OYSTER, SARDINE, SCALLOP, HERRING, AND ABALONE SEGMENT OF THE CANNED AND PRESERVED FISH AND SEAFOOD PROCESSING INDUSTRY POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, DC. Effluent Guidelines Div.
E. H. Forsht.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 840, Price codes: A22 in paper copy, A01 in microfiche. Report No EPA 440/1-75/041-a, September, 1975. 485 p, 102 fig, 203 tab, 48 ref, 3 append.

Descriptors: *Effluents, *Baseline studies, *Fish, *Shellfish, Canneries, Salmon, Bottom fish, Herrings, Clams, Oysters, Shellfish, Water pollution control, Industrial wastes, Waste water treatment, *Federal Water Pollution Act Amendments(1972), *Seafood processing, Point pollution, Fish meal, Sardines, Scallops, Abalone.

Several sectors of the fish and shellfish processing industry were extensively analyzed to establish effluent limitation guidelines under the Federal Water Pollution Control Act Amendments of 1972. For 1 July 1977, (existing point sources) effluent reductions are those attainable through application of the 'Best Practicable Control Technology Currently Available' (BPCTCA), and for 1 July 1983 the 'Best Available Technology Economically Achievable' (BATEA). Sectors studied were fish meal, salmon, Bottom fish, sardines, herring, clams, oysters, scallops, and abalone. Wastes from all sectors were found to be amenable to biological waste treatment, and no materials harmful to waste treatment processes were found. With the exception of the fish meal industry, the level of waste treatment throughout the seafood industry is generally inadequate. Many plants in the contiguous states and virtually all Alaskan plants discharge solid and liquid wastes directly into receiving waters; others screen out only gross solids. Technology is available to enable most plants to comply with limitations by 1977. For the contiguous states the 1977 limitations are based on fine screening, housekeeping practices, and barging; for Alaska they are based on fine screening and barging of solids in nonremote areas, and comminutors or grinders in remote areas. For 1983 and for new sources additional technology includes physical/chemical and secondary treatment and in-plant controls. (Lynch-Wisconsin)
W78-02578

REMOTE SENSING REPORT, PACIFIC NORTHWEST AREA, WASHINGTON, OREGON, IDAHO, APRIL AND JULY 1973.
National Field Investigation Center, Denver, CO.
For primary bibliographic entry see Field 7B.
W78-02611

THERMOMETRY IN THE CONTROL OF WATER QUALITY,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-02618

FEASIBILITY OF RETURNING FLY ASH TO WESTERN MARYLAND FOR MINE RECLAMATION.
Maryland Environmental Service, Annapolis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 520, Price codes: A07 in paper copy, A01 in microfiche. Report No. ARC-74-139-MD-3202, December 1975. 128 p, 7 fig, 7 tab, 36 ref, 5 append. Prepared for Appalachian Regional Commission, Washington, D.C. ARC 74-139-MD-3202.

Descriptors: Chemical properties, Physical properties, *Fly ash, *Mining, *Land reclamation, Transportation, Mine acids, Mine drainage, *Maryland, Feasibility studies, Water pollution control, *Factor analysis.

A study was made of the feasibility of using fly ash from Maryland electric power plants to abate acid mine drainage and reclaim abandoned mines in Garrett and Allegany Counties in western Maryland. The study included a survey of abandoned and active mines to determine their suitability for fly ash reclamation projects, an evaluation of means of handling and transporting fly ash from power plants to the mines where it might be used, and evaluation of the physical and chemical properties of Maryland power plant fly ash pertinent to its suitability for mine reclamation, and evaluation of reclamation techniques using fly ash (particularly those associated with acid mine drainage abatement), and an evaluation of legal, institutional, and public factors pertinent to the development of a fly ash rail haul/reclamation project for western Maryland mines. Project development was not recommended on the basis of study results because of the limited number of viable uses of the fly ash and the high cost ($10/ton) of handling and transporting ash to western Maryland. Appendices give information on prospective mine sites, transportation systems, properties of fly ash related to reclamation, institutional considerations, and sources of information (contacts and references). (Wares-IPA)
W78-02620

SUPPLEMENTAL AERATION SYSTEM DESIGN FOR THE HOUSTON SHIP CHANNEL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
T. W. Hoskings, T. D. Reynolds, and R. W. Hann, Jr.
Sea Grant College Report No. TAMU-SG-78-201, October 1977. 220 p, 45 fig, 26 tab, 73 ref, 7 append. SG-04-6-158-44012.

Descriptors: *Aeration, *Waste treatment, *Oxygenation, Mathematical models, Texas, Water pollution control, *Houston Ship Channel(Tex), Dissolved oxygen, Ship channels.

The oxygen demand on the Houston Ship Channel exceeds its natural assimilative capacity. Dissolved oxygen (DO) is depleted so that warm weather and low flow commonly produce zero DO concentration in the upper 14 miles of the channel. This study develops and demonstrates a technique for designing an in-channel supplemental aeration system that might be considered as an alternative to advanced waste treatment. A mathematical model is used to calculate the capacity of supplemental aeration systems and to locate aeration equipment for maximum efficiency. Accurate simulation of oxygen dynamics is critical, and extensive effort is made in modeling oxygen sources and sinks. Model verification is conducted under both steady state and dynamic conditions. A general system design consisting of required oxygen transfer capacities under critical and average conditions, and site locations are developed. Sidestream oxygenation, diffused aeration, diffused oxygen, and surface aeration systems are evaluated for their ability to meet the requirements of the general design, for their economic desirability, and for their physical feasibility. (NOAA)
W78-02645

OHIO EPA WATER QUALITY STUDIES IN THE SANDUSKY RIVER BASIN,
Ohio State Environmental Protection Agency, Bowling Green. Northwest District Office.
G. Martin.

In: Proceedings of Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 100-122, 2 fig, 2 tab, 8 ref.

Descriptors: *Water quality control, *Water quality, *Planning, Rivers, *River basins, Pollution abatement, Legislation, Regulation, Permits, Effluents, Discharge(Water), Data collection, Ohio, *Sandusky River Basin(Oh), *Point pollution, Water quality studies, National Pollutant Discharge Elimination System, NPDES.

An important component of Ohio's federally-required water quality management continuing planning process is the state EPA's water quality studies. Federal approval of each state's continuing planning process is required for the state to issue discharge permits under the National Pollutant Discharge Elimination System (NPDES). This federal approval is contingent on state maintenance of an adequate water quality monitoring system. The Ohio EPA's survey of the Sandusky Basin was carried out in 1974. Sixteen locations on the Sandusky River and 18 tributaries were sampled from April to December. Point-source pollution was emphasized rather than agricultural and urban runoff, as sampling concentrated on moderate to low-flow regimes (June-October). There are 15 municipal and semipublic dischargers, 27 direct industrial dischargers, and 14 municipal water treatment plants in the basin. Four of the sewage treatment plants and five of the industries discharge more than one million gallons per day. Inadequate municipal sewage treatment and combined sewer overflows were the prime factors in heavy pollution encountered in the Sandusky River below Bucyrus, Muskellunge Creek at Fremont, Spring Run below Carey, and Paramour Creek below Crestline. Fecal coliform bacteria, dissolved oxygen, and ammonia were the most frequent violations. Most other areas appear to have water quality capable of supporting a variety of warm water fish. Extensive statistical data are presented in tables. (See also W78-01528) (Lynch-Wisconsin)
W78-02649

AQUATIC VASCULAR PLANTS OF THE SANDUSKY RIVER BASIN,
Ohio State Univ., Columbus. Dept. of Botany.
R. L. Stuckey.
In: Proceedings of the Sandusky River Basin Symposium, Held at Tiffin, Ohio on May 2-3, 1975. p 295-333, 3 fig, 3 tab, 36 ref.

Descriptors: *Aquatic plants, *River basins, Rivers, Bays, Streams, Watershed(Basins), Ohio, History.
Identifiers: *Sandusky River Basin(Oh), *Vascular plants.

A study of aquatic vascular plants in the Sandusky River Basin in Ohio includes a historical survey of literature describing vegetation in the basin. Sandusky basin wetlands can be categorized as (1) remnants of original wet prairie, marshes, swamps, peat lands, and cranberry bogs in the upper portion of the basin; (2) remnants of dike marshes at the upper end of Sandusky Bay; (3) Sandusky River and its tributaries; and (4) man-created drainage ditches, reservoirs, and ponds. Field research conducted between 1967 and 1969 recognized about 240 species of aquatic vascular plants in the basin. Of these 58 (24%) are common, 68 (28%) are rare and localized, and 30 (13%) are believed extirpated. The greatest diversity in species composition is found in the marshes of Sandusky Bay, where also the greatest variation in habitats is found. However, increased turbidity in the bay in the last century has eliminated or reduced the numbers of many submerged plants. The former bogs once dominated by the American cranberry, were drained after 1855. The Sandusky River and tributaries contain many of the aquatic species that occur in the remnant original wetlands, but submersed plants are generally absent due to turbidity and silted bottoms. Species composition in the ditches, reservoirs, and ponds is virtually unknown. (See also W78-01518) (Lynch-Wisconsin)
W78-02650

PROCEDURES FOR EVALUATING OPERATIONS OF WATER MONITORING NETWORKS,
URS Research Co., San Mateo, CA.
For primary bibliographic entry see Field 5A.
W78-02656

PROTOTYPE SYSTEM FOR PLUGGING LEAKS IN RUPTURED CONTAINERS,
Rockwell International, Canoga Park, CA. Rocketdyne Div.
J. J. Vrolyk, R. C. Mitchell, and R. W. Melvold.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 245, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-300, December 1976. 111 p, 36 fig, 5 tab, 7 ref, 2 append. 1BB610, EPA 68-03-0234.

Descriptors: *Water pollution, *Leakage, Accidents, Hazards, Transportation, Sealants, Chemicals, Pollution abatement, Prototype tests, Evaluation, Rupturing, Failures, *Hazardous materials, Spills, Plugs, Foams.

A prototype leak-plugging system, developed to temporarily stop the flow of hazardous materials spilling on land or under water from ruptured or damaged containers, was successfully tested. The system, portable, integrated and field operable by one person, uses foamed-in-place polyurethane rigid foam plugs surrounded by a flexible protective membrane for sealing leaks. An applicator tip attached to a long handle is placed into the leak. The foam delivery system is then actuated and the foam chemicals, which are stored in a backpack, are automatically mixed and forced through a delivery tube and into the applicator tip expanding it both inside and outside the tank. The foam hardens in a few minutes and locks the plug in place. The applicator is then detached from the delivery system, which can then be refilled with foam chemicals and used again with a new applicator. The prototype leak plugging system from this project is considered developed to the point that it is realistic to project practical field use of the system. A preliminary implementation plan, including recommendations for additional work needed, is outlined. (Wares-IPA)
W78-02657

PLANNING FOR URBAN STORMWATER CONTROL, (PART III),
Fell, Brusso, Bruton and Knowles, Inc., Tulsa, OK.
W. J. Fell.
Public Works, Vol. 108, No. 10, p 90-93, October, 1977.

Descriptors: *Storm water, *Analytical techniques, *Hydrograph analysis, *Rainfall-runoff relationships, *Time of concentration, Surface runoff, Overland flow, Urban runoff, Topography, Mathematical models, Storm runoff, Hydrographs.

A method for deriving the time of concentration or the time required for water to travel from the farthest part of a watershed to its drainage is presented for use in calculating the shape of a storm water hydrograph. A series of equations for expressing peak flood flows as functions of the area of the given watershed, the slope, and the average annual precipitation is given. An equation for the volume of flow or the area under the hydrograph is used to derive the runoff per sq mile and the time to peak. Inches of runoff are computed for recurrence intervals of 10, 25, 50, and 100 yrs and losses are subtracted for depression storage, infiltration, interception, and evapotranspiration. The Tulsa area in Oklahoma is used to illustrate computation of time of concentration, channel length, and slope is presented graphically for 10- and 25-yr storms. (Schulz-FIRL)
W78-02660

GROUND-WATER CONTAMINATION: PROBLEMS AND REMEDIAL ACTIONS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W78-02675

RELATIONSHIP OF REGROWTH OF AQUATIC MACROPHYTES AFTER TREATMENT WITH HERBICIDES TO WATER QUALITY AND PHYTOPLANKTON POPULATIONS,
Florida State Game and Fresh Water Fish Commission, Eustis.
C. C. Carter, and R. S. Hestand.
Journal of Plant Management, Vol 15, p 65-69, June 1977. 3 fig, 1 tab, 11 ref.

Descriptors: *Herbicides, *Dequat, *Aquatic weed control, Florida, Phytoplankton, Water quality, Chara, Submerged plants, Bacteria, Ecosystems, Toxicity, Succession, Recreation, *System E, *Hydrothol 191, *TD-1874, Endothall, Coontail, Ceratophyllum demersum, Vallisneria americana, Hydrilla verticillata, Myriophylluim-spicatum, Water milfoil, Najas guadalupensis.

Tests of four herbicides in plastic pools containing combinations of six submersed plant species with 100% cover indicated that 116-280 days after a total treatment macrophyte recovery and ecological stabilization was achieved, but at only 29-40% of the original cover. Based on test results, 40-50% of a multiple-use recreational lake should be kept vegetated, with 50-60% in open water. The four herbicides tested were TD-1874, Hydrothol 191, System E, and Diquat with Cutrine Plus. Plants included coontail (Ceratophyllum demersum), muskgrass (Chara sp.), eelgrass (Vallisneria americana), Hydrilla verticillata, Eurasian water milfoil (Myriophyllum spicatum), and southern naiad (Najas guadalupensis). Pools were planted in August 1974 in central Florida and allowed to stabilize for one year. By the ninth day after treatment all plants in all of the treated pools were dead and decomposing, with the exception of pools treated with System E, which did not affect muskgrass. Treatment with the other three herbicides resulted in water with high turbidity and putrid odors as anaerobic sulfur bacteria liberated H_2S byproducts. A total kill of plants, fish, and invertebrates resulted in an explosive growth of bacteria and phytoplankton. In System E pools, however, the persistence of muskgrass kept water quality and phytoplankton levels similar to the control. With macrophyte recovery, turbidity, pH, orthophosphate, and total organic nitrogen returned to normal. Relative species dominance was significantly changed by the treatments. (Lynch-Wisconsin)
W78-02676

AQUATIC HERBICIDE CHRONICITY,
Creative Biology Lab., Inc., Barberton, OH.
S. A. Quinn, N. F. Cardarelli, and E. O. Gangstad.
Journal of Aquatic Plant Management, Vol 15, p 74-76, June 1977. 4 tab, 8 ref. Corp of Engineers DACW 73-73-C-0042.

Descriptors: *Aquatic weed control, *Herbicides, *Rates of application, *Diquat, Lethal limit, Toxicity, Chemcontrol, *Chronicity, *2 4-D BEE, *Silvex, Water milfoil, Myriophyllum spicatum, Vallisneria americana, Elodea canadensis, Slow-release treatment.

In an effort to determine feasibility of slow-release herbicide application, low concentrations of three herbicides were applied on a long-term basis to various aquatic plant species to first find the

minimum lethal repeated dosage. Matrix analysis of the data indicated that the application rate, concentration, type of herbicide, method, and exposure time were highly significant, whereas differences due to individual plant species were relatively small. Diquat, 2,4-D BEE, and silvex were tested on Eurasian water milfoil (Myriophyllum spicatum), wild celery (Vallisneria americana), and waterweed (Elodea canadensis) under laboratory conditions. It was possible to demonstrate chronic effects of the herbicides at 1.0, 0.1, and 0.01 ppm concentrations. A field application of 0.1 ppm would probably be an effective level for operational control. Exposure times for diquat, 2,4-D BEE, and silvex are estimated at 19, 23, and 27 days respectively, under accumulative treatment conditions, although field trials would be essential. Two basic experiments were performed: (1) the herbicides were added daily so that the dose would be accumulative for each rate of application; (2) the testwater was changed every other day to ensure a constant concentration for each application rate. (Lynch-Wisconsin)
W78-02677

RESTORATION OF WATER QUALITY IN LAKE WESTON, ORLANDO, FLORIDA,
Orange County Pollution Control Dept., Orlando, FL.
J. M. Bateman, and R. L. Laing.
Journal of Aquatic Plant Management, Vol 15, p 69-73, June 1977. 7 fig, 2 tab, 9 ref.

Descriptors: *Nutrient removal, *Eutrophication, *Algal control, *Calcium, *Aeration, Florida, Phosphorus, Nutrients, Sewage effluents, Algae, Phytoplankton, Stratification, Equipment, Methodology, Water purification, *Lake Weston(FL), Lake Lovely(FL), Lake Lawne(FL).

Lake Weston, a 11.3 ha, 15-m deep eutrophic lake in Orlando (FL) was treated with aeration and a nontoxic soluble calcium compound to precipitate phosphorus and make it unavailable for plant assimilation. Aeration raised bottom dissolved oxygen to > 3 mg/l, bottom ammonia to < 0.11 mg/l, and pH to > 6.5 to prepare the water for phosphorus removal using the calcium-based precipitant. Phosphate is continually combining with natural calcium in the water, but redissolves when it reaches the anoxic bottom water. By the end of the 18 month treatment period, initiated in June 1975, three-year water quality goals for dissolved oxygen (DO), total nitrogen, ammonia nitrogen, orthophosphate, and biochemical oxygen demand were exceeded, while goals for chlorophyll-a and total phosphate were nearly achieved. Aeration alone resulted in improved environment for fish, decrease in aquatic plant nutrient levels, and an apparent decrease in bottom muck. Besides nitrogen and phosphorus reduction, reduction in alkaline earth metals probably helped control phytoplankton. The cause of eutrophication in the lake, which previously had been polluted by sewage effluent, was stratification resulting in an inadequate supply of bottom DO, persistence of noxious gases, and accumulation of anaerobic acids. The aerators consisted of an 0.5 Hp piston air compressor connected to lake bottom ceramic diffusers by plastic tubing. (Lynch-Wisconsin)
W78-02678

EFFECTS OF SEASON AND WATER DEPTH ON EURASIAN WATERMILFOIL,
Tennessee Valley Authority, Muscle Shoals, AL. Environmental Biology Branch.
R. A. Stanley, E. Schackelford, D. Wade, and C. Warren.
Journal of Aquatic Plant Management, Vol. 14, June 1976, p. 32-35. 5 fig, 30 ref.

Descriptors: *Reservoirs, *Seasonal, *Depths, *Tennessee Valley Authority, *Aquatic weed control, *Rooted aquatic plants, Eutrophication, Standing crops, Spatial distribution, Water temperature, Biomass, Nuisance algae, Contours, Aquatic weeds, Tennessee, Alabama, *Eurasian watermilfoil, *Myriophy-lum spicatum, *Watermilfoil, Melton Hill Reservoir(Tenn), Guntersville Reservoir(Ala).

Samples of Myriophyllum spicatum L. collected for one year at four-week intervals in two Tennessee Valley Authority reservoirs were investigated in terms of season and contour levels and their effects on distribution. The reservoirs were Melton Hill near Oak Ridge, Tenn., and Guntersville, near Scottsboro, Ala. Ash-free dry weight per sq m was related to month and elevation above mean sea level. In both reservoirs a spring growth phase began in May, but a fall decline occurred earlier in Guntersville (August-September) than in Melton Hill (October-December). A winter regrowth and early spring decline occurred in Melton Hill, but not in Guntersville, where growth remained relatively constant. Maximum standing crop in Melton Hill was consistently about three times as great as in Guntersville, which may indicate that Melton Hill's greater water level fluctuation and shorter colonization time is favorable to the growth of Eurasian watermilfoil. Effects of temperature on growth were inconclusive. Greatest growth density occurred between contour elevations of about 240.0 m and 239.6 m during most of the year. In winter, however, heavy growth was noted up to about 241.0 m. Sharp declines in density were noted above and below these limits. (Lynch-Wisconsin)
W78-02680

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A MULTI-PARAMETER WATER QUALITY MANAGEMENT MODEL FOR RIVER BASINS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-02202

OPTIMAL ALLOCATION AND MANAGEMENT OF AGRICULTURAL WATER,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-02226

COMPUTER MODELING TO MAXIMIZE WATER USE EFFICIENCY AND REDUCE ENERGY IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-02404

VALUE OF INFORMATION IN RESERVOIR OPTIMIZATION,
Department of the Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 4A.
W78-02445

OPTIMAL CAPACITY EXPANSION WITH OFF-DESIGN COSTS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3A.
W78-02450

RECREATION MANAGEMENT: A PROGRAMMING EXAMPLE,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02528

A STATUS GROUP DYNAMICS APPROACH TO PREDICTING PARTICIPATION RATES IN REGIONAL RECREATION DEMAND STUDIES,
Wisconsin Univ.-Green Bay. Leisuer Sciences and Sociology.
For primary bibliographic entry see Field 6B.
W78-02561

AN OPERATIONAL APPROACH TO MULTIPLE OBJECTIVE DECISION MAKING FOR PUBLIC WATER RESOURCES PROJECTS USING INTEGER GOAL PROGRAMMING,
North Carolina Univ. at Greensboro. Dept. of Business Administration.
W. P. Neely, R. M. North, and J. C. Fortson.
American Journal of Agricultural Economy, Vol. 59, No. 1, p. 198-203, February 1977. 5 tab, 13 ref.

Descriptors: *U.S. Water Resources Council, *Decision making, *Project planning, Multiple-purpose projects, Planning, *Integer goal programming, Environmental quality, Problem identification and ranking.

A variation of linear programming called integer goal programming is proposed as a quantitative approach to integrate multiple objectives in the selection and scheduling of federally funded water resources projects. Deviations from target levels of both economic and environmental objectives may be minimized by using the method to evaluate projects under the proposed multiple objectives. Integer goal programming permits decisionmakers to specify and to change the priorities given each goal and to select only complete rather than partial projects in multiple period funding of multiple objective projects. It is suggested that the approach is capable of incorporating environmental, regional, economic and national economic factors. Political factors and other qualitative parameters of a social and environmental nature can be built into the model as constraints or as additional goals. It is possible to make trade-offs, and observe changes in costs, benefits, and net values. (Coyle-Wisconsin)
W78-02575

6B. Evaluation Process

THE ALLOCATION OF A NATURAL RESOURCE WHEN THE COST OF A SUBSTITUTE IS UNCERTAIN,
Ohio State Univ., Columbus.
D. A. Hanson.
Annals of Economic and Social Measurement, Vol. 6, No. 2, p. 189-201, 1977. 5 fig, 3 ref. Natl. Science Foundation GK-40298.

Descriptors: *Resource allocation, Economics, Costs, *Risks, Mathematical models, Capital, Natural resources, Economic efficiency, Risk neutrality, Risk aversion.

This paper deals with the theoretical problem of how much resource to use initially, and what mix of reproducible capital and remaining resource stock will maximize future welfare in a situation where a substitute for an exhaustible natural resource can be produced only at unknown cost. Through mathematical derivations the conclusion is reached that for linear homogeneous production functions and classes fo strictly concave production functions and with risk neutrality, future welfare is improved with more capital and less resource when the cost is uncertain; i.e., more resource should be used initially. The effect of risk aversion is in the opposite direction. For sufficiently strong risk aversion, the direction of shift in desired future assets can be reversed. The paper postulates a production possibility frontier between capital and resources available for the future. In a world of certainty, the efficient mix of

assets is determined by the Hotelling condition, which is that the ratio of the net marginal product of the resource between any two periods must equal the marginal rate of transformation of capital between those periods. (Lynch-Wisconsin)
W78-02209

DIVIDING OCEAN RESOURCES: A DEVELOPMENT AND APPLICATION OF THE THEORY OF FACTOR TRANSFER,
University of Western Ontario, London.
For primary bibliographic entry see Field 6C.
W78-02212

A CRITIQUE OF THE NATIONAL WATER COMMISSION ANALYSIS OF COST SHARING,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
W. Hunt, E. Cohn, and D. J. Allee.
Cornell Agricultural Economics Staff Paper No. 76-16, April 1976. 1 fig, 111 ref.

Descriptors: *National Water Commission, *Cost sharing, Municipal water, Irrigation water, Navigation, Flood control, Regional development, Competition, Model studies, Electric power, Recreation water sports, Municipal wastes, Low-flow augmentation, Cost sharing historical origins, Economic competitive market model.

The 1973 National Water Commission's review and recommendations on cost sharing policies for water development projects is analyzed and alternative recommendations are offered. A competitive economic market model used by the Commission is considered simplistic and inappropriate and ignores profound exceptions; it is argued that the Commission relies on a doctrinaire political model of state supremacy that disregards opportunities for redrafting federal programs to meet state needs. Counter recommendations are given, stating that the need for water resource programs and implementing strategies should be established by political process involving federal, state and local governments, and that once the political process is set, cost sharing appropriate to the specific program should be undertaken. Also, a clear understanding is needed of the goal of federal cost sharing as it related to a specific program. Counter recommendations include cost sharing aspects, cover municipal water, irrigation water, navigation, electric power, water based recreation, municipal waste collection and treatment, flood control, environmental values, regional development and low flow augmentation. (Coyle-Wisconsin)
W78-02214

COAL, ENERGY STUDY ISSUE, UPDATE, 1976,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 3E.
W78-02225

ECONOMIC/DEMOGRAPHIC ASSESSMENT MANUAL: CURRENT PRACTICES, PROCEDURAL RECOMMENDATIONS, AND A TEST CASE,
Arizona State Univ., Tempe. Dept. of Economics.
J. A. Chalmers, and E. J. Anderson.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver, Colo., November 1977. 300 p. Bur Reclam 7-07-DR-50180.

Descriptors: Cohort-survival population projections, *Construction period, Impact assessment, Economic base analysis, Economic, *Demographic assessment, *Forecasting, *Environmental impact assessment, Fiscal impact analysis, Planning, *Population projection, Simulation modeling, Socio-economic assessment, Water resource development projects.

Problems associated with projecting the population, employment, and income impacts of both the construction and the operation phases of water resource development projects were studied. The manual consists of three sections. Survey of Current Practices. A large number of environmental assessments and planning reports are reviewed. Methods currently being used for economic and demographic analysis are described. Procedural Recommendations. Based partly on current practices and partly on the professional social science literature, a set of procedural recommendations are made for carrying out economic/demographic assessments. Important methodological options are identified and evaluated as they apply to the different steps in the projection and assessment process. Test Case. The procedural recommendations are demonstrated by applying them to a proposed desalting plant near LaVerkin, Utah. The organization of the assessment follows the procedural recommendations and illustrates the way in which many of the practical problems of an actual assessment can be met. Each of the three major sections of the manual is organized around a seven-step procedure for carrying out an economic/demographic assessment. (1) Description of the Existing Economic/Demographic Environment; (2) Baseline Economic/Demographic Projections; (3) Description of the Proposed Action; (4) Population, Employment, and Income Impacts of the Proposed Action; (5) Community Population Impacts; (6) Community Facilities Impacts; (7) Fiscal Impacts. (See also W78-02275) (Bur of Reclam)
W78-02274

BUREAU OF RECLAMATION, CONSTRUCTION WORKER SURVEY,
Arizona State Univ., Tempe. Dept. of Economics.
J. A. Chalmers.
Prepared for Mountain West Research, Inc., under contract to Bur Reclam, Eng and Res Ctr, Denver, Colo., October 1977. 70 p, 1 fig, 11 tab, 3 append. Bur Reclam 7-07-DR-50180.

Descriptors: *Construction period impact assessment, Housing requirements, *Construction workers, *Population influx, Unemployed labor resources, *Water resource development projects, *Surveys.

Problems associated with estimating the economic and demographic impacts arising out of project construction activities were studied. Methodological problems and procedures are discussed in a report entitled the Economic/Demographic Assessment Manual. The construction worker survey is an attempt to obtain empirical observations on key characteristics of Bureau of Reclamation construction workers. A survey was conducted during the summer of 1977 and was designed to determine the characteristics of construction workers and their families; the distribution of the construction force between local and nonlocal workers; the extent to which nonlocal workers were accompanied by their families; the way in which the local residences of the nonlocal workers were distributed; and, finally, to investigate the previous employment status of local workers. (See also W78-02274) (Bur Reclam)
W78-02275

THE ARIZONA WATER RESOURCES COMMITTEE: HISTORY AND POLITICS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-02400

WATER CONSERVATION IN CALIFORNIA.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02409

THE CALIFORNIA DROUGHT - 1976.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02410

THE CALIFORNIA DROUGHT - 1977, AN UPDATE.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02411

THE CONTINUING CALIFORNIA DROUGHT.
California State Resources Agency, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 3B.
W78-02412

BOATS AND THEIR PEOPLE. A STUDY OF RHODE ISLAND BOAT OWNERS,
Rhode Island Univ., Narragansett. Dept. of Resource Economics.
N. Rorholm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 735, Price codes: A03 in paper copy, A01 in microfiche. Marine Technical Report 52, July 1976, 31 p. 12 tab. SG-04-5-158-6.

Descriptors: *Rhode Island, *Boating, *Recreation demand, Boats, Recreation, Social aspects, Surveys, Recreation facilities, Fishing, Marinas, Income.

A questionnaire survey of 931 Rhode Island Owners of engine-powered boats conducted for the 1973 season provides information on average household incomes, length of residence, influence of boating interest in choice of town in which to live and various other aspects. The household income of 45% of Rhode Island boat owners in over $15,000, compared with 41.7% for New England, and 38.6% for the United States as a whole. By occupation, the distribution of boat ownership is: professionals and administrators, 35%; craftsmen and laborers, 34%; proprietors, 11%; retired, 11% clerical and sales, 9%. There was little difference in family size by type of boat (3.3-3.6), but inboard powerboat or inboard sailboat owners tended to be older (49,46) and have owned their boats longer (16,15 years) than outboard owners (43,42 average age; 12, 10 years ownership). Owners of sailboats with inboard power had the highest average income, $28,613, while outboard powerboat owners had the lowest, $15,942. Some 40% of the respondents indicated that their boating interest positively influenced their decision of where to live, varying from 33% for those with an average income of $15,942 to 61% years for outboard sailboat owners to 23 years for inboard powerboat owners. (Lynch-Wisconsin)
W78-02520

RECREATION MANAGEMENT: A PROGRAMMING EXAMPLE,
Victoria Univ. (British Columbia). Dept. of Economics.
G. R. Walter, and J. A. Schofield.
Land Economics, Vol 53, No 2, p 212-225, May 1977. 4 tab, 15 ref.

Descriptors: *Ecosystem, Dynamic programming, Recreation facilities, Recreation demand, Use rates, Prices, Social needs, Non-consumptive use, Canada, *Bowron Lake Provincial Park, *Wilderness recreation management, British Columbia, Tourist expenditures, Policy analysis, Multiple objectives planning.

A programming model is developed as an aid in making decisions on the operation of a wilderness recreation area. There is an empirical development of the model in reference to Bowron Lake Provin-

cial Park in the central interior of British Columbia. Resource management is treated as a case of welfare maximization in a framework allowing a broad range of issues to be examined. Specifically the approach makes possible a review of various policy judgements on visitor use, appropriate user charges, and restrictions on use arising out of consideration of congestion and environmental impact. It is noted, however, that the paper does not deal with investment to provide for more visitors, the treatment of time periods, and environmental impact. In the latter case it is contended that a sophisticated endogenous treatment of ecological capacity is not yet feasible. It is stressed that the approach developed is not designed to produce easy solutions but to provide information on likely effects of different policies as an aid in determining preferred policy. (Coyle-Wisconsin)
W78-02528

BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, MA.
R. Dorfman.
Society, Vol. 14, No. 3, March-April 1977, p. 63-66. 3 tab.

Descriptors: *Pollution abatement, *Cost-benefit analysis, *Cost allocation, Costs, Benefits, Cost analysis, Expenditures, Economics, Progressive taxes, Social impact, Social aspects.

In 1972 total outlays for pollution control in the United States amounted to about $19 billion. About two-thirds was paid by private and government enterprises, with the remaining third divided about equally between direct costs to households and government costs at all levels. However, all the costs are ultimately borne by households through taxes and price increases. Based on estimates of the Public Interest Economics Center and survey data of the National Wildlife Federation, the average per-family cost for pollution control is $121 for incomes under $5,701, $205 for $5,701-11,410, and $549 for over $11,410 while average willingness to pay for pollution control is $60, $214 and $608 respectively. It is socially and politically harmful to compel citizens to pay more for government programs than they are willing to, defined as 'exaction.' For families under $5,701 and $61 exaction comes to a total of some $600 million. A hypothetical example of four towns polluting a lake shows that the most efficient method of reducing pollution (i.e., least costly) may well not provide the lowest exaction rate. Which of various trade-offs is chosen depends on relative valuations placed on economic efficiency and equity. It is argued that progressive abatement measures are most desirable; upper income households should bear more of the burden, especially in water pollution control. Regressive methods for automative emission control are probably unavoidable. (Lynch-Wisconsin)
W78-02530

TRENDS IN OUTDOOR RECREATION ACTIVITY PARTICIPATION: IMPLICATIONS FOR PLANNING,
Wisconsin Univ.-Madison. Coll. of Agricultural and Life Sciences.
N. Enosh, and A. Somersan.
Journal of Soil and Water Conservation, p 267-272, November-December, 1976. 3 fig, 5 tab, 8 ref.

Descriptors: *Recreation, *Surveys, *Attitudes, Recreational facilities, Planning, Camping, Swimming, Fishing, Hunting, Boating, Central U.S., Human population, Hiking, Horseback riding, Picnicking, Age-cohort groups.

Since most outdoor recreation activities are free or priced artificially low, there is no market mechanism for automatically allocating resources. This project was designed to determine the validity of using current outdoor recreation participation data for predicting future trends. Participation patterns of 12 to 17 year olds over five decades were determined on the basis of a telephone survey of 6,440 households (with 11,460 adults over 18) in nine mid-western states. Age-15 cohort groups were established for : 1921-30, 1931-40, 1941-50, 1951-60, and 1961-70. Respondents were asked which of these recreation activities they participated in during their youth: swimming, fishing, camping, hiking, horseback riding, picnicking, hunting, and boating. Results were analyzed by sex, race, urban/rural, water sports facilities near residence, and membership in youth organizations. Participation rates overall for hunting, fishing, and picnicking were found to be stable; swimming and camping increasing rapidly; boating increasing slowly; and horseback riding and hiking showing varying trends. Sex was the strongest factor affecting participation. Females dominated swimming, picnicking, hiking, and horseback riding; males dominated hunting, fishing, and camping; and boating was neutral. The study found no general trend in participation that could be applied to all outdoor recreation activities. (Lynch-Wisconsin)
W78-02531

STRUCTURE OF DEMAND FOR OUTDOOR RECREATION,
Economic Research Service, Tucson, AZ. Natural Resources Economics Div.
R. L. Gum, and W. E. Martin.
Land Economics, Vol. 53, No. 1, p 43-55, February, 1977. 1 tab, 6 ref.

Descriptors: *Recreation, *Attitudes, *Arizona, *Demand, Elasticity of demand, Hunting, Surveys, Planning, Fishing, Camping, Statistical methods, Analytical techniques, Cluster analysis.

A method for analyzing the structure of demand for outdoor recreation is developed and applied to a stratified random sample (2,926 respondents) representing the Arizona population. Cluster analysis provided a means of reducing 49 variables to eight dimensions or 'clusters'. On the basis of these dimensions the population was grouped into eight recreation types having similar tastes and preferences. Such traditional variables as income and education, while more quantifiable, have been found to be unreliable indicators or recreational activity. Instead, the data showed that the outdoor recreation activity of about 70% of the population of Arizona is affected mostly by tastes and preferences. They have adequate incomes and vacation times, but their recreation is determined by such factors as attitude toward killing wildlife and the general interest of the family in outdoor activities. For some 11% of the population, primarily retired people, recreation is determined mainly by their concern with age. Only 19% of the sample was considered 'elastic', i.e., would increase their recreational activities if they had higher incomes or more vacation time. A shift in this group from one recreation type to another because of more leisure time or higher income would affect the demand structure significantly. Consideration of alternate scenarios due to this elasticity can be useful in planning. (Lynch-Wisconsin)
W78-02532

HOW TO ESTIMATE THE SOCIAL RATE OF DISCOUNT,
Harvard Univ., Cambridge, MA.
R. Dorfman.
Discussion Paper 442. Harvard Institute of Economic Research, Harvard University, 1975. p. 1-14. 1 fig, 2 tab, 5 ref.

Descriptors: *Discount rates, *Resource allocation, Economics, Cost allocation, Resources development, *Social rate of discount, *Utility rate of discount, *Consumption rate of discount, Social welfare, Per capita consumption, Marginal utility.

An estimate of the social rate of discount assumes that measurable social welfare exists and that societies maximize the integral of social welfare over time. The measure is welfare corresponding to the average level of consumption. Utility is scaled from zero at the povery line to a maximum of 100. Two rates of social discount are established, the utility and the consumption rates. The consumption rate is defined as the proportional rate at which the current social significance of a marginal change in the level of per capita consumption declines with time. The commodity rate is the utility rate plus the product of the elasticity of the marginal utility of consumption and the rate of growth of per capita consumption. Assuming the utility rate of discount and the long run growth rate are constant, elasticity will be constant over time if the measurement scale is a constant elasticity utility function (also assumed). Then the consumption rate of discount will follow from observing the rate of growth of per capita consumption, specifying an appropriate utility function, and selecting an appropriate utility rate of discount. (Coyle-Wisconsin)
W78-02534

CONGESTION AND WILLINGNESS TO PAY: A STUDY OF BEACH USE,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
K. E. McConnell.
Land Economics, Vol 53, No 2, p 185-195, May 1977. 3 tab, 19 ref.

Descriptors: *Beaches, *Recreation demand, *Recreation, *Rhode Island, Decision making, Demand, Estimating, *Beach management, *Congestion(Beaches), Site quality.

A model is developed for estimating demand for congested recreation sites in densely populated areas. The model is used to estimate benefit functions for six Rhode Island beaches, demonstrating a management strategy for short-run decisionmaking. This is done by comparing optimal beach use implied by benefit function with standards of beach use established by the Bureau of Outdoor Recreation plans for several states. In addition to providing insight into methodology for estimating effect of congestion, the study also suggests a technique which may be used to reexamine standards for beach usage. Reviewed at length is a 1974 survey of the Rhode Island beaches to determine willingness to pay. Willingness-to-pay interviews can have important policy implications. By setting different standards at different beaches, planners can increase the social value derived from these resources. And a policy of different standards at different beaches may imply greater available capacity than suggested by a mechanical use of Bureau of Recreation standards. (Coyle-Wisconsin)
W78-02556

ON THE PROFITABILITY OF EXHAUSTING NATURAL RESOURCES,
Department of Economics. Sweden, Umea Univ. (Sweden).
T. Puu.
Journal of Environmental Economics and Management, Vol 4, No 3, p 185-199, September 1977. 4 fig, 9 ref.

Descriptors: *Exploitation, *Investment, Fish, Economic efficiency, Benefits, *Mineral deposits, *Production.

The question is raised as to whether it is profitable from the point-of-view of an individual profit-maximizing firm to exhaust a natural resource completely. Two cases are examined. One deals with a mineral deposit of given size. The second deals with a growing biological substance, such as fish. The conclusions are described as fairly optimistic. Under the assumption of the model used, it never pays to exhaust a resource completely.

The assumptions are that any mineral deposit contains ore of every grade and that a biological substance continues to grow as long as a positive quantity of it is left. It is conceded that several important minerals occur in concentrated high-grade deposits only and that a certain minimum population of a species might be necessary for its survival. But it is considered worthwhile to analyze cases where increasing costs of working low grade ores or harvesting dispersed fish specimens always puts an end to exploitation before the resource is exhausted, unless prices rise beyond any limit. (Coyle-Wisconsin)
W78-02557

NONSEPARABILITY AND THE VOLUNTARY APPROACH TO EXTERNALITY PROBLEMS,
Dortmund Univ. (West Germany). Dept. of Economics.
A Endres.
Journal of Environmental Economics and Management, Vol 4, No 3, p 209-213, September 1977. 8 ref.

Descriptors: *Cost analysis, *Resource allocation, Optimization, Economics, *Externality problems, *Voluntary bargaining, *Polluter-pollutee bargaining.

Competitive markets fail to achieve optimal resource allocation when externalities exist. According to the voluntary approach to externality problems, this difficulty can be met by bargining between the externality producing firm and-in case of a negative externality, the injured firm, if property rights are clearly defined. Ronald Coase has held that, given zero transaction costs, a voluntary polluter-pollutee bargaining would result in an optimal resource allocation which is invariant to the liability rule. The contention has been challenged on several grounds, including the argument that liability matters when cost functions are nonseparable. It is a serious objection because separable externalities are not what would be expected to come across in practice. This paper argues that the challenge of the nonseparability critics, notably Marchand, Russell and Dick, suffers from important failures, correction of which will show the irrelevance of the separability question for the Coase theorem. It is contended that the Coase theorem can cope very well with the nonseparability criticism. There are problems for the theorem in income effects, long run effects, impounderabilities of bilateral monopoly and ubiquitous transaction costs. But they are not dealt with in this paper. (Coyle-Wisconsin)
W78-02558

A STATUS GROUP DYNAMICS APPROACH TO PREDICTING PARTICIPATION RATES IN REGIONAL RECREATION DEMAND STUDIES,
Wisconsin Univ.-Green Bay. Leisuer Sciences and Sociology.
P. C. West.
Land Economics, Vol 53, No 2, p 196-211, May 1977. 7 tab, 21 ref.

Descriptors: *Recreation demand, *Planning, *Methodology, *Social aspects, Social values, Social function, Social participation, *Status group dynamics, *Participation rates, Leisure lifestyle, Recreation participation rate stability.

A status group dynamics approach is developed as a first step in a more accurate projection of recreation demand. The basic premise is that recreation participation correlates to socioeconomic characteristics such as education partly because leisure lifestyles are important symbolic cues in the status-ordering reflected in the various socioeconomic indicators. Four ideal type concepts are developed--status-based diffusion, status-based withdrawal, status defusion and status group barriers. Status-based diffusion is associated with rapid faddish increases in participation rates. Status-based withdrawal is associated with declining participation rates. Status group barriers and status defusion are associated with relatively stable participation rates. The approach is labeled theoretical, conceptualizing dynamics of the effect of status forces on recreation participation rate stability and change. While it is noted that further research and refinement is needed, the approach is considered an aid in improving ability to deal with fad and fashion in recreation demand projections. (Coyle-Wisconsin)
W78-02561

COASTAL BELT TOURISM, ECONOMIC DEVELOPMENT AND ENVIRONMENTAL IMPACT,
A. Haulot, N. Vanhove, L. R. A. Verheyden, and R. H. Charlier.
International Journal of Environmental Studies, Vol 10, No 3, p 161-172, 1977. 13 fig, 6 tab, 11 ref.

Descriptors: *Seashores, *Tourism, *Water pollution, Industrial plants, Human population, Sea walls, Dunes, Recreation demand, Recreation facilities, Parks, Environmental effects, Coasts, *Belgium.

The natural environment of the Belgian coastline, a prime tourist attraction, characterized by fine sand beaches and dunes, and under Gulf Stream influence with less rain than inland and greater sunshine and wind intensity, is coming under great stress due to the modern tourist explosion. Along with the effects of fast moving technical and economic development, tourism may damage the better part of the amenities for which it exists. The environment has been affected by population growth and changes and additional pollution caused by the tourist influx, formerly confined to two or three months but now spread over the year. Analysis shows that the coastal area is reaching the saturation point at normal periods of occupancy and will soon be oversaturated at peak periods. Efforts are being made to prevent an unbroken line of buildings along the coastline through development of recreational tourist parks, geared to tourism and particularly to long-stay visitors. It is noted that there has been a turning point in government decisions on tourist development policy, including a decision that compensatory or parallel credits may be spent on touristic schemes. (Coyle-Wisconsin)
W78-02564

ESTIMATING THE BENEFITS OF RECREATION UNDER CONDITIONS OF CONGESTION,
Virginia Commonwealth Univ., Richmond. Dept. of Economics.
J. N. Wetzel.
Journal of Environmental Economics and Management, Vol 4, No 3, p 239-246, September, 1977. 2 fig, 2 tab, 12 ref.

Descriptors: *Natural resources, *Mathematical models, *Recreation demand, Cost-benefit analysis, Benefits, Measurements, Model studies, Recreation, Value, *Congestion, Travel cost method, Clawson method.

A challenge has been made against the use of the travel cost method to evaluate demand for outdoor recreation, holding that the method does not take into account problems raised by congestion. It is argued that the travel cost method will always underestimate the true benefits provided by recreation at a site because of the role of congestion, identifies what is called a source of bias in measuring benefits of outdoor recreation and suggests how it may be corrected. A congestion model is proposed which implies that recreation areas that have relatively low levels of use might have a higher overall economic value than similar areas with higher levels of use because of the differences in congestion at the sites. It is also suggested that building, developing, or increasing access to areas with low levels of use may lead to increased use but with a lower economic value attached to that use because of increased congestion. Such issues, it is noted, may be of considerable importance for projects such as reservoirs which are replacing low-attendance, high-value facilities by high-attendance, low-value facilities. The paper holds that higher value attached to the more primitive types of facilities is related not only to the physical differences but also due to a lower level of congestion. (Coyle-Wisconsin)
W78-02565

THE CHANGING CONTEXT OF WATER RESOURCES PLANNING: THE NEXT 25 YEARS,
Victoria Univ. (British Columbia). Dept. of Geography.
W. R. D. Sewell.
Natural Resources Journal, Vol 16, No 4, p 791-805, October 1976. 2 fig.

Descriptors: *Long-term planning, *Water resources development, *Water management(Applied), Social values, Planning, Institutional constraints, Social needs, Political constraints, Foreign countries, Technology, Model studies.

The implications of water resources planning for the next 25 years, in the context of a changing international society, are explored. A simple heuristic model of the social environment within which water resources planning takes place, is described. And a number of emerging concepts in water resources planning in the past half century are discussed and related to various social environments. The article holds that the picture that emerges is one of gradual improvement in water management in countries where planners have been able to successfully blend needs with technological innovation and the modification of institutions. But in other areas there are growing discrepancies between needs and technology, or needs and institutional adjustment. The result is that problems in many parts of the world have become gradually worse, reaching crisis proportions in some instances. Planning has either failed or has been unable to perform the role expected of it. It is concluded that while water resources planning has made major advances in the last half century, the challenges in the next quarter century will be even more demanding. A shift in perspective and improvements in techniques of analysis will be required if the challenges are to be met. (Coyle-Wisconsin)
W78-02567

CONTROLLING NONPOINT SEDIMENT SOURCES WITH CROPLAND MANAGEMENT: A NATIONAL ECONOMIC ASSESSMENT,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-02568

CITIZEN PARTICIPATION IN THE YORK RIVER BASIN STUDY: THE USE OF THE VALUE TRADE-OFF QUESTIONNAIRE,
Weston (Roy F.), Inc., Roslyn, NY.
For primary bibliographic entry see Field 5G.
W78-02569

ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOME COMMUNITIES,
Pennsylvania Agricultural Experiment Station, University Park.
H. B. Gamble, G. L. Cole, M. I. Bevins, D. Derr, and D. M. Tobey.
Bulletin 801, Pennsylvania State University, July 1975. 81 p. 6 fig, 29 tab, 6 ref, 3 append. USDA Regional Research Project NE-65.

Descriptors: *Social aspects, *Water quality, *Property values, *Tax revenues, *Northeast U.S., Septic tanks, Land use, Non-structural alternatives, *Seasonal communities, *Environmental quality, *Lakeside communities, *Public opinion surveys, Rural environment, Set back, Community design.

A study was made of 18 seasonal home communities in five northeastern states to determine local attitudes toward environmental quality of the communities and to evaluate costs and benefits tied to different seasonal home environments. The study was also aimed at producing alternative institutional arrangements to improve efficient resource use in such communities. Residents completed detailed questionnaires covering attitudes toward environmental situations as well as demographic and socioeconomic data. Total costs of lower environmental standards for the average property, considering all the communities, was about $6,250. It is concluded that some control over actions of residents and how they use their land must be exercised. It was also concluded that, based on resident reactions to restrictions, legislative bodies need not fear adverse reactions to controls on land use and some activities. A significant tie was found between property values and environmental quality, showing there can be a dollar payoff in maintaining quality. It is recommended that attention be paid to proper handling of domestic wastes and that there be a minimum setback of buildings from the water and control of shore structures. (Coyle-Wisconsin)
W78-02570

AN OPERATIONAL APPROACH TO MULTIPLE OBJECTIVE DECISION MAKING FOR PUBLIC WATER RESOURCES PROJECTS USING INTEGER GOAL PROGRAMMING,
North Carolina Univ. at Greensboro. Dept. of Business Administration.
For primary bibliographic entry see Field 6A.
W78-02575

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFICIENCY IMPACTS OF COST SHARING ON SHORELINE MANAGEMENT,
National Bureau of Standards, Washington, DC.
H. E. Marshall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 960, Price codes: A02 in paper copy, A01 in microfiche. Coastal Zone Management Journal, Vol. 2, No. 4, p 369-382, 1976. 3 tab, 26 ref.

Descriptors: *Cost sharing, *Beach erosion, *Hurricanes, *Flood protection, *Shore protection, Wind erosion, Waves(Water), Coasts, Coastal engineering, Costs, Efficiencies, Planning, Shoreline management, Corps of Engineers.

Federal cost-sharing programs for beach erosion control, coastal hurricane flood protection, and emergency coastal flood protection involving the U.S. Army Corps of Engineers are evaluated. Inconsistencies in the present system are shown to bias local planners in favor of excessively large and costly engineering projects rather than management protection techniques. these inconsistencies include: (1) the beach erosion program requires public ownership, whereas private interests may participate in the hurricane and emergency protection programs; (2) percentage costs borne by the federal government vary widely among the three programs, favoring hurricane protection and higher cost projects; (3) emergency protection is for repair of existing structures, while the other two programs for new projects; and (4) traditionally there has been no federal cost-sharing assistance to nonfederal interests for providing management techniques for shoreline protection. Operation and management costs are absorbed by local interests, while federal funds pay for a large proportion of construction costs (especially for hurricane and emergency protection) and, in the case of hurricane protection, land costs. Therefore planners are induced to select engineering rather than management projects, and to favor hurricane protection over beach erosion control. To encourage selection of optimum techniques for shoreline management, the nonfederal cost share should be equalized for all techniques and cost categories. (Lynch-Wisconsin)
W78-02208

THE ALLOCATION OF A NATURAL RESOURCE WHEN THE COST OF A SUBSTITUTE IS UNCERTAIN,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 6B.
W78-02209

MONEY WAGES, PRICE OF NONTRADABLE GOODS, AND THE ENVIRONMENTAL GOODS,
Haifa Univ. (Israel). Dept. of Economics.
O. Israeli.
Journal of Environmental Economics and Management, Vol. 4, No. 3, September 1977, p. 265-270. 1 tab, 11 ref.

Descriptors: *Equilibrium prices, *Economics, Wages, Monetary benefits, Supply, *Environmental goods, *Tradable good, *Nontradable good, Full income, Supply elasticity.

The effect of environmental goods on money wages and the price of nontradable goods is analyzed. Environmental goods have two components. One is a public good, such as climate, terrain, view, and air quality. The second component is a private good, such as air conditioners and safety facilities. Environmental goods are treated as regular goods and are added to the two other composite goods--goods tradable between cities and goods not tradable, such as housing and transportation, which are typically used as components of the utility function. The relevant amount of environmental goods consists of that which the individual might purchase in the market. The analysis demonstrates that an equilibrium situation will prevail if either the money wage or the price of the nontradable good, or both, are a function of the given amount of environment goods. During equilibrium, people are indifferent with regard to their choice of location since their full income-defined as the money wage plus the money value of a given amount of environmental goods available free, is the same. (Coyle-Wisconsin)
W78-02210

OPTIMAL LOCATION OF A POLLUTING PLANT ON A LINE UNDER UNCERTAINTY,
Bar Ilan Univ., Rama-Gan (Israel). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-02211

DIVIDING OCEAN RESOURCES: A DEVELOPMENT AND APPLICATION OF THE THEORY OF FACTOR TRANSFER,
University of Western Ontario, London.
J. R. Markusen.
Economic Record, Vol 52, No 138, p. 213-227, June, 1976. 15 ref.

Descriptors: *Economic efficiency, *Resource allocation, *Oceans, Mathematical models, Economics, Analytical techniques, Tariff, Foreign trade, Income, *Factor transfer.

As deep water petroleum production and the mining of ocean floor mineral resources become increasingly pratical, issues of efficiency in resource division vs. equity are raised. This paper argues that if a division of resource stocks is efficient, then, together with transfer payments, all countries will be better off relative to any inefficient division. A simple trade model for one-period, two-commodities and two-countries is developed. It is assumed that: (1) a resources is to be divided between the two countries, (2) that it will all be consumed in the present period, (3) that there will be no subsequent production externalities between the two countries. The paper examines how different divisions of the resource affect national and world real income. In general, if a division exists which increases world income relative to some initial resource distribution, there usually exists a transfer payment which will make both countries better off. It is concluded that geographic divisions are inefficient, whether they are arbitrary (e.g., 200 mi limits) or negotiated. Allocations by bidding, on the other hand, may be efficient in special circumstances. Adding revenue sharing payments to an agreement for an arbitrary geographic division may result in an even more inefficient solution. (Lynch-Wisconsin)
W78-02212

A CRITIQUE OF THE NATIONAL WATER COMMISSION ANALYSIS OF COST SHARING,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-02214

COST-EFFECTIVE ELECTRIC POWER GENERATION FROM THE WIND: A SYSTEM LINKING WINDPOWER WITH HYDROELECTRIC STORAGE AND LONG-DISTANCE TRANSMISSION,
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 8C.
W78-02273

ECONOMIC ANALYSIS OF GEOTHERMAL ENERGY,
Battelle-Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 3E.
W78-02285

A SOCIAL AND ECONOMIC IMPACT STUDY OF OFFSHORE PETROLEUM AND NATURAL GAS DEVELOPMENT IN ALASKA. PHASE II.
Mathematical Sciences Northwest, Inc., Bellevue, WA.
For primary bibliographic entry see Field 5G.
W78-02517

ECONOMIC AND FINANCIAL IMPACTS OF FEDERAL AIR AND WATER POLLUTION CONTROLS ON THE ELECTRIC UTILITY INDUSTRY.
Temple, Barker and Sloane, Inc., Wellesley Hills, MA.
For primary bibliographic entry see Field 5G.
W78-02518

CHOOSING THE OPTIMUM FINANCIAL STRATEGY FOR POLLUTION CONTROL INVESTMENTS.
Environmental Protection Agency, Cincinnati, Ohio. Office of Technology Transfer.
For primary bibliographic entry see Field 5G.
W78-02519

INTERTEMPORAL AND INTERGENERATIONAL PARETO EFFICIENCY: A COMMENT,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
R. C. Bishop.
Journal of Environmental Economics and Management, Vol 4, No 3, p 247-251, 1977. 4 ref.

Descriptors: *Discount rate, Optimization, Economics, *Pareto efficiency, Perfect competition, Fixed resources.

The earlier argument of Sandler and Smith that discounting at a constant rate for all individuals and time periods is Pareto inefficient over time is challenged. It is held that while Sandler and Smith's analysis of the Pareto conditions appear to be technically correct, they have erred in drawing such a conclusion. The counter argument is that to take an optimality condition and try to introduce a discount rate into it is meaningless. If the governmental sector is contemplating a project to produce a public good, it would clearly be necessary to discount consumers' willingness to pay if the project is to be evaluated in such a way as to achieve optimality. From the standpoint of Pareto efficiency this conclusion would not be changed by introducing multiple generations. The role of the discount rate as an expression of opportunity cost means that so long as all the other assumptions remain intact, any departure from the maximization conditions for individual producing and consuming units will lead to nonoptimality. (Coyle-Wisconsin)
W78-02522

HOW TO ESTIMATE THE SOCIAL RATE OF DISCOUNT,
Harvard Univ., Cambridge, MA.
For primary bibliographic entry see Field 6B.
W78-02534

CONGESTION AND WILLINGNESS TO PAY: A STUDY OF BEACH USE,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 6B.
W78-02556

NONSEPARABILITY AND THE VOLUNTARY APPROACH TO EXTERNALITY PROBLEMS,
Dortmund Univ. (West Germany). Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02558

ENVIRONMENT--EXTERNALIZING THE INTERNALITIES,
City Univ. of New York. Graduate School and Univ. Center.
For primary bibliographic entry see Field 5G.
W78-02560

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-02563

LOCAL VERSUS NATIONAL POLLUTION CONTROL: NOTE,
Clarkson Coll. of Technology. Potsdam, NY. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-02566

STATUS, PROBLEMS, ADVANCES AND ECONOMICS OF EUCHEUMA FARMS,
For primary bibliographic entry see Field 4A.
W78-02571

INFLUENCE OF METERING, PRICING, POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 6D.
W78-02572

6D. Water Demand

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS (PHASE II),
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton, and R. C. Peralta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 647, Price codes: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1977). 28 p, 17 fig, 6 tab, 8 ref. OWRT B-034-OKLA(1).

Descriptors: *Water demand, *Water supply systems, *Distribution systems, *Rural areas, Standpipes, Water delivery, *Oklahoma, Water districts, *Rural water districts, Rural water systems, Peak demand rate, Daily demand rate, Monthly demand rate.

Rural Water District design depends on expected usage amounts and rates, which in rural areas, is often season-dependent. An 'average' rural water district in Oklahoma was monitored for consumptive use, peak use rates, and temporal distribution of water use. Monthly usage amounts per tap were significantly higher for June, July and August than for the rest of the year. (12,799 gal. or 48,431 l versus 8,219 gal. or 31,101 l). The average monthly use per residential tap was 8,258 gal. (31,248 l) and the average monthly use per person was 2,796 gal. (10,501 l). The period of time when water use was lowest from 11:00pm-6:30am. The criterion of 85% adequacy was used in presenting the following information. (Only 15% of the daily demands or daily peak flow rates exceeded these values). The daily demand per tap in July-August was 620 gal. (2,346 l) as compared with 365 gal. (1,381 l) for the other months. The peak demand values were .74 gpm (2.8 lpm) per person and 1.3 (4.9 lpm) per tap. (See also W75-11056)
W78-02206

WATER SUPPLY, LAND USE, AND URBAN GROWTH,
Santa Clara Valley Water District, CA.
For primary bibliographic entry see Field 4A.
W78-02448

INFLUENCE OF METERING, PRICING, POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
A. R. Gallager, and R. W. Robinson.
Australian Water Resources Council, Canberra, Technical Paper No. 19, 1977. 28 fig, 50 tab, 151 ref, 1 append. 72/42.

Descriptors: Water supply, *Pricing, *Water demand, *Water rates, Water users, Costs, Water policy, Economics, Potable water, Elasticity of demand, Cities, *Australia, Metering, Incentives.

The price of water for urban use is the focus of this research report on the urban water supply industry in Australia. The hypothesis that the price elasticity of demand for water is zero is rejected; it is contended that, although elasticity is small, over the long-run responsiveness of water use to price would result in changed demand habits. As consumers are made aware of water supply costs, resources would not need to be wasted on excessively large water supply systems. Such needlessly large systems often result from the conventional approach to estimating future water requirements through extrapolation from past consumption trends, together with the rating system used by most water authorities (based on property valuation). The installation of water meters permits a water authority to set water allowances and detect excess users. Water allocation policies are improved, thereby generating greater water use efficiency. An alternative approach, however, is to replace water requirement with the urban water demand function, in which the quantity of water demanded per unit of time is determined by the price per unit of water, other commodity prices, income, and tastes. The economies of density and diseconomies of distance must also be considered. The price should reflect the higher cost of providing water to customers located further from the load center, thus discouraging urban sprawl and encouraging concentration of water users. (Lynch-Wisconsin)
W78-02572

6E. Water Law and Institutions

WATER POLICIES IN INDIA AND CHINA,
Scandinavian Inst. of Asian Studies, Copenhagen (Denmark).
J. Sigurdson.
AMBIO, Vol 6, No 1, p. 70-76, 1977. 1 fig, 2 tab, 21 ref.

Descriptors: *Water policy, *Water resources, Administration, Governments, Irrigation, Flood control, Agriculture, Foreign countries, *China, *India, Tubewell irrigation.

India and China are compared in terms of water resources, land area, precipitation, runoff, cultivated area, grain production, and population in the first section of this article. In the second, water and development strategies are contrasted. Both countries are well-endowed with water resources, but precipitation shows extreme spatial and temporal variations. Irrigation and flood control have been central to planning in each country. China has maintained a strong central control of water resources; in India the constituent states have been given the responsibility for planning and implementing their own water programs. In water conservation policy, China now emphasizes (1) small projects, (2) irrigation and drainage systems complete with supplementary facilities, and (3) projects undertaken by the people's communes and their production brigades and teams. The latter has facilitated a more intensive farming than otherwise would have been possible. The present irrigation system in India has been designed more for protection against erratic rainfall than for intensive farming. Tubewell irrigation has been rapidly introduced in recent years in India and China, totalling about 2.6 million and 2.0 million respectively. (Lynch-Wisconsin)
W78-02213

A CRITIQUE OF THE NATIONAL WATER COMMISSION ANALYSIS OF COST SHARING,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-02214

WATER POLLUTION LAW: CONGRESS CONCEDES SOME 'MID-COURSE CORRECTIONS'.
Industry Week, Vol. 195, No. 4, p 17-19, November 21, 1977.

Descriptors: *Water pollution control, *Legislation, Industries, Toxins, Pollutants, Steel, *Industrial wastes, Legal aspects, *Water Pollution Control Act(1972), *Metal finishing industry.

A common theme echoed for the half decade since the passage of the 1972 water pollution control law that 'mid-course corrections' would have to be made to fashion something industry could live with, particularly regarding the strict technology-forcing 1983 requirements. On November 10, 1977, a House-Senate conference committee completed work on those mid-course corrections

and drew both praise and blame from industry spokesmen for their efforts. Postponement of the best available technology (BAT) requirement from 1983 to 1984 is hailed by some as a true compromise. BAT control will still be required for 'toxic' pollutants, but not necessarily for 'conventional' pollutants such as oxygen-consuming materials or suspended solids. Nonetheless, requirements for eliminating discharge of toxins to waterways and municipal sewer systems may force a number of marginally profitable small plants out of business, particularly in the metal finishing industry. No special relief from environmetal regulation was granted the steel industry, which has hoped for favorable treatment in light of its current financial problems. (Eberle-NWWA)
W78-02292

THE ARIZONA WATER RESOURCES COMMITTEE: HISTORY AND POLITICS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
H. J. Cortner, and M. P. Berry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 799, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, November 1977. 6 p. OWRT A-072-ARIZ(3), 14-34-0001-7005 and 7006.

Descriptors: Water yield improvement, *Arizona, *Decision-making, Watershed management, *History, *Political aspects, *Arizona Water Resources Committee, Political interest groups, Vegetative modification.

The Arizona Water Resources Committee (AWRC) was examined from both an historical and political perspective. The AWRC, formed in 1956, is a political interest group which predominately seeks to increase the water yield from Arizona's watersheds through vegetative modification. The study traced the history of the activities of the AWRC since its formation, and evaluated the committee's success in advancing its principal goals and objectives in the policy process. As an organized group, the AWRC is characterized by many of the variables that distinguish groups with maximum potential to gain access and exert influence in decision-making. Committee activities in securing congressional appropriations, in building a network of cooperative relations among agencies and researchers, in convincing resource managers of the efficacy of watershed management research, and in obtaining political and financial support for those endeavors demonstrate the AWRC's ability to capitalize upon its access and influence potential. While the committee has yet to see its goal of a full-scale operational program of water yield improvement realized, its remarkable success in supporting and sponsoring watershed research programs are indications of its political proficiency.
W78-02400

INTERTEMPORAL AND INTERGENERATIONAL PARETO EFFICIENCY: A COMMENT,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-02522

DEEP WELL INJECTION OF INDUSTRIAL WASTES: GOVERNMENT CONTROLS AND LEGAL CONSTRAINTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5G.
W78-02538

THE CHANGING CONTEXT OF WATER RESOURCES PLANNING: THE NEXT 25 YEARS,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-02567

HARMONIZING WATER RESOURCES DEVELOPMENT AND USE WITH ENVIRONMENTAL PROTECTION IN MUNICIPAL AND INTERNATIONAL LAW,
Fordham Univ., NY. School of Law.
L. A. Teclaff.
Natural Resources Journal, Vol. 16, No. 4, p 807-861, October 1976.

Descriptors: *Legal aspects, *Water resources development, *Environmental effects, *Water law, History, Treaties, Judicial decisions, International law, Riparian waters, Legislation, Municipal law.

Phases in the evolution of municipal and international water law in relation to environmental protection are traced and analyzed. In municipal law, three periods are distinguished: (1) before about 1850 any environmental protection attributed to water law was an incidental by-product of legal restraints on water resource development; (2) a period of unbridled water resource development began in the second half of the 19th century without regard for environmental consequences; (3) beginning in the mid-1960's water law has been slowly reshaped to reflect the perception that changes in one environmental element must be harmonized with effects on all other elements. Each phase is discussed in detail. International water law similarly was long concerned only with protection of water uses and interests, and environmental benefits were incidental. The scope of treaties grew with the increasing need for cooperation and the capacity for inflicting injury. As the manace of water pollution increased, distribution rules were supplemented by rules protecting water resources of neighboring states. In the 20th century pollution control efforts were broadened, as in the U.S.-Canada joint commission on Great Lakes pollution beginning in 1912. Recent developments are discussed. In the United States the river basin authority is giving way to multipurpose resource agencies in regulating general resource development. (Lynch-Wisconsin)
W78-02573

THERMOMETRY IN THE CONTROL OF WATER QUALITY,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-02618

PUGET SOUND POWER AND LIGHT CO. V. F.P.C. (LICENSING JURISDICTION OVER REPAIRS TO HYDROELECTRIC PROJECT).
557 F.2d 1311-16 (9th Cir. 1977).

Descriptors: *Federal jurisdiction, *Federal power act, *Hydroelectric plants, *Hydroelectric project licensing, *Repairing, Construction, Dam construction, Diversion dams, Electric generators, Electric power, Electric power industry, Electric power production, Electric power plants, Generators, Hydroelectric power, Jurisdiction, Legislation, Non-navigable waters, Power system operation, Projects, Regulation, Rivers, Judicial decisions.

Petitioner, electric power company, sought a determination that respondent, Federal Power Commission, had no licensing jurisdiction over a hydroelectric project originally built in 1904 on a non-navigable stream. The project had undergone extensive repair and restoration following a landslide in 1936. The Commission contended that such repairs were sufficient to bring the project within its jurisdiction under the provisions of the 1935 amendments to the Federal Power Act. Those amendments required parties intending to construct dams or other projects on non-navigable streams to file a license application with the Commission. The Ninth Circuit Court of Appeals held that the mandatory licensing requirements of the Federal Power Act were not to be applied retroactively. Furthermore, the court held that the repair work undertaken by the petitioner did not constitute construction within the meaning of the 1935 amendments. Although the repairs involved were substantial, they merely restored the project to its original specifications with no changes in capacity or physical plants. (White-Florida)
W78-02928

6F. Nonstructural Alternatives

AN ANALYSIS OF THE EFFECTIVENESS OF LAND USE REGULATIONS REQUIRED FOR FLOOD INSURANCE ELIGIBILITY,
Mississippi State Univ., Mississippi State. Div. of Business Research.
L. R. Cheatham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 596, Price codes: A06 in paper copy, A01 in microfiche. Mississippi State University, Water Resources Research Institute, Completion Report, October 1977. 113 p, 6 fig, 32 tab, 23 ref. OWRT A-105-MISS(1), 14-34-0001-7052.

Descriptors: Flood plains, *Insurance, *Zoning, *Regulation, *Land use, *Flood plain insurance, *Legislation, Construction, Non-structural alternatives, *Mississippi, Flood control, *National Flood Insurance Program, Federal Insurance Administration.

The study was designed to investigate the effectiveness of land use control measures by the Federal Insurance Administration (FIA) for participation in the National Flood Insurance Program. Limitations in FIA authority are primarily associated with the emergency program of insurance. All communities entering the flood insurance program eventually will be required to adopt and implement appropriate land use control measures. Investigations were conducted for selected Mississippi municipalities to determine if status C land use regulations, required in community flood plain ordinances, were being enforced. Evidently, communities in the state are actively enforcing such ordinances. Analyses of construction trends revealed that flood plain ordinances have had an effect on the amount of flood plain construction in selected Mississippi regular program communities. When construction data for two communities were separated into commercial and non-commercial categories, it became apparent that the two types of construction were not affected equally by flood plain ordinances. The amount of construction on flood plans was influenced by changes in the business cycle and by the occurrence of major floods.
W78-02207

FLOOD PLAIN INFORMATION: LITTLE CREEK, PRINCE WILLIAM COUNTY, VA,
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02623

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02624

FLOOD PLAIN INFORMATION: LUZERNE COUNTY, PENNSYLVANIA, SUSQUEHANNA AND LACKAWANNA RIVERS.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02627

FLOOD HAZARD INFORMATION: CHAMBERS CREEK, EVERMAN, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02628

FLOOD PLAIN INFORMATION: CIENEGAS CREEK AND CANTU BRANCH, DEL RIO, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02629

FLOOD PLAIN INFORMATION: MARYS AND SOUTH MARYS CREEKS, FORT WORTH, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02630

FLOOD PLAIN INFORMATION: MONAHANS DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02631

SPECIAL FLOOD HAZARD INFORMATION: WALNUT BRANCH, SEGUIN, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02632

FLOOD PLAIN INFORMATION: CRUMP CREEK, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02633

FLOOD PLAIN INFORMATION: JAMES RIVER AT RICHMOND, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02634

FLOOD PLAIN INFORMATION: MECHUMPS CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02635

FLOOD PLAIN INFORMATION: SWIFT CREEK, CHESTERFIELD COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02636

FLOOD PLAIN INFORMATION: TOTOPOTOMOY CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02637

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CARROLL TOWNSHIP, DONORA, AND FALLOWFIELD TOWNSHIP, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02638

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CENTERVILLE BOROUGH AND EAST BETHLEHEM TOWNSHIP, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02639

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, FAYETTE COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02640

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, MONESSEN AND ROSTRAVER TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02641

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, UNION TOWNSHIP, NEW EAGLE, AND MONONGAHELA, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02642

FLOOD PLAIN INFORMATION: NESHANNOCK CREEK BASIN, LAWRENCE COUNTY, PENNSYLVANIA--MAIN REPORT AND TECHNICAL APPENDIX.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02643

FLOOD PLAIN INFORMATION: OHIO AND BEAVER RIVERS, BEAVER COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02644

6G. Ecologic Impact Of Water Development

SOME ECONOMIC AND ENVIRONMENTAL EFFECTS OF HIGHWAYS IN JAPAN AND THE UNITED STATES,
Federal Highway Administration, Washington, D.C. Transportation Economics Div.
For primary bibliographic entry see Field 5C.
W78-02221

ECONOMIC/DEMOGRAPHIC ASSESSMENT MANUAL: CURRENT PRACTICES, PROCEDURAL RECOMMENDATIONS, AND A TEST CASE,
Arizona State Univ., Tempe. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02274

BUREAU OF RECLAMATION, CONSTRUCTION WORKER SURVEY,
Arizona State Univ., Tempe. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02275

CHANGES IN THE ECOLOGY OF AREAS ADJACENT TO IRRIGATION SYSTEMS, (IN RUSSIAN),
Kuban Agricultural Inst., Krasnodar (USSR).
For primary bibliographic entry see Field 3F.
W78-02388

USE OF ECOLOGICAL PROFILES IN THE STUDY ON THE DYNAMICS OF COASTAL LANDSCAPES, (IN RUSSIAN),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 2L.
W78-02446

ENVIRONMENTAL PHOSPHORUS HANDBOOK.
For primary bibliographic entry see Field 5B.
W78-02457

COASTAL BELT TOURISM, ECONOMIC DEVELOPMENT AND ENVIRONMENTAL IMPACT,
For primary bibliographic entry see Field 6B.
W78-02564

ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOME COMMUNITIES,
Pennsylvania Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 6B.
W78-02570

HARMONIZING WATER RESOURCES DEVELOPMENT AND USE WITH ENVIRONMENTAL PROTECTION IN MUNICIPAL AND INTERNATIONAL LAW,
Fordham Univ., NY. School of Law.
For primary bibliographic entry see Field 6E.
W78-02573

MONITORING ENVIRONMENTAL IMPACTS OF THE COAL AND OIL SHALE INDUSTRIES RESEARCH AND DEVELOPMENT NEEDS,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5A.
W78-02619

ENVIRONMENTAL, HEALTH, AND CONTROL ASPECTS OF COAL CONVERSION: AN INFORMATION OVERVIEW: VOLUMES 1 AND 2.
Oak Ridge National Lab., Oak Ridge, TN.
For primary bibliographic entry see Field 5C.
W78-02622

PROCEEDINGS OF THE NINTH DREDGING SEMINAR.
Texas A and M Univ., College Station. Center for Dredging Studies.
For primary bibliographic entry see Field 5C.
W78-02646

7. RESOURCES DATA

7A. Network Design

EVALUATION OF MILES CITY SWR-75 WEATHER RADAR,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
P. L. Smith, Jr.
Report No. 77-1, April 1977. 55 p, 6 fig, append. Submitted to Bureau of Reclamation, Denver, Colo., Div of Atmospheric Water Resources Mgmt. Bur Reclam Purchase Order 7-01-81-00478.

Descriptors: *Radar, *Evaluation, Weather modification, Weather data, *Montana, Measurement, Instrumentation, Calibration, Reflectivity, Errors, Miles City(Mont).

Results are presented of an evaluation of the SWR-75 C-band weather radar system located at Miles City, Montana. The evaluation procedures are described in some detail and the results of the measurements given. Where appropriate, recommendations for changes or improvements in the system and the calibration and operating procedures are presented. The SWR-75 system and the calibration procedures in use conform for the most part to currently accepted practice in the weather radar field. No basis was found for expecting substantial errors in C-band equivalent

radar reflectivity factors measured with the SWR-75.
W78-02227

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2B.
W78-02228

DESIGN CONSIDERATIONS FOR SAMPLING PROGRAMS IN REMOTE AREAS,
Alaska Univ. College.
L. A. Casper, R. C. Gordon, and E. W. Mueller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 066, Price codes: A04 in paper copy, A01 in microfiche. EPA Artic Environmental Research Laboratory, College, Working Paper No. 23, November 1973. 57 p, 24 fig, 13 ref.

Descriptors: *Water sampling, *Polar regions, *Design criteria, *Testing procedures, *Sampling, *Arctic, *Alaska, Water quality, Data collections, Chemical analysis, Instrumentation, On-site tests, Testing, Water analysis, Aircraft, Analytical techniques, Reliability, Cold regions, Transportation, Preservation techniques.

Water quality field studies in the Arctic rapidly reveal flaws in logistic schemes and equipment reliability because of severe constraints placed on all components by the environment. Since the studies generally require collection of samples in areas remote from central laboratory facilities, the time lag between sampling and analysis necessitates the inclusion of field analyses in the sampling scheme where the analytes may exhibit rapid change. The selected scheme includes components of sampling, field processing, shipping, and laboratory analysis which are dependent of both the time and mode of transportation as well as the requirements for analytical reliability. Decisions regarding analytical specifications are dependent upon the resources of the investigator, although in a more immediate sense the decisions are a function of the working environment and available field instrumentation. Additional development and design is necessary to bring component reliability up to the state-of-the-art. Unit data cost and statistical reliability can be optimized through critical path analysis. Equipment reliability can be greatly improved through the application of environmental simulation techniques such as those developed for space program instrumentation. Research on analyte concentration for improved transportability and preservation could achieve a reduction in statistical and logistical restraints. (Henley-ISWS)
W78-02235

PROCEDURES FOR EVALUATING OPERATIONS OF WATER MONITORING NETWORKS,
URS Research Co., San Mateo, CA.
For primary bibliographic entry see Field 5A.
W78-02656

7B. Data Acquisition

A COMPARISON BETWEEN CONVENTIONAL AND LANDSAT-BASED HYDROLOGIC MODELING: THE FOUR MILE RUN CASE STUDY,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-02232

EXAMINATION OF THE ELUTRIATE TEST, A SCREENING PROCEDURE FOR DREDGING REGULATORY CRITERIA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-02253

MULTICHANNEL SEISMIC REFLECTION PROFILES OF THE CONTINENTAL CRUST BENEATH THE NEWFOUNDLAND RIDGE,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 2L.
W78-02260

A MORE PRECISE METHOD OF DETERMINATION OF SPECIFIC RESISTANCE TO FILTRATION,
K. A. Wuhrmann.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 377-378, 1977. 2 fig, 1 tab, 2 ref.

Descriptors: *Filtration, *Analytical techniques, *Filters, *Monitoring, *Instrumentation, Viscosity, Flow resistance, Flowmeters, Flow measurement, Automatic control, Equipment, Waste water treatment, Filtration resistance.

The method of determination of specific resistance to filtration of substances such as sewage sludge was refined with the design of an automatic device for filtrate sampling. The resistance to filtration is normally expressed as a function of the flow gradient of the filtrate calculated on the basis of the filtrate volume as a function of time, the filtering pressure, the active filtering area, the dry residue, and the dynamic viscosity of the liquid. The automatic resistance measuring device registers the time to obtain two predetermined volumes of filtrate from a standardized filtering apparatus. A comparison of results obtained from eight series of five conventional and five automatic measurements is presented. (Schulz-FIRL)
W78-02374

ASSESSMENT OF AQUATIC VEGETATION WITH SATELLITE-DERIVED DATA,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-02401

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02416

METHODS FOR COLLECTION AND ANALYSIS OF AQUATIC BIOLOGICAL AND MICROBIOLOGICAL SAMPLES,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-02432

TECHNIQUES FOR ESTIMATING FLOOD DISCHARGES FOR OKLAHOMA STREAMS,
Geological Survey, Reston, VA; and Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02436

PHASE-SENSITIVE RADIO-ECHO SOUNDING AT THE DEVON ISLAND ICE CAP, CANADA,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 2C.
W78-02581

AN ERROR IN ICE-TEMPERATURE MEASUREMENT,
British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 2C.
W78-02591

A COMPARISON OF THE CRREL 500 CU CM TUBE AND THE ILTS 200 AND 100 CU CM BOX CUTTERS USED FOR DETERMINING SNOW DENSITIES,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W78-02592

REMOTE SENSING REPORT, PACIFIC NORTHWEST AREA, WASHINGTON, OREGON, IDAHO, APRIL AND JULY 1973.
National Field Investigation Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 599, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-330/3-74-002, September 1974. 146 p, 56 fig, 1 tab, 3 append.

Descriptors: *Remote sensing, *Water pollution sources, *Washington, *Oregon, *Idaho, Photography, Aerial photography, Infrared radiation, Aircraft, Water pollution, Rivers, Lakes, Estuaries, Oil spills, Wastes, Pulp wastes, Farm wastes, Feed lots, Industrial wastes, Cities, Effluents, Outlets, Water pollution control, Law enforcement, *Puget Sound(Wash), *Willamette River(Ore), *Snake River(Idaho), *Salmon River(Idaho), *Coeur D'Alene Lake(Idaho).

Airborne remote sensing studies of five areas in the Pacific Northwest states of Washington, Oregon, and Idaho were conducted in April and July 1973. Aircraft sensors were selected to record the presence and characteristics of municipal and industrial wastewater discharges. The location and characteristics of detected discharges were compared with those of known discharges reported in Refuse Act Permit Program (RAPP) and National Pollutant Discharge Elimination System (NPDES) permit applications. Discharges from unknown sources that may have originated fron nonfilers, and apparent additional or changed discharges at sources filing for permits were identified. The color, dispersion pattern, and size of visible plumes for the observed discharges were documented. (Sims-ISWS)
W78-02611

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
I. A. Reid, and R. A. Halliday.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-24674, Price codes: A02 in paper copy, A01 in microfiche. Quarterly Report No. SR 28190, April 1976. 8 p, 1 fig, 3 tab.

Descriptors: *Data collections, *Hydrologic data, *Data transmission, *Canada, Water levels, Precipitation(Atmospheric), Temperature, Air temperature, Meteorological data, Satellites(Artificial), Water resources, Flood forecasting, Remote sensing, Equipment, Projects, Hydrology, *LANDSAT data, *Data collection platforms, Retransmission.

Data Collection Platforms were installed at 18 sites in remote areas of Canada for transmittal of water level and other water resource data. The implementation of the Alaska Receive Site in December 1975 has increased the value of the system substantially. The near real-time data are used for water management purposes. The system has met all requirements and the suitability of satellite retransmission has been demonstrated. (See also W77-02506, W77-03111) (Sims-ISWS)

W78-02612

DEVELOPMENT OF A METHODOLOGY FOR DESIGNING CARBON MONOXIDE MONITORING NETWORKS,
Systems Applications, Inc., San Rafael, CA.
For primary bibliographic entry see Field 5A.
W78-02653

PRELIMINARY RESULTS OF UHF RADIOMETRIC AND DIRECT GROUND STUDIES OF SOIL MOISTURE IN 1975,
For primary bibliographic entry see Field 2G.
W78-02684

7C. Evaluation, Processing and Publication

A MULTI-PARAMETER WATER QUALITY MANAGEMENT MODEL FOR RIVER BASINS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-02202

EVALUATION OF MILES CITY SWR-75 WEATHER RADAR,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 7A.
W78-02227

DEVELOPMENT OF AN EXPERIMENTAL HYDROMETEOROLOGICAL DATA COLLECTION NETWORK,
Western Scientific Services, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2B.
W78-02228

INVENTORY OF SEDIMENT SAMPLE COLLECTION STATIONS IN THE MISSISSIPPI RIVER BASIN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 2J.
W78-02230

RADIUM-226, URANIUM, AND OTHER RADIOLOGICAL DATA COLLECTED FROM WATER QUALITY SURVEILLANCE STATIONS LOCATED IN THE COLORADO RIVER BASIN OF COLORADO, UTAH, NEW MEXICO, AND ARIZONA- JANUARY, 1961 THROUGH JUNE, 1972.
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-02231

URBAN STORM RUNOFF INLET HYDROGRAPH STUDY: VOL. 1, COMPUTER ANALYSIS OF RUNOFF FROM URBAN HIGHWAY WATERSHEDS UNDER TIME-AND SPACE-VARYING RAINSTORMS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4D.
W78-02240

DIGITAL LOAD CONTROL FOR HYDROELECTRIC POWERPLANTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W78-02266

FREQUENCY-RESPONSE ANALYSIS OF AUTOMATED CANALS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W78-02271

URBAN STORM RUNOFF MODEL,
CH2M Hill, St. Louis, MD.
For primary bibliographic entry see Field 5B.
W78-02300

COMPUTERS AND INSTRUMENTATION--PARTNERS IN TREATMENT PLANT OPERATION,
R. Zucchetti.
Water and Pollution Control, Vol 115, No 8, p 9-11, August, 1977. 1 fig.

Descriptors: *Computers, *Automatic control, *Monitoring, *Data processing, *Instrumentation, Automation, Digital computers, Operation and maintenance, Water treatment, Waste water treatment.

The use of computers and instrumentation systems is considered for providing automatic control and operation monitoring in municipal water and waste water treatment. Topics discussed include the importance of primary sensing elements, data logging, digital control centers, microprocessors, and trouble-shooting. A typical wiring diagram for a microprocessor which can be used to monitor filters, headloss, turbidity, and flow rate is presented. Criteria which may be useful in the evaluation of a computerized monitoring system for plant operation are presented. (Schulz-FIRL)
W78-02373

COMPUTER CONTROL OF LARGE-SCALE WASTEWATER TREATMENT PLANT,
Tokyo Sewerage Bureau (Japan).
For primary bibliographic entry see Field 5D.
W78-02380

COMPUTER MODELING TO MAXIMIZE WATER USE EFFICIENCY AND REDUCE ENERGY IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-02404

GROUND WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE PORTLAND AREA, MAINE,
Geological Survey, Augusta, ME. Water Resources Div.
G. C. Prescott, Jr.
Available from the U. S. Geological Survey, Reston, VA 22092, price $1.75. Hydrologic Investigations Atlas HA-561, 1976. 1 sheet, 6 fig, 15 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Maine, Water wells, Water yield, Water resources development, Glacial drift, Groundwater availability, Water quality, Water levels, Groundwater recharge, Surface-groundwater relationships, Maps, *Portland area(Maine).

This hydrologic atlas describes the surficial geology and groundwater resources of about 240 square miles in Cumberland County, Maine. The most productive aquifers are outwash and ice-contact deposits. Their locations and the most favorable areas for obtaining large yields from them are indicated on the map. The largest reported yield from a well in unconsolidated deposits is 100 gpm, but it is likely that in places as much as 500 gpm can be obtained from properly located and developed wells. Ground water is available to drilled wells in bedrock in sufficient quantity for domestic use. The average yield from bedrock wells is 11 gpm, the median yield is 5 gpm, and the maximum reported yield is 150 gpm. The quality of the water is generally good, although brackish or salty water is obtained by some wells on the coast. (Woodard-USGS)
W78-02413

RECONNAISSANCE HYDROLOGY OF PORTAGE GLACIER BASIN, ALASKA--1972,
Geological Survey, Anchorage, AK. Water Resources Div.
L. R. Mayo, C. Zenone, and D. C. Trabant.
Available from the U. S. Geological Survey, Reston, VA 22092, price $1.25. Hydrologic Investigations Atlas HA-583, 1977. 2 sheets, 13 ref.

Descriptors: *Glaciers, *Glaciology, *Glacial drift, *Alaska, Climatology, Snow, Ice, Reviews, Evaluation, Hydrologic data, Projections, Snowmelt, Lakes, Ablation, Maps, Aerial photography, *Portage Glacier basin(Alaska), Calving, Glacier retreat, Outburst floods, Portage Lake.

Early reports of conditions in Portage Pass, Alaska, provide evidence that Portage Glacier was formerly larger and thicker. Past conditions, recent history, current retreat, and possible future changes are summarized from an analysis of reports, photographs of the glacier (1939, 1950, and annually since about 1960), and data on snow and ice balance and bathymetry (1972). Between 1900 and 1972, the glacier terminus retreated 3.4 kilometers, and the lower part of the glacier thinned 200 meters. Climatic change controlled the retreat until about 1930; since then deep water at the terminus has influenced the calving retreat. The calving rate and present terminus position cannot be sustained by current climatic conditions and rate of snow accumulation. Thus the glacier will continue to recede until the terminus stabilizes in shallower water, probably about 1.5 kilometers upvalley from the present terminus and in about year 2020, assuming no change in present climatic conditions and calving rate. Possible small climatic changes could cause a shift in the point at which annual snow accumulation equals annual ablation (500 meters) and a corresponding change in terminus behavior. Potential natural hazards include avalanches, outburst floods from ice-dammed lakes, and unstable icebergs. (Woodard-USGS)
W78-02414

WISCONSIN, A SUMMARY OF ACTIVITIES AND PLANS OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1977,
Geological Survey, Madison, WI. Water Resources Div.
J. H. Green, and R. A. Lansing.
Wisconsin District report, 1977. 102 p, 1 plate.

Descriptors: *Wisconsin, *Projects, *Water resources, *Geological surveys, *Land resources, Mineralogy, Water resources development, Hydrologic data, Floods, Sediment transport, Streamflow, Low flow, Groundwater resources, Aquifer characteristics, Water quality, Mapping, Publications, Bibliographies, Reviews.

The U.S. Department of the Interior's Geological Survey, established in 1879, is the Nation's principal fact-finding agency concerned with physical resources--the configuration and character of land surface, the composition and structure of the underlying rocks, and the quality, extent, and distribution of water and minerals. The Survey is an impartial fact-finding and research agency that gathers and interprets data so that managers can make decisions based on objective information. The Wisconsin program of the U.S. Geological Survey is, for the most part, planned and funded with local and State agencies through cooperative programs. This booklet will be useful to cooperat-

ing agencies by providing an understanding of all current studies and identifying present and future resource problems that are relevant to the experience and competence of the Survey in Wisconsin. (Woodard-USGS)
W78-02415

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1976.
Geological Survey, Nashville, TN. Water Resources Div.
Water-Data Report TN-76-1, June 1977. 520 p, 8 fig.

Descriptors: *Tennessee, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Tennessee consist of records of stage, discharge, and water quality of streams and springs; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 103 gaging stations; stage only records for one lake gaging station; elevation and contents for 26 lakes and reservoirs; water quality for 50 gaging stations, 80 partial-record flow stations, and 18 wells; and water levels for 27 observation wells. Also included are 118 crest-state partial-record stations and 84 low-flow partial-record stations. Other data were collected and published for miscellaneous stream and spring sites, of as seepage investigations of discharge and water quality. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Tennessee. (Woodard-USGS)
W78-02417

WATER RESOURCES DATA FOR WISCONSIN WATER YEAR 1976.
Geological Survey, Madison, WI. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 291, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report WI-76-1, July 1977. 596 p, 8 fig.

Descriptors: *Wisconsin, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1976 water year for Wisconsin include records of streamflow at gaging stations, partial-record stations, and miscellaneous sites; records of reservoir storage, records of chemical, physical and biological characteristics of surface water, ground water, and precipitation, and records of water levels in observation wells. Records for a few gaging stations in bordering states also are included. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Wisconsin. (Woodard-USGS)
W78-02418

WATER RESOURCES DATA FOR NEW MEXICO, WATER YEAR 1976.
Geological Survey, Albuquerque, NM. Water Resources Div.
Water-Data Report NM-76-1, November 1977. 655 p, 6 fig.

Descriptors: *New Mexico, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for New Mexico consist of records of discharge and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 212 gaging stations; stage and contents for 24 lakes and reservoirs; water quality for 67 gaging stations, 19 partial-record stations, 1 reservoir, 8 springs and 205 wells; and water levels for 98 observation wells. Also included are 155 crest-stage partial-record stations and 3 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. U.S. Geological Survey and cooperating State and Federal agencies in New Mexico. (Woodard-USGS)
W78-02419

WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1976.
Geological Survey, Boston, MA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 093, Price codes: A10 in paper copy, A01 in microfiche.
Water-Data Report NH-VT-76-1, August 1977. 208 p, 2 fig, 1 tab.

Descriptors: *New Hampshire, *Vermont, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1976 water year for New Hampshire and Vermont consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 92 gaging stations, stage records for 4 lakes, monthend contents for 28 lakes and reservoirs, water quality for 9 gaging stations, and water levels for 18 observation wells. Also included are data for 41 crest-stage and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations (not included above) in bordering States and Province of Quebec are also included in this report. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in New Hampshire and Vermont. (Woodard-USGS)
W78-02420

WATER RESOURCES IN WESTERN CORTLAND COUNTY, NEW YORK: HYDROLOGIC DATA FOR 1972-75 AND PROGRESS REPORT,
Geological Survey, Ithaca, NY. Water Resources Div.
H. L. Shindel, W. Buller, and W. H. Johnston.
Open-file report 77-525, September 1977. 36 p, 11 fig, 17 tab, 7 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *New York, Streamflow, Flow rates, Rainfall-runoff relationships, Groundwater movement, Inflow, Streams, Base flow, Chemical analysis, Biological properties, Chemical properties, Cortland County(N Y), Gridley Creek, Virgil Creek, Otter Creek, Tioughnioga River.

Basic data on the surface water, ground water, and water quality of Cortland County, New York, are presented with a short explanatory text. Seepage investigations showed that during periods of base flow, the surface-water regime cannot be predicted on the basis of flow-duration figures alone. The investigations also indicate that the streambeds are permeable for extended reaches throughout the areas studied. Inconsistent data on gain or loss for a given reach are assumed to be indicative of the changes in rate of ground-water recharge or discharge. Analysis of surface-water quality since 1972 showed high nitrate (as NO3) concentrations (4 to 18 mg/liter) in the Cortland area and in Factory Brook. The nitrate source is probably from human activities. Although ground water in the Gridley Creek basin is moderately hard (34 to 140 mg/liter CaCO3), it generally meets standards of the New York State Department of Health. (Woodard-USGS)
W78-02422

HYDROLOGIC RECONNAISSANCE OF THE EASTERN NORTH SLOPE, ALASKA, 1975,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-02424

SOLUTION OF THREE-DIMENSIONAL GROUND-WATER FLOW EQUATIONS USING THE STRONGLY IMPLICIT PROCEDURE,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-02428

GROUND-WATER DATA FOR THE DREWSEY RESOURCE AREA, HARNEY AND MALHEUR COUNTIES, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
J. B. Gonthier, C. A. Collins, and D. B. Anderson.
Open-file report 77-741, September 1977. 28 p, 4 fig, 1 plate, 5 tab, 15 ref.

Descriptors: *Groundwater resources, *Water quality, *Water wells, *Water levels, *Well data, Oregon, Hydrographs, Observation wells, Driller logs, Lithologic logs, Chemical analysis, Maps, Water utilization, Drewsey resource area(Oreg), Harney County, Malheur County.

Appraisals of the resources of selected management areas in eastern Oregon are being made by the U.S. Bureau of Land Management. To provide needed hydrologic information the Bureau of Land Management requested the U.S. Geological Survey Water Resources Division to inventory ground-water data for the Drewsey Resource Area. Included in this report are well data, drillers' lithologic logs, hydrographs, a summary of observation-well data, and chemical analyses of ground water. (Woodard-USGS)
W78-02430

MAP SHOWING DRAINAGE BASINS AND LOCATION OF STREAMFLOW-MEASURING SITES, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, VA. Water Resources Div.
E. H. Mohler.
Open-file report 77-270, 1977. 1 sheet, 2 ref.

Descriptors: *Watersheds(Basins), *Drainage areas, *Maps, *Gaging stations, *Streams, Sites, *Virginia, Fairfax County(Va).

A drainage basin map of Fairfax County shows basins for named streams with drainage areas of 1.1 sq mi (2.8 sq km) or more. Areas of minor streams draining directly into the Potomac River and Occoquan Creek are tabulated. The locations of continuous-record and partial-record (peak-flow and low-flow) flow sites are shown. The use of topographic and climatic characteristics of

drainage basins to transfer flow data from gaged areas to ungaged areas is discussed. (Woodard-USGS)
W78-02431

DESIGN FOR A UNIFIED SYSTEM FOR CHARACTERIZING CONTINENTAL BODIES OF WATER AND ITS USE FOR WATER QUALITY ANALYSIS, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-02559

FLOOD PLAIN INFORMATION: LITTLE CREEK, PRINCE WILLIAM COUNTY, VA,
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02623

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02624

FLOOD PLAIN INFORMATION: LUZERNE COUNTY, PENNSYLVANIA, SUSQUEHANNA AND LACKAWANNA RIVERS.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-02627

FLOOD HAZARD INFORMATION: CHAMBERS CREEK, EVERMAN, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02628

FLOOD PLAIN INFORMATION: CIENEGAS CREEK AND CANTU BRANCH, DEL RIO, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02629

FLOOD PLAIN INFORMATION: MARYS AND SOUTH MARYS CREEKS, FORT WORTH, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02630

FLOOD PLAIN INFORMATION: MONAHANS DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02631

SPECIAL FLOOD HAZARD INFORMATION: WALNUT BRANCH, SEGUIN, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-02632

FLOOD PLAIN INFORMATION: CRUMP CREEK, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02633

FLOOD PLAIN INFORMATION: JAMES RIVER AT RICHMOND, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02634

FLOOD PLAIN INFORMATION: MECHUMPS CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02635

FLOOD PLAIN INFORMATION: SWIFT CREEK, CHESTERFIELD COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02636

FLOOD PLAIN INFORMATION: TOTOPOTOMOY CREEK, HANOVER COUNTY, VA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-02637

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CARROLL TOWNSHIP, DONORA, AND FALLOWFIELD TOWNSHIP, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02638

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CENTERVILLE BOROUGH AND EAST BETHLEHEM TOWNSHIP, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02639

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, FAYETTE COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02640

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, MONESSEN AND ROSTRAVER TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02641

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, UNION TOWNSHIP, NEW EAGLE, AND MONONGAHELA, WASHINGTON COUNTY, PA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02642

FLOOD PLAIN INFORMATION: NESHANNOCK CREEK BASIN, LAWRENCE COUNTY, PENNSYLVANIA--MAIN REPORT AND TECHNICAL APPENDIX.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02643

FLOOD PLAIN INFORMATION: OHIO AND BEAVER RIVERS, BEAVER COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-02644

8. ENGINEERING WORKS

8A. Structures

THERMAL REGIME OF AN EARTH DAM BUILT ON A PERMAFROST BASE DURING CONSTRUCTION AND INITIAL OPERATION,
Gorkovskii Inzhenerno-Stroitelnyi Inst. (USSR).
For primary bibliographic entry see Field 8D.
W78-02237

ECONOMIC/DEMOGRAPHIC ASSESSMENT MANUAL: CURRENT PRACTICES, PROCEDURAL RECOMMENDATIONS, AND A TEST CASE,
Arizona State Univ., Tempe. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02274

UNDERGROUND TANK USED FOR STORM WATER DETENTION.
Water and Wastes Engineering, Vol. 14, No. 9, p 59, September, 1977.

Descriptors: *Construction materials, *Storm runoff, *Underground storage, *Storage tanks, Storage requirements, Urban runoff, Equipment, Waste water treatment, Alexandria(VA).

An underground fiberglass storage tank was chosen by VVKR Partnership as a solution to storm water detention needs at the Alexandria Hospital in Virginia. City ordinances and existing storm water runoff problems required the construction of storm water detention facilities when Alexandria Hospital constructed additional parking facilities. The required storage volume for the 5-acre site was estimated at 600 cu ft of water for a 18-yr rainfall intensity and a release rate of 6.4 cu ft per second. Conventional methods of storm water detention such as surface storage ponds, below-grade storage in concrete chambers, oversized pipes, and gravel interceptors were rejected because of costs, maintenance requirements, and specific problems related to the site. Manufactured by Owens-Corning Fiberglass, the 75-ft long, 10-ft dia tank was shipped in two sections and was equipped with a special junction box to control the release rate. (Schulz-FIRL)
W78-02296

8B. Hydraulics

THE MOVEMENT OF SUSPENDED PARTICLES DUE TO SUDDEN RELEASE OF WATER FROM A LONG PRISMATIC FLUME,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 597, Price codes: A03 in paper copy, A01 in microfiche. Mississippi State University Water Resources Research Institute, Completion Report, October 1977. 23 p, 16 fig, 2 ref. OWRT A-106-MISS(1), 14-34-0001-7052.

Descriptors: *Suspended solids, Flow characteristics, *Flumes, *Unsteady flow, Equipment, Measurement, *Particle size, *Particle shape, Velocity, Open channel flow.

The purpose was to acquire qualitative and quantitative knowledge of the movement of suspended particles in water following sudden release of the suspension from one end of a long, straight, horizontal flume of rectangular cross section. This laboratory study made use of a glass-walled flume and auxiliary photographic and timing equipment. This equipment enabled the observation and recording of movement of particles that were suspended or in contact with the flume bottom.

The particles tested were small polyethylene pellets and spheres of two different diameters that were somewhat larger than the pellets. All particles had a specific gravity just slightly greater than unity. Four different initial water depths were used. Qualitative observations as to particle motion, in regard to both direction and relative magnitude, are reported. Quantitative data regarding average velocities are shown graphically.
W78-02205

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS (PHASE II),
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W78-02206

DEBRIS OF THE CHENA RIVER,
Cold Regions Research and Engineering Lab., Fairbanks, AK. Alaska Projects Office.
For primary bibliographic entry see Field 2J.
W78-02238

PORT IMPROVEMENT DESIGN CRITERIA FOR TEXAS COAST,
Texas A and M Univ., College Station. Ocean Engineering Program.
J. W. Berriman, and J. B. Herbich.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW4, Proceedings Paper 13322, p 487-504, November 1977. 16 fig, 5 tab, 18 ref, 1 append.

Descriptors: *Harbors, *Coastal engineering, *Navigation, *Texas, Ships, Coasts, Channels, Transportation, Excavation, Dredging, Design, *Design criteria, Deep water, Estuaries, *VLCC ports, Harbor facilities, Port improvement.

Navigation facilities must be designed for good control and safe maneuvering of ships. Channel dimensions for safe navigation were calculated on the basis of existing knowledge and were presented for vessels of 100,000, 150,000, and 250,000 deadweight tons. (Sims-ISWS)
W78-02245

STORM TIDE FREQUENCIES FOR CAPE FEAR RIVER,
National Weather Service, Silver Spring, MD. Office of Hydrology.
V. A. Myers, and J. E. Overland.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13337, p 519-535, November 1977. 10 fig, 5 tab, 15 ref, 1 append.

Descriptors: *Storms, *Floods, Estuaries, *North Carolina, Model studies, Mathematical models, Rivers, Hurricanes, Tides, Tidal effects, Storm surge, Coasts, Continental shelf, Data processing, Frequency analysis, *Cape Fear River(NC).

Frequencies of storm tides, principally from hurricanes, in the Cape Fear River, North Carolina, below Wilmington were calculated by applying two previously developed numerical-hydrodynamic models to simulating surges from a large number of hypothetical hurricanes, chosen so as to collectively represent all climatologically expected hurricanes. The models are the continental shelf model of Jelesnianski and a model for the Cape Fear River by the writers. The recurrence interval of each hypothetical hurricane and its simulated tide were derived by combining the probabilities of the several parameters that define each storm. A methodology for carrying out the frequency evaluation economically was illustrated. The 100-yr return period tide level at Wilmington was estimated to be between 10 ft and 11 ft mean sea level. (Sims-ISWS)
W78-02247

EFFECT OF SEDIMENT GRADATION ON CLEAR WATER SCOUR,
Auckland Univ. (New Zealand). Dept. of Civil Engineering.
A. J. Raudkivi, and R. Ettema.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY10, p 1209-1213, October 1977. 2 fig, 6 ref, 1 append.

Descriptors: *Scour, *Laboratory tests, *Piers, *Erosion, Streambeds, Stream erosion, Depth, Analysis, Foreign research, Bridges, Gradation, Sediments.

A comparison of the published experimental data on scour depths at bridge piers showed a large range of values at what appear to be identical conditions. Therefore, it was decided to investigate whether or not the variation could arise from different grain size distributions of the bed material used. The experiments were carried out in a recirculating flume 38 m long, 1.5 m wide, and 1.2 m deep, using a 100 mm diam cylindrical pier. In the experiments, the d sub 50 grain size and the grain size distribution were varied systematically. Trial runs showed that for a given shear velocity, depth of flow greater than about two pier diameters, 2D, had no observable effect on the depth of scour, and thereafter all tests were run at a flow depth of 0.60 m, or six pier diameters. The velocity of the approach flow and the shear velocities were determined from the slope of the velocity distribution. The investigation showed that the maximum depth of clear water scour, d sub s is: (1) A function of the standard deviation, sigma, of the grain size distribution of the bed material; and (2) independent of the grain size in gravel beds where d sub s/D is about 2.1-2.3 for sigma = 0 and decreases with increasing sigma/d sub 50. (Humphreys-ISWS)
W78-02248

BEDLOAD TRANSPORT BY TRANSLATION WAVES,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Research.
G. A. Griffiths, and A. J. Sutherland.
Journal of the Hydraulics Division, American Society of Civil Engineers, Proceedings Paper 13363, Vol. 103, No. HY11, p 1279-1291, November 1977. 5 fig, 1 tab, 12 ref.

Descriptors: *Bed load, *Waves(Water), *Model studies, Channels, Flood routing, Hydraulics, Hydrology, Sediment transport, Mathematical models, Rivers, Sedimentation, *Triangular translation waves, Equilibrium, Steady-state sediment hydrograph, Nonsteady sediment hydrograph.

The response of a gravel bed reach to imposed steady flows and to gradually varying triangular translation waves was examined; first, under equilibrium transport conditions, and second, with no bedload inflow. With equilibrium transport, no significant differences could be found between the sediment hydrograph associated with a wave and the comparable steady-state sediment hydrograph. This result, combined with the observed but small variation in resistance, implies that the use of steady-state resistance and bedload formulas in a mathematical model of the situation can be justified. With nonequilibrium transport, differences occurred between measured nonsteady sediment hydrographs and the comparable steady hydrographs due to a bed response effect. This diminished towards the downstream end of the scour region associated with a wave's passage. Consequently, mathematical model performance would be poor when the reach length is less than the scour hole length. (Lee-ISWS)
W78-02249

STATISTICAL PROPERTIES OF SEDIMENT BED PROFILES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-02251

SETTLEMENT OF SOLID PARTICLES IN OPEN-CHANNEL FLOW,
Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
B. M. Sumer.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY11, Proceedings Paper 13368, p 1323-1337, November 1977. 6 fig, 1 tab, 11 ref, 3 append.

Descriptors: *Sedimentation, *Open channel flow, *Model studies, Mathematical models, Analytical techniques, Turbulence, Settling velocity, Deposition(Sediments), Flow, Diffusion, Suspended solids, Settling basins, Canals, Sedimentology, Solid particle settlement.

Settlement of solid particles in turbulent water environment is encountered in various fields of engineering. Settling basins of hydro-power plants or settling tanks of water treatment plants serve as units for removing suspended solid particles, where the solid particles settle out of suspension due to gravity. When a small heavy particle is released into a turbulent open-channel flow, it moves in the vertical direction under the combined action of: (1) gravity; and (2) vertical component of turbulence. If the former is dominant, the particle will finally settle out of suspension. In this analysis, the boundary condition at the bed is assumed so that the particles coming to the bed are deposited and there is no particle entrainment from the bed into the flow. The boundary condition at the free surface is such that there is no net transport of particles across the free surface. The initial condition is assumed as an instantaneous plane source. The problem was formulated in the Eulerian sense and then Aris moment transformations were employed. The following quantities were predicted analytically: (1) the vertical distribution and the fraction of particles retained in suspension; (2) the probability density function of the duration of the retention period of particles in suspension and the mean retention period; and (3) following the hypothesis that the distribution of deposited partciels follows an exponential function with increasing time, the mean and the variance of settling length of particles. (Sims-ISWS)
W78-02252

OBSERVATIONS OF SHEAR IN NEAR-BED CURRENTS IN THE SOUTHERN NORTH SEA,
University of East Anglia, Norwich (England). School of Environmental Sciences.
J. G. Harvey, and C. E. Vincent.
Estuarine and Coastal Marine Science, Vol 5, No 6, p 715-731, November 1977. 10 fig, 2 tab, 30 ref.

Descriptors: *Ocean currents, *Tides, *Currents(Water), Measurement, On-site investigations, Circulation, Water circulation, Ocean circulation, Current meters, Tidal effects, Flow, Offshore platforms, Equipment, Instrumentation, Data processing, Oceanography, *North Sea.

Measurements of current speed and direction were made at four heights between 0.6 m and 10 m above the sea-bed at a location in the southern North Sea during a 14-day period. Tidal ellipses were presented for the currents at each height for both neap and spring tides. Speed profiles indicated that there is a logarithmic layer in the lowest 5 m of the water column; both the roughness lengths and the drag coefficients determined from the profiles decreased with increasing current speed. The current directions were found to exhibit positive veering, some 8 deg between 0.6 m and 3.0 m above the bed, and a further 7 deg

between 3.0 m and 10 m above the bed. The maximum currents when the flow was directed between north and northwest (the ebb) were consistently stronger than those when it was directed between south and southeast (the flood) at each of the levels, and hence the residual currents were in the ebb direction. The residual currents were generally greater during spring tides than during neap tides, and also exhibited positive veering: the 14-day vector-mean current 0.6 m above the bed was directed some 25 deg to the left of that at 10 m. The residual flow can be considered part of a clockwise circulation around the Well Bank. (Sims-ISWS)
W78-02256

SEDIMENT PREDICTION IN THE EASTERN UNITED STATES,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-02259

EXPERIMENTAL STUDY OF DRAINAGE BASIN EVOLUTION AND ITS HYDROLOGIC IMPLICATIONS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-02262

PILOT-SCALE DRILLING-RESEARCH EFFORTS CAN AID IN MUD DESIGN,
Amoco Production Co., Tulsa, OK.
For primary bibliographic entry see Field 8C.
W78-02284

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART I,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 31, No. 12, p 52-54, December, 1977.

Descriptors: *Water wells, Gravels, Well filters, Well casings, Wells, Construction materials, Plastics, Deltas, Sands, Water table, Water-bearing formations, Drawdown, Transmissivity, Observation wells, *Bangladesh, Tubewells, Gravelpacks.

Drillers in third world nations must utilize innovative methods suited to existing conditions. Experiments were run to find a low-cost tubewell design for use in Bangladesh that could be constructed of materials produced or available locally. Bangladesh in underlain by poorly-sorted, unconsolidated, deltaic sands, silts, and clays with a high water table. Four-inch tubewells producing 224 gpm can supply 20 acres, and six-inch wells can supply 500 gpm for cooperative groups with larger acreage. In addition to PVC or steel casing and filters, tubewells required gravel packing, which was held to 1-2 1/2 inch thicknesses to reduce costs. The poorly sorted, angular gravel was poured into the annular space from all sides at once. Filters of various slot-sizes were used. Observation wells showed great variation among aquifers, but yielded little other useful data. Completed wells successfully supplied water, however. (Palmer-NWWA)
W78-02286

SCANNER, ORIENTER HELP FIND CASING LEAKS,
For primary bibliographic entry see Field 8G.
W78-02287

BEAM BEHAVIOR OF BURIED RIGID PIPELINES,
California Univ., Berkeley. Sanitary Engineering Research Lab.
F. H. Pearson.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 767-783, October, 1977. 7 fig, 9 ref, 3 append.

Descriptors: *Pipelines, *Stress analysis, *Bearing strength, *Structural behavior, *Structural design, Sewers, Design criteria, Elastic theory, Shear, Strength of materials, Structural engineering, Mathematical models, Waste water treatment.

Buried rigid piplines or sewer lines can behave longitudinally as beams, developing shear forces and bending moments if subjected to nonuniformly distributed loads or reactions. Since current pipeline design criteria only consider minimum depth of cover and pipe length with respect to beam behavior, theories and applications of elastic beam behavior are discussed with respect to pipelines. Equations are presented defining the two categories of characteristic pipe length on which the elastic foundations of beam behavior are based. For short pipes the bedding reactions as well as the shear forces and bending moments induced in the pipe can be described by static analysis. For a longer pipe static analysis would, however, give higher than actual values for shear and moments due to a concentrated load. Bedding reactions and moments and shears in short pipes are discussed with respect to the effects of a concentrated surface load and of a nonuniformly distributed earth load. Dimensionless parameters of deflection, slope, moment, and shear are discussed for point loading and a concentrated surface load with respect to pipe of infinite length. Shears and moments are discussed with respect to medium-length pipes in which the maximum bending moment occurs at the point of application of the load. Practical applications are presented with equations to estimate the shear forces in spigot- and bell-jointed buried rigid pipelines and in O-ring jointed pipelines under anticipated normal conditions of construction and control; and to calculate the maximum bending moment in a buried pipe due to a surface load such as a truck wheel. (Schulz-FIRL)
W78-02310

SHALLOW WAVE DIFFRACTION AROUND LARGE CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. de St. Q. Isaacson.
Journal of the Waterway, Port, Coastal, and Ocean Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WW1, p 69-82, February 1977. 4 fig, 45 equ, 15 ref.

Descriptors: *Waves(Water), *Dimensional analysis, Coastal engineering, Hydrodynamics, Shallow water, Design, Equations, *Diffraction theory, *Wave dispersion, *Offshore structures, *Cylinders, Cnoidal waves.

The diffraction of cnoidal waves around a large vertical circular cylinder is investigated. First approximations are derived for the velocity potential of the flow field and consequently for the wave loading on the cylinder. The forces may be appreciably larger than predicted on the basis of shallow water sinusoidal wave theory, and the consequences on the design of large offshore structures in shallow water are assessed. The possibility of extending the theory to a second approximation is examined. (Bell-Cornell)
W78-02447

INVESTIGATIONS OF THE DUNES GEOTHERMAL ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART 1, GEOCHEMISTRY OF GEOTHERMAL FLUIDS,
California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2F.
W78-02535

INVESTIGATIONS OF THE DUNES ANOMALY, IMPERIAL VALLEY, CALIFORNIA: PART II, PETROLOGICAL STUDIES,
California Univ., Riverside. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W78-02536

GOVERNING EQUATIONS FOR GEOTHERMAL RESERVOIRS,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 2F.
W78-02542

NEW TECHNOLOGY OF DRILLING WELLS IN PERMAFROST: CHAPTER 6, DRILLING WITH SIMULTANEOUS FREEZING OF WET, LOOSE ROCKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
B. B. Kudriashov, and A. M. Iakovlev.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 676, Price codes: A03 in paper copy, A01 in microfiche. Draft Translation 517, 1976, CRREL Access. No. 29-1641. 10 p, 5 fig, 1 tab. Translated from Novaia Tekhnologiaa Bureniia Skvazhin V Merzlykh Porodakh, Leningrad, 1973, p 135-143.

Descriptors: *Core drilling, *Permafrost, Drilling fluids, Wells, Mathematics, Boreholes, Rock mechanics, Heat flow, Coolants, Ice, Freezing, Sampling, *Leningrad Mining Institute.

The method of drilling with simultaneous freezing ahead of the drill involves the circulation in the well of a low-temperature, washing refrigerating agent during the drilling process. Moisture contained in the formation freezes to form strong ice-and-rock crusts in the borehole walls, the core, and bottom (face). Advantages of this method are greater hole stability and improved quality of sampling for coring operations in permafrost environments. Hole diameters can be sharply reduced as well, which eliminates the need for taking heavy drilling rigs into rugged or swampy terrain. Kerosene cooled by dry ice is one example of a refrigerant fluid system that has been tested successfully with this method. The bulk of the text is devoted to the mathematics of freezing ahead of drilling. An analytical solution is obtained on the basis of the theory of moving thermal sources. Relationships between depth of freezing ahead of the bit and drilling rate are discussed. (Eberle-NWWA)
W78-02544

LABORATORY TESTS OF RELIEF WELL FILTERS: REPORT 1, WELLS ALONG THE MISSISSIPPI RIVER LEVEES, ALTON TO GALE, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
F. Mitronovas.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 368, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous paper S-68-4, May, 1968. 41 p, 20 fig, 5 tab.

Descriptors: *Well filters, *Well screens, Sands, Specific yield, Gravels, Gradation, Head loss, Pumping, Levees, Mississippi River, Laboratory tests, Water wells, *Relief wells, *Migration of fines, Clogging, Segregation, Surging.

The relief well system along the Mississippi River levees between Alton and Gale, Illinois, was installed in a sand and gravel aquifer during the period 1953-1955. Results from subsequent pumping tests showed a steadily decreasing specific yield in the system, possibly due to the clogging of gravel filters surrounding the well screens. Though the validity of the gravel filter design had been established by field and laboratory tests, ac-

cidental departure from the design may have occurred due to segregation of gravel during shipment and placement or because of variation in the gradation of the source material. The investigation reported here was undertaken to obtain data on three filter samples, one of which has the standard gradation specified for the well system, and two others representing gradations that might have developed had accidental segregation of material occurred. Hydraulic head losses were found to be significantly less than would account for the efficiency reductions in the relief wells; it was thus concluded that variation in gradation of filter gravel may lead to well failure due to piping of sand, but that it is not a major factor in causing reductions of well efficiency due to clogging of filter gravel with formation sand. (Eberle-NWWA)
W78-02545

RESERVOIR EVALUATION TESTS ON RRGE 1 AND RRGE 2, RAFT RIVER GEOTHERMAL PROJECT, IDAHO,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W78-02549

ESTIMATING AQUIFER PERMEABILITY BY SURFACE ELECTRICAL RESISTIVITY MEASUREMENTS,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W78-02551

GEOTHERMAL RESOURCES, EXPLORATION AND EXPLOITATION: A BIBLIOGRAPHY.
Department of Energy, Oak Ridge, TN. Technical Information Center.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-3354-R1, Price codes: A99 in paper copy, A01 in microfiche. Publication No. TID-3354-R1, July, 1976. 628 p, 5476 ref, 1 append.

Descriptors: *Geothermal studies, *Bibliographies, Exploration, Surveys, Technology, Sites, Equipment, Economics, Thermal power, Thermal powerplants, Electric power production, Corrosion, Brines, Geochemistry, Drilling, Legal aspects, Environmental effects.

To aid the industrial and scientific community concerned with geothermal resource exploration and development, the ERDA Technical Information Center has cataloged, indexed, and stored in machine-readable form a major portion of the scientific and technical information published on this subject. The coverage dates back as far as useful references could be obtained and was current at the time of this bibliography's publication. Citations listed may be recalled on the RECON computer retrieval system. References are arranged in broad subject categories and are made up of complete bibliographic citations. These are followed by a listing of subject descriptors used to describe the content of each reference for machine storage and retrieval. Subject, Author, Corporate, and Report Number indexes are provided. (Eberle-NWWA)
W78-02553

WAVES GENERATED BY HORIZONTAL OSCILLATIONS IN BAYS,
Tetra Tech, Inc., Pasadena, CA. Engineering Div.
Y. K. Lee, and L-S. Hwang.
Journal of the Waterway, Port, Coastal, and Ocean Division, American Society of Civil Engineers, Vol 103, No WW4, Proceedings Paper 13316, p 411-422, November 1977. 8 fig, 1 tab, 5 ref, 2 append. NSF GI-38982.

Descriptors: *Waves(Water), *Resonance, *Numerical analysis, Coastal engineering, Harbors, Bays, Hydrodynamics, Seismic design, Equations, Mathematical studies, *Integral equations, *Linear wave theory, *Wave generation, Oscillations, Amplitude.

The waves generated in a coastal basin by the horizontal components of ground motion (e.g., during an earthquake) were studied. Special emphasis was placed on the resonant response of the basin of arbitrary boundary shape and uniform depth for idealized motions. An integral equation technique with numerical solution was presented. Results showed that the waves generated at resonant frequencies are significant in a semi-enclosed coastal basin with horizontal ground displacement amplitudes typical of large earthquakes. (Adams-ISWS)
W78-02600

TIDAL PRISM OF EQUILIBRIUM INLETS,
Toups and Loiederman, Rockville, MD.
M. Krishnamurthy.
Journal of the Waterway, Port, Coastal, and Ocean Division, American Society of Civil Engineers, Vol 103, No WW4, Proceedings Paper 13315, p 423-432, November 1977. 2 fig, 2 tab, 10 ref, 3 append.

Descriptors: *Inlets(Waterways), *Equilibrium, *Sediment transport, *Tidal effects, Tides, Channels, Hydraulics, Open channel flow, Shear stress, Particle size, Regime, Stability, *Tidal prism, Tidal flow.

The magnitude of tidal prism depends on the cross sectional area of the inlet. When an inlet is in equilibrium, many investigators have established a relationship between the two parameters. In this paper, a formula was derived to estimate the value of tidal prism of an equilibrium inlet taking the range and period of the ocean tide, flow resistance of the channel, and the size of the bed material of the inlet into consideration. This formula was compared with the available formulas and verified using data of existing equilibrium inlets. (Adams-ISWS)
W78-02601

SHOALING RATES AND RELATED DATA FROM KNIK ARM NEAR ANCHORAGE, ALASKA,
Coastal Engineering Research Center, Fort Belvoir, VA.
C. H. Everts, and H. E. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 095, Price codes: A05 in paper copy, A01 in microfiche. Technical Paper No. 76-1, March 1976. 83 p, 35 fig, 3 tab, 6 ref, 4 append.

Descriptors: *Sediments, *Shoals, *Alaska, Bulk density, Currents(Water), Tides, Navigation, Sediment transport, Hydraulics, Boats, *Anchorage(Alaska), *Accretion rate, Harbor shoaling, Small-craft harbors, Navigation channels.

In high tidal range areas where large quantities of fine-grained sediment are carried in suspension, the potential for harbor shoaling is great. Because of high current speeds resulting from the tides and because of winter ice conditions, many small-craft harbors in Alaska are constructed as enclosed basins connected to estuaries by a navigation channel. Such harbors, as typified by Dillingham Harbor where the shoaling rate is 6 feet per year, become sediment traps. This study measured summer shoaling rates in 1971 and 1972 in a sedimentation tank located on a tidal flat near Anchorage, Alaska. The mean shoaling rate was 0.073 foot per day in 1971, and 0.06 foot per day, or 15% less in 1972. Shoaling rates were uniform throughout the summer tests; the sediment surface in the 12-foot-diameter tank remained level. The accretion rate in the tank was 10 times as great as the rate on the adjacent tidal flat. Bulk density in the tank increased nonlinearly from the depositional surface to the bottom. The mass accretion rate was about 1.9 pounds per square foot per tidal cycle in 1971, and 1.6 pounds per square foot per tidal cycle in 1972. The mean particle size was 0.0058 millimeter in 1971, and 0.0068 millimeter in 1972. Size varied daily, but not at different collection stations in the tank. Vertical and horizontal circulation in the tank was not observed. Data concerning the characteristics of the fluid and sediment, the suspended sediment concentrations inside and outside the basin, and current velocities near the basin were obtained. (Lee-ISWS)
W78-02608

COASTAL CHANGES, EASTERN LAKE MICHIGAN, 1970-73,
Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 2J.
W78-02609

EFFECTS OF SPECIMEN RECONSTITUTION ON CYCLIC TRIAXIAL RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-02610

8C. Hydraulic Machinery

DIGITAL LOAD CONTROL FOR HYDROELECTRIC POWERPLANTS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
W. B. Gish.
Report No REC-ERC-77-10, August 1977. 76 p, 13 fig, 5 ref, append.

Descriptors: *Load-frequency control, *Computer applications, *Algorithms, *Supervisory control(Power), Automatic control, Control systems, Computer programing, Governors, Data transmission, Feedback, Power dispatching, Power system operations, Generating capacity, Spinning reserve, Hydroelectric power, Electric generators, Minicomputers.

A typical load controller for a hydroelectric powerplant utilizing a digital computer is described. Flow charts indicating the necessary timing, interface program interaction, logic, and calculations are included. Notes and suggestions to adapt the algorithm to specific applications are also included. (Bur Reclam)
W78-02266

FREQUENCY-RESPONSE ANALYSIS OF AUTOMATED CANALS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
H. T. Falvey.
Report No REC-ERC-77-3, July 1977. 69 p, 25 fig, 3 tab, 11 ref, 3 append.

Descriptors: *Automation, *Canals, *Analytical techniques, *Frequency analysis, *Automatic control, Control equipment, Feedback, Control systems, *Frequency-response method, Computer programs, *Coalinga Canal.

Two methods are available for determining control parameters on automated canals. These are the transient-response method and the frequency-response method. Since a typical canal system is influenced predominantly by transient inputs, the transient-response method has been extensively used in the analysis of automated canal systems. The main advantage of the frequency-response method is that the effects of varying the various control parameters can be readily visualized and evaluated. The presently used transient-response method and parameter selection are reviewed. The basic concepts of the frequency-response method

are presented and their application to an automated reach is illustrated with an example. Two computer programs are given which can be used to determine canal response characteristics. The state-of-the-art in process control has progressed sufficiently so that both the transient-response and frequency-response methods of analysis can be used in a complementary fashion. Employment of only one method in the design of automated systems is, in general, wasteful of both computer time and engineering effort. (Bur Reclam)
W78-02271

COST-EFFECTIVE ELECTRIC POWER GENERATION FROM THE WIND: A SYSTEM LINKING WINDPOWER WITH HYDROELECTRIC STORAGE AND LONG-DISTANCE TRANSMISSION,
Bureau of Reclamation, Denver, CO. Div. of Atmospheric Water Resources Management.
C. J. Todd, R. L. Eddy, R. C. James, and W. E. Howell.
Bur Reclam Engineering and Research Center, Denver, Colorado, August 1977. 29 p, 11 fig, 1 tab, 32 ref.

Descriptors: Wind(Meteorology), *Wind energy, *Windpower, *Power generation, Environmental effects, Social impact, Resource research and development, Systems analysis, Systems research and development, Wind profiles, Wind pressure, Transmission towers, *Cost analysis, Wind Energy Conversion Systems(WECS), Western United States.

The idea of generating windpower at the windiest available sites (wind farms) is examined for its effect on feasibility of large-scale windpower input to the nationwide electric power network. Windpower is considered in association with pumped-storage hydroelectric plants for load leveling and existing types of transmission lines for interconnecting the wind farms and energy-storage sites with load centers up to 2000 km away. Potential energy harvest from wind farm sites in the 17 Western States is estimated at well over 100 GW, and many times this much in arctic North America. At the 100-GW level of development, bus bar cost at the wind farm would be about 3 mills/MJ (10 mills/kWh). Energy storage required for load leveling would add about 1.8 mills/MJ and transmission costs another 2.1 mills/MJ, for a total cost at the load center of 6 mills/MJ (21 mills/kWh), all in 1976 dollars. This would be competitive with energy generated near load centers by new nuclear or fossil-fuel powerplants. Windpower appears environmentally acceptable and avoids many of the environmental liabilities of conventional sources. Large-scale windpower implementation will require major advance commitment of capital, about $1 billion, to lower bus bar costs to 4.4 mills/MJ (16 mills/kWh). The timetable will therefore likely depend on Federal incentives. (Bur Reclam)
W78-02273

EXTRACTION OF GEOTHERMAL ENERGY BY TWO-LOOP SYSTEMS,
Krzhizhanovskii Energeticheskii Inst., Moscow (USSR).
I. T. Alad'yev, Y. V. Spaernov, V. P. Trusov, and V. K. Fardzinov.
Heat Transfer-Soviet Research, Vol. 8, No. 2, p 86-91, March-April, 1976. 3 fig, 1 tab.

Descriptors: *Geothermal studies, *Sedimentary rocks, *Heat transfer, *Thermal power, Heat exchangers, Explosions, Fractures(Geology), Thermal water, *Two-loop geothermal systems, *Geothermal energy.

Geothermal energy is extracted primarily in the form of a water-steam mixture or self-rising hot water. A second source of geothermal energy now under formation and subsequently pumping water through it. Conditions exist in many areas, however, such that neither of the above methods is feasible. Sedimentary rock, for example, may discharge too little hot water for the first-mentioned system and absorb too much pumped water for the latter. An intermediate system is described. To attain high outputs of hot ground water, permeability of part of a sedimentary stratum is increased by underground blasting. Water is pumped into the blast-fractured area, where it receives heat from the ground water and from the rock through which it flows. This heat transfer is effected within the borehole by means of a special heat exchanger. The economics of this type of system are analyzed for depths and diameter of borehole, different sizes of heat exchanger, different pumps, and strength and number of fracturing blasts. (Eberle-NWWA)
W78-02276

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel Corp., San Francisco, CA.
For primary bibliographic entry see Field 3A.
W78-02277

PROCESS DESIGN FOR GEOTHERMAL POWER,
California Univ., Berkeley.
T. K. Sherwood.
Chemical Engineering Progress, Vol. 72, No. 7, p 83-88, July, 1976. 9 fig, 1 tab, 11 ref.

Descriptors: *Geothermal studies, *Thermal power, *Heat exchangers, *Brines, Heat transfer, Corrosion, Flash distillation, Turbines, Steam, Pressure, Cooling towers, Design criteria, *Multi-stage multi-flash heat exchangers, Rankine cycle, Power fluids, Binary cycle geothermal plants.

Almost all the known geothermal energy resources are in the form of hot brines. Both steam flash and brinary cycle process schemes have been studied as means of generating electric power from brines, however, problems of efficiency, equipment corrosion, and brine disposal exist for each method. It has been proposed that the two schemes be combined, the binary cycle being used to recover heat from the large amount of hot brine rejected after one or two flashes of the brine from the well. A system is described that would employ multi-stage flashing with small increments of pressure reduction using the flashed steam for countercurrent heating and vaporization of the binary cycle power fluid. There are many potentially practical power fluids chemically stable at the relatively moderate operating temperatures in a geothermal plant, among which are mixtures of two or more substances. (Eberle-NWWA)
W78-02278

SOLAR IRRIGATION SYSTEM BEGINS OPERATION IN NEBRASKA.
For primary bibliographic entry see Field 3F.
W78-02279

GEOTHERMAL HEAT: TO WHAT EXTENT CAN IT SATISFY OUR ENERGY HUNGER,
For primary bibliographic entry see Field 4B.
W78-02280

GEOTHERMAL DEVELOPMENT OF THE SALTON SEA,
DSS Engineers, Inc., Ft. Lauderdale, FL.
For primary bibliographic entry see Field 3E.
W78-02281

POWER FROM HOT GEOTHERMAL BRINES,
Rotoflow Corp., Los Angeles, CA.
J. S. Swearingen.
Chemical Engineering Progress, Vol. 73, No. 7, p 83-86, July, 1977. 6 fig, 2 tab, 9 ref.

Descriptors: *Geothermal studies, *Brines, *Energy, *Electric power production, Thermal waters, Heat transfer, Costs, Steam, Scaling, Turbines, *Binary systems, Steam flash systems, *Geothermal brines.

Proposed geothermal energy recovery plans generally fall into one of two main groups: (1) the expansion of steam flashed from hot well waters; and (2) the 'binary' system, which involves the transfer of heat from the hot well stream into a secondary boiling clean liquid to generate power. The latter system is more efficient, however, certain problems with scaling of equipment exist due to the chemistry of brines. A method is described for overcoming the scale problem. Heat is transferred from the hot scale-forming into a non-scale-forming water stream by a pair of novel concurrent switching gravel packed beds. The heat is then transferred from this non-scale-forming hot water stream to a power cycle boiling fluid, which in turn drives a unique turbine device. The economic analysis suggests a power production cost of around $1.67 per kilowatt hour. (Eberle-NWWA)
W78-02282

PILOT-SCALE DRILLING-RESEARCH EFFORTS CAN AID IN MUD DESIGN,
Amoco Production Co., Tulsa, OK.
J. C. Estes.
Oil and Gas Journal, Vol. 75, No. 8, p 136-142, November 21, 1977. 7 fig, 1 tab, 8 ref.

Descriptors: *Drilling fluids, *Rotary drilling, Wells, Mud, Flow rates, Temperature, Weight, Particle-size grading, Penetration rates, Microbits, Hydraulic bit cleaning, Drilling speeds, Factorial design, Solids effects, Differential pressures.

The type and condition of drilling mud can be as important in determining drilling efficiency and costs as all other man-controllable variables combined. To test drilling fluid effects, Amoco constructed a pilot-scale drilling machine with a 1 1/4-inch microbit to circulate 1/2 bbl of drilling fluid. Rocks were drilled under pressure for accuracy. Journal bearings of the microbit were isolated from drilling fluid lubrication effects. Tests drilled in limestones are randomly placed to overcome structural variations. Penetration rate for water increased linearly at 0.62 ft/hr. per 10 degrees F (57-190 degrees F), so temperature were identified and described. Complexity of data requires mathematical model to simulate drilling process. Solids effects can be related linearly, however, by comparing penetration using mud to penetration using water under same conditions, if particle-size distribution calculations are made. (Palmer-NWWA)
W78-02284

ECONOMIC ANALYSIS OF GEOTHERMAL ENERGY,
Battelle-Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 3E.
W78-02285

THE POTENTIAL FOR GEOTHERMAL STEAM,
Union Oil Co. of California, Los Angeles.
For primary bibliographic entry see Field 4B.
W78-02288

SOLAR ENERGY TO POWER IRRIGATION PUMPS.
Agricultural Engineering, Vol. 58, No. 7, p 41-2, July, 1977.

Descriptors: *Irrigation engineering, *Pumping, *Energy, Irrigation systems, Solar radiation, *Solar energy, Arizona, *Solar collectors, Rankine cycle turbines.

A sun-powered pump in an experimental irrigation system now operating at Gila Bend, Arizona

presently delivers 10,000 gpm to a 25,000 acre field. The system is a joint project of the Battelle Memorial Institute and Northwestern Mutual Life Insurance Company. Parabolic, tracking solar collectors are used to heat water to 300 degrees F which in turn provides the energy to power a Rankine-cycle turbine engine delivering 50 hp to the irrigation pump. While the present system uses electricity to operate auxiliary components, the design can be adapted for totally automatic operation with no external power. Because the heating and working fluids are in sealed systems, the design has been judged to be environmentally safe. (Eberle-NWWA)
W78-02291

DESALTING GEOTHERMAL BRINES,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 3A.
W78-02293

GEOTHERMAL ENERGY: ITS PROMISE FOR THE FUTURE.
For primary bibliographic entry see Field 3E.
W78-02294

FILTER SYSTEM SUCCESSFUL.
Water and Waste Treatment, Vol. 20, No. 7, p 9-10, July, 1977.

Descriptors: *Filters, *Nitrification, *Nozzles, *Pipes, *Activated sludge, Effluents, Plastic pipes, Pumping, Sewage treatment, Waste water treatment, Nozzle systems, Wanlip(UK).

A Delavan-Watson fixed distributor nozzle system is being used on a nitrifying plant at the 20-mgd Wanlip Water Reclamation Works in England. The distributor nozzle system is being used to provide a constant spray of effluent over the filter bed. Standards for the system required Delevan-Watson to design a unit which was capable of giving an even distribution of 20.5 mgd of effluent at a nozzle pressure of 5 psi, and which could be adapted to a distribution of 36 mgd at 7 psi. Effluent from an activated sludge tank is pumped to a 300- x 150-m nitrifying filter. The fixed distributor nozzle system includes sectioned laterals which run the width of the filter bed and are spaced at 3-m intervals along the length of the bed. Cast iron pipes with puddle flanges and cast iron mono-flange butterfly valves comprise the initial sections of the laterals. PVC pipes are used for the remainder of the lateral. Detachable PVC spray nozzles are fitted on the six pipes. (Schulz-FIRL)
W78-02321

ELECTRIC EQUIPMENT FOR MUKOGAWA RIVER SEWAGE TREATMENT PLANT,
Hanshin City Improvement Bureau, Hyogo (Japan).
K. Yokomichi, Y. Nagata, H. Hatada, and T. Tomita.
Toshiba Review, No 109, p 5-12, May-June, 1977. 8 fig, 2 tab.

Descriptors: *Monitoring, *Treatment facilities, *Computers, *Supervisory control(Power), *Automatic control, Sewage treatment, Electronic equipment, Design data, Data processing, Municipal wastes, Electrical design, Waste water treatment, Mukogawa River(Japan).

Operation of the Mukogawa River Sewage Treatment Plant is controlled and supervised by a large process computer, a TOSBAC-7000/25. The Mukogawa plant is designed to treat and average volume of combined municipal and industrial waste water of 570,000 cu m/day. Treatment facilities will include a pumping well, pre-aeration tank, primary settling tank, final settling tank, storm water settling tank, chlorination, sludge treatment, and sludge thickening. Pump well water level, aeration, return sludge system volume, excess sludge volume, and power supplies will be controlled from a central supervisory control panel. Nine industrial television cameras will be used to observe various activities in the plant. Diagrams of apparatus layout in the control room, computer hardware system, supervisory control system, sewage treatment plant flow, and the control system for return sludge are provided. Vertical water flow meters and level meters will trigger changes in power intake and distribution, operation of the main facilities, treatment mode, and chlorine dosage. The computerized control system is designed for expansion to accomodate any future plant expansions. (Schulz-FIRL)
W78-02323

PUMP APPLICATIONS IN SEWAGE SLUDGE DEWATERING PROCESSES,
D. J. Lambert.
Water and Waste Treatment, Vol. 20, No. 9, p 43-46, September, 1977. 6 fig.

Descriptors: *Dewatering, *Pumps, *Pumping, *Filtration, *Sludge treatment, Filters, Centrifugation, Incineration, Activated sludge, Sewage treatment, Waste water treatment.

A variety of treatment and disposal options are available for the estimated 1.5 million tons of sludge generated in the United Kingdom annually. Pumps can be used to transport sludges having moisture contents greater than 80%. Various sludge types, including primary, humus, seed or breeder, activated, consolidated, and digested sludges, are discussed with respect to moisture content and permissible pump speeds with helical rotor positive displacement pumps. Current commonly used dewatering processes include sludge drying beds, plate and frame filter presses, continuous or semi-continuous belt presses, roto-plug concentrators, vacuum filters, centrifuges, and incinerators. In sludge drying beds, positive displacement helical rotor/stator pumps are used where head exceeds 20 m and centrifugal pumps where head is less than 20 m. The use of helical rotor positive displacement pumps is discussed with respect to controlling the flow rate to a filter press, incinerator, vacuum filter, and centrifuge. A helical rotor pump speed selection chart is presented for selection of pump speed with respect to sludge moisture content and pump port size. (Schulz-FIRL)
W78-02350

HOSPITAL'S WASTE.
Water and Waste Treatment, Vol. 20, No. 9, p 54, 56, September, 1977.

Descriptors: *Pumps, *Pumping, *Sewage treatment, Equipment, *Valves, Sewerage, Municipal wastes, Waste water treatment.

The Tuke and Bell gravity-filled ejector system, the Electromatic Sewage Ejector, has replaced centrifugal pumps previously used for sewage transport at a hospital under the jurisdiction of the East Anglian Water Authority in England. The problematic hospital sewage, which frequently clogged suction pipework, pump casings, and delivery valve systems, had created problems with operation and maintenance of the centrifugal pump system. To accomodate the required design capacity of 150 gpm, special ejector bodies were designed and 22-KW compressors were used to provide directly to the main sewer, the inlet chamber was equipped with a roller screen on skids operated by an electric motor. Rotary valve or electrode control units were not required with the Electromatic ejector. Operations were controlled by the displacement of a small amount of air through nylon transfer tubes by influent to control opening and closing of the solenoid. (Schulz-FIRL)
W78-02354

OPTIMAL CONTROL OF SEWAGE AND RAIN PUMPS BASED ON INFLUENT FLOW PREDICTION,
Tokyo Sewerage Bureau (Japan).
S. Kato, M. Shioya, A. Shiraishi, M. Kashiwagi, and M. Ozaki.
Hitachi Review, Vol 26, No 7, p 235-240, 1977. 6 fig, 2 tab, 6 ref.

Descriptors: *Mathematical models, *Computer models, *Combined sewers, *Storm water, *Pumping, Model studies, Urban runoff, Monitoring, Estimating, Flow control, Flow rates, Waste water treatment.

Pumping stations servicing combined sewer lines are subjected to varying influent flow rates during wet and dry weather conditions and in situations where a diurnal distribution in sewage flow occurs. When flow rates of influent to the pumping station can be predicted, pump start-up and operation can be controlled to raise treatment efficiency, minimize energy consumption, and prevent combined sewer overflows. The mathematical models which are presented include an influent prediction model and a scheduling model for quasi-optimum pump operation. The first model utilizes a multiple regression analysis technique to predict influent flows up to 1 hr in advance on the basis of stored volume in the sewer, calculated from sewer line sizes and suction well water level, pumping rate, and rainfall data. The scheduling model or Quasi-optimum Routing System (QRS) is based on the variation of pumping rate through control of the number of pumps in operation with respect to stored volumes and cumulative curves for pumping rate, sewer line capacity, and influent flow rate over a given time period. The QRS technique utilizes a heuristic algorithm to search for a pump scheduling route which minimizes start-stop frequency. The algorithm can then be used in evaluation functions for the total number of pump switchings, energy consumption, variation of pumping rate, operating time of a specified pump, and energy consumption per pumping rate. (Schulz-FIRL)
W78-02387

HYDRAULIC FRACTURE EXPERIMENTS IN GT-1 AND GT-2,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 8E.
W78-02540

NEW SOURCES OF ENERGY: PROCEEDINGS OF THE CONFERENCE, VOLS. 2 AND 3, GEOTHERMAL ENERGY.
United Nations, New York.
For primary bibliographic entry see Field 4B.
W78-02541

DESIGN OF A WATER JET DRILL FOR DEVELOPMENT OF GEOTHERMAL RESOURCES: PROGRESS REPORT, JUNE 1, 1975 - JUNE 1, 1976,
Missouri Univ.-Rolla. Rock Mechanics and Explosives Center.
D. A. Summers, and D. J. Bushnell.
Report No. COO-2677-2, June, 1976. 38 p, 19 fig, 5 tab, 5 ref.

Descriptors: *Rotary drilling, *Nozzles, Jets, Orifices, Drilling fluids, Equipment, Laboratory tests, Drill holes, Pressure, Sandstones, Geothermal studies, Polymers, Penetration rate, Confining pressure.

A nozzle design developed under ERDA contract has drilled relatively soft sandstone at rates of up to 280 in./min. This dual orifice nozzle has an orifice diameter ratio of 2:1, with the smaller orifice directed forward while the larger orifice was angled outward at 30 degrees. It was judged to give superior performance. Tests were performed using a modified Soiltest No. T-8154 chamber as a pres-

sure vessel to simulate downhole conditions at around 6,000 feet. Various rations of bit feed rate vs. rotational speed were tested. High rotational speeds were found to produce the smoothest hole walls and thus the easiest nozzle passage. Four polymer drilling fluid additives were also tested with the system, and all four were effective in improving penetration rate when compared with plain water. Further tests in different rocks and with different nozzle configurations (including cavitation nozzles) were planned at the time of this report. (Eberle-NWWA)
W78-02543

LABORATORY TESTS OF RELIEF WELL FILTERS: REPORT 1, WELLS ALONG THE MISSISSIPPI RIVER LEVEES, ALTON TO GALE, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02545

CONCEPTUAL DESIGN OF COMMERCIAL 50 MWE (NET) GEOTHERMAL POWER PLANTS AT HEBER AND NILAND, CALIFORNIA.
Bechtel International Corp., San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as SAN-1124-1, Price codes: A15 in paper copy, A01 in microfiche. ERDA Publication No. SAN-1124-1, October, 1976. 308 p, 63 fig, 20 tab, 76 ref.

Descriptors: *Geothermal studies, *Thermal powerplants, Thermal power, Flash distillation, Brines, Design, Sites, Capital costs, Construction costs, Energy, Instrumentation, Electric power, Electrical equipment, Turbines, Generators, Environmental impact, Cooling, Materials, Heat transfer, *Salton Sea Geothermal Field(Calif), Binary Cycle systems.

The scope of this study includes conceptual designs, corresponding capital cost estimates and engineering and construction schedules for two 50 MWe (NET) commercial-scale geothermal plants. In order to develop and illustrate the concepts involved, the reservoir and site conditions of the geothermal field near Heber, California, which has moderate-temperature low-salinity brine, were used for one of the plants. Field conditions near Niland, California (or the Salton Sea Geothermal Field), representing high-temperature high-salinity brine, were used for the other power plant. Together the two plants provide engineering perspective for the range of hydrothermal resources that are of economic interest for electric power generation. The direct-flash energy conversion process was evaluated for the Heber power plant. The Niland plant design employs a multistage-flash/binary process that was adapted from desalination technology, with isopentane used as a working fluid. (Eberle-NWWA)
W78-02550

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 4B.
W78-02554

8D. Soil Mechanics

THERMAL REGIME OF AN EARTH DAM BUILT ON A PERMAFROST BASE DURING CONSTRUCTION AND INITIAL OPERATION,
Gorkovskii Inzhenerno-Stroitelnyi Inst. (USSR).
V. N. Grandilevskiy, Ye. S. Gogolev, V. P. Kulikov, and A. V. Fevralev.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 678, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 527, May 1976. 6 p, 1 fig, 2 tab, 2 ref. Translated from Stroitel'stvo i arkhitektura, No. 8, 1975.

Descriptors: *Dam construction, *Earth dams, *Permafrost, *Arctic, Cold weather construction, Temperature, Cold regions, Structures, Hydraulic structures, Construction, Dams, Foreign research, Thermal properties, Infiltration, Seepage, Dam foundations, *USSR.

The conditions of the construction of an earth-filled dam on a permafrost foundation have a substantial influence on the thermal mode of the dam during the initial operating period. Construction conditions include the methods and time of construction of a dam; thermophysical characteristics of the soils from which the dam is made; thickness of the layers of soil with which the dam is filled during the summer and autumn seasons and duration of that period; climatic conditions and duration of the winter-spring period, during which dam building operations are postponed. (Sims-ISWS)
W78-02237

BEACH, HIGHWAY AND SEWER PLAN ROLLED INTO ONE.
Engineering News-Record, Vol. 199, No. 14, p 44, October, 1977. 1 fig.

Descriptors: *Multi-purpose projects, *Parks, *Sewers, *Sands, *Recreation facilities, Highways, Road construction, Conveyance structures, Erosion, Design data.

The $17-19.5 million Great Highway-Ocean Beach project was initiated as a multi-purpose project, since construction of a large consolidation sewer line was expected to remove or damage most of the existing upper Great Highway in San Francisco. The program included reconstruction and redesign of the highway for a distance of 3.6 miles, restoration of sand dunes, and creation of a linear park, along with construction of the sewer line. The plan was designed by Michael Painter and Associates of Sausalito, and Tudor Engineering Company and Chin and Hensolt of San Francisco, California. The plan recommended lowering the profile of both the highway and beach, extending the beach 200 ft west to add 48 acres of recreational area. The dunes would be revegetated and beach access would be improved. A curving four-lane highway with bicycle paths would replace the existing stretch of highway, which had been partially blocked by encroaching sand dunes. (Schulz-FIRL)
W78-02311

EFFECTS OF SPECIMEN RECONSTITUTION ON CYCLIC TRIAXIAL RESULTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
W. F. Marcuson, III, and F. C. Townsend.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 917, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper S-76-5, April 1976. 28 p, 12 fig, 1 tab, 3 ref.

Descriptors: *Soil tests, *Soil stability, *Dam construction, Earth materials, Construction materials, Strength of materials, Soils, Laboratory tests, Soil strength, Soil mechanics, Soil physics, Soil properties, Dams, Earth dams, *Fort Peck Dam, Specimen reconstitution, Liquefaction(Soils).

The Army Engineer Waterways Experiment Station (WES), in connection with a dynamic analysis of Fort Peck Dam, conducted a series of dynamic laboratory tests on reconstituted specimens of Fort Peck materials to evaluate their liquefaction potential. From a comparison of the laboratory results with other laboratory results obtained for undisturbed hydraulic-fill material, it was apparent that reconstitution did affect the results. To evaluate more fully this effect, various laboratories and institutions engaged in dynamic testing were contacted in an effort to determine the state of the art in this area. After reviewing the present state of the art, WES conducted cyclic triaxial compression tests on undisturbed specimens from Fort Peck Dam. The specimens then were reconstituted to the as-tested density, and the cyclic triaxial tests were repeated. The test results indicated that the undisturbed specimens were repeated. The test results indicated that the undisturbed specimens were approximately 70 to 80% more stable than the reconstituted specimens. (Sims-ISWS)
W78-02610

8E. Rock Mechanics and Geology

HYDRAULIC FRACTURE EXPERIMENTS IN GT-1 AND GT-2,
Los Alamos Scientific Lab., NM.
R. L. Aamodt.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6712, Price codes: A02 in paper copy, A01 in microfiche. Publication No. LA-6712, February, 1977. 19 p, 32 fig, 2 tab, 10 ref.

Descriptors: *Geothermal studies, *Heat flow, Temperature, Fractures, Cracks, Permeability, *Structural geology, Water circulation, Hydrostatic pressure, Thermal properties, Heat transfer, Crystalline rocks, Granites, *Hydraulic fracturing, Apparent surface energy, Fluid recovery, Earth stress, Propping, Los Alamos(New Mexico).

Fluid circulated in artificial cracks in regions where shallow rocks have abnormally high heat-flows can be used to extract heat energy. Hydraulic fracturing experiments were conducted in granites at temperatures near 100 degrees and 150 degrees C, in two wells near Los Alamos, N.M. The wells were 0.785 km (2575 ft.) and 1.98 km (6500 ft.). No unusual difficulty was observed in fracturing crystalline rock hydraulically. The energy required to create the new fracture surface by breaking the rock (apparent surface energy) was measured as 100 J/miles square. In the second well, the orientation of the fracture was measured as roughly 35 degrees E. The fraction of the fluid injected into the second fracture that could be recovered at hydrostatic surface pressure was measured. The efficiency of this recovery was as high as 92 percent after the impedance to flow was lowered within the fracture by 'propping' the fracture with sand. The permeability of the rock over the face of the fracture was compatible with laboratory measurements between 10 to the (-7) and 10 to the (-8) darcys. Downhole pressures required to extend the fractures were about 150 and 340 bars (2175 and 4900 psi), respectively. Interactions of old and new fractures were also studied. (Palmer-NWWA)
W78-02540

DESIGN OF A WATER JET DRILL FOR DEVELOPMENT OF GEOTHERMAL RESOURCES: PROGRESS REPORT, JUNE 1, 1975 - JUNE 1, 1976,
Missouri Univ.-Rolla. Rock Mechanics and Explosives Center.
For primary bibliographic entry see Field 8C.
W78-02543

NEW TECHNOLOGY OF DRILLING WELLS IN PERMAFROST: CHAPTER 6, DRILLING WITH SIMULTANEOUS FREEZING OF WET, LOOSE ROCKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 8B.
W78-02544

8F. Concrete

ALTERNATE MATERIALS OF CONSTRUCTION FOR GEOTHERMAL APPLICATIONS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 8G.
W78-02290

BENEFITS FROM GROUTING AN ENTIRE SEWER SYSTEM,
Lower Allen Township Authority, Camp Hill, PA.
V. C. Wass, and C. M. Bush.
Public Works, Vol 108, No 11, p 55-57, November, 1977. 1 tab.

Descriptors: *Sewers, *Infiltration, *Inflow, *Chemical grouting, Flow control, *Grouting, Construction materials, Joints(Construction), Conveyance structures, Sewerage, Waste water treatment, Camp Hill(PA).

An extensive 2-yr program for sewer renovation in Camp Hill, Pennsylvania, was conducted in response to waste water flow measurements which indicated that actual flow was 3.2-6.0 mgd when it should have been in the range 1.6-2.0 mgd based on the population size serviced by the sewer system. Video Pipe Grouting, Inc., was contracted by the Lower Allen Township Authority for the project, which included cleaning and chemical grouting with closed circuit television inspection of the area's 76 miles of sewer lines. An initial inspection by Video Pipe revealed roots from fast-growing pin oak, maple, and sycamore trees in the 20-yr-old system and associated infiltration/inflow. Rehabilitation of the system included removal of root growths, sealing of leaking joints with grout which contained a root inhibitor, cleaning of all lines, and cementing of manhole walls where infiltration was particularly heavy. Average flow was reduced by the rehabilitation program to 1.5 mgd, resulting in lower waste water treatment costs for chemicals, electrical power, general operating costs, and collection system repairs. (Schulz-FIRL)
W78-02309

R7-M JOHANNESBURG SEWER TUNNEL.
The Civil Engineer in South Africa, Vol. 19, No. 7, p 163, July, 1977.

Descriptors: *Sewerage, *Conveyance structures, *Pipelines, *Engineering geology, Construction, Municipal wastes, Waste water treatment.

The 7-km long Bushkoppie outfall sewer is being built as part of a sewer construction program being conducted by the city of Johannesburg in South Africa. During the second phase of the program a second, 9-km long sewer tunnel will be constructed to join the Bushkoppie sewer at about 3.5 km from the proposed Bushkoppie sewage treatment plant slated for operation by 1981. The upstream portion of the tunnel will have a D-shaped cross-section and will be 2 x 2 m. The section below the confluences will be enlarged to a height of 2.5 m and a width of 2.75 m. The tunnel, which runs through residual lava of the Vertersdorp system with a depth below ground level of 5-60 m, will be lined with 300 m of dolomitic concrete. Steel arches at 1-m spacing with wire mesh and shotcrete are being used to reinforce the tunnel in unstable sections. The use of dolomitic aggregates and a 75-mm concrete cover are expected to alleviate the effects of corrosion in the tunnel, which will only have two vent shafts and a maximum slope of 1:1200. LTA Construction and Bomat Civil Engineering were contracted for construction and tunnelling in the 7-million-rand project. (Schulz-FIRL)
W78-02313

PLASTIC LINED CONCRETE CHANNEL FOR WASTE WATER PURIFICN. PLANT - ASSEMBLED FROM PREFABRICATED MODULAR ELEMENTS WITH SEALED PLASTIC JOINTS.
Belgian Patent BE 852-803. Issued September 23, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 39, p 2, November, 1977.

Descriptors: *Oxidation, Equipment, *Patents, *Concrete pipes, Construction materials, Design data, Waste water treatment, Plastics.

A plastic lined channel has been patented for use in oxidation during waste water treatment. The elongated channel is constructed of a series of tubular parallel-piped elements, each of which is equipped with inlet and outlet openings of the same size and lined with a sheet of thermoplastic material which extends through the openings to form flaps. During assembly of two elements for continuous flow, the outlet of one element and the inlet of the other element are superimposed and the corresponding flaps and lining of thermoplastic material are seam-welded together. A manhole aperture can be placed at the top of an element which has two open ends for straight-through flow. In this instance, the thermoplastic sheeting is secured during casting of the concrete by protruding studs on one side of the sheeting. The prefabricated modular elements are designed to allow rapid construction of channel oxidation zones of any size and shape in waste water treatment plants. (Schulz-FIRL)
W78-02315

CONCRETE FORMING FOR WATER AND WASTE TREATMENT PLANTS.
Concrete Construction, Vol. 22, No. 11, p 615-617, November, 1977.

Descriptors: *Construction materials, *Concrete construction, *Concrete technology, *Cast-in-place structures, *Engineering structures, Concrete plants, Conveyance structures, Framework(Construction), Water treatment, Treatment facilities, Waste water treatment.

Concrete has been used as a construction material for a wide variety of water, sewage, and industrial waste treatment projects. Construction requirements may vary greatly from one project to the next, but site-cast concrete can be designed and built to provide desired hydraulic characteristics, to produce a watertight system, and to accomodate almost any other design requirement. Reusable factory-built modular forms are discussed as an alternative to custom-built forms which can rarely be reused. Modular forms which are currently manufactured are usually in the form of panels on a steelframe backing faced with plastic-coated plywood to insure smooth surfaces after multiple reuse. The panels can be connected to produce straight or curved walls, Y-walls, haunches, and slabs. Experiences with the use of modular forms during construction at the Meander Water Pollution Control Project in Mineral Ridge, Ohio, are described. (Schulz-FIRL)
W78-02395

8G. Materials

FREQUENCY-RESPONSE ANALYSIS OF AUTOMATED CANALS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W78-02271

BUREAU OF RECLAMATION, CONSTRUCTION WORKER SURVEY,
Arizona State Univ., Tempe. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-02275

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel Corp., San Francisco, CA.
For primary bibliographic entry see Field 3A.
W78-02277

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART I,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W78-02286

SCANNER, ORIENTER HELP FIND CASING LEAKS,
E. S. Pennebaker, and R. T. Woody.
Oil and Gas Journal, Vol. 75, No. 49, p 75-80, November 28, 1977. 10 fig, 5 ref.

Descriptors: *Electrical well logging, Subsurface investigations, Wells, Well casings, Subsurface waters, Sands, Grouting, *Sonic logs, *Temperature logs, *Behind-casing leaks, Squeeze cementing, Noise logs, High pressure sands.

The temperature-noise log is useful in the location of behind-casing leaks. Temperature and sound profiles reinforce each other and enhance interpretation of channels where fluid movement occurs in cemented areas behind metal well casing. A log format which uses condensed and expanded depth scale presentations of both temperature and sound data is used to detect well problems producing subtle changes in sound and temperature. The technique consists of logging temperature from surface to total depth on the trip in the hole. Then with the same tool, sound intensity readings are obtained at selected levels on the way out. The logging sound which performs this task is a combination piezoelectric-crystal sound detector and temperature probe with collar locator and downhole amplifiers, all in one tool. Data can be recorded only when the tool and line are stationary and all well head valves, compressors and waterflood pumps are shut down to eliminate all extraneous noise. The surface panel is a portable, self contained unit for use with any single-conductor-line recording unit. When a positive voltage is applied to the tool, temperature data return, when a negative voltage is sent down the line the sound amplifiers are activated and the resulting sound intensities for various frequency cuts are recorded and displayed on digital meters in decibels. (Heiss-NWWA)
W78-02287

GEOTHERMAL MATERIALS STUDIES: METALLURGY DIVISION QUARTERLY REPORT, APRIL-JUNE 1976,
California Univ., Livermore. Lawrence Livermore Lab.
A. Goldberg.
Available from the National Technical Information Service, Springfield, VA 22161 as UCID-17261-76-2, Price codes: A03 in paper copy, A01 in microfiche. Report No. UCID-17261-76-2, June, 1976. p 26, 4 fig, 9 tab.

Descriptors: *Thermal power, Equipment, *Erosion, *Corrosion, *Turbines, *Nozzles, Brines, Metallurgy, Salinity, Acidity, Titanium, Laboratory tests, *Geothermal studies, *Total flow process, Chemical coatings.

Since its inception in 1974, the Lawrence Livermore Laboratory Geothermal Program has evolved into two basic activities: (1) providing advanced technologies for hydrothermal systems with emphasis on the Total Flow Process (2) maintaining an Industrial Support Program to provide technical assistance to joint ERDA/industry projects. In the Total Flow Process, the total flow of the wellhead is expanded through converging-diverging nozzles to convert the enthalpy of the

fluid into kinetic energy to drive impulse turbines. This process is expected to be as much as 60% more efficient than either flashed steam or binary cycle power generation. Among the studies being done at the laboratory are nozzle-and-turbine erosion tests to investigate the durability of various chemical coatings, hard facings, and inserts under conditions simulating the severe environment of high-velocity brine and entrained particulates. General corrosion and stress corrosion experiment and evaluations are also being run on various components of a Total Flow turbine generating system. (Eberle-NWWA)
W78-02289

ALTERNATE MATERIALS OF CONSTRUCTION FOR GEOTHERMAL APPLICATIONS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
L. E. Kukacka, J. Fontana, W. Horn, J. Amaro, and T. Sugama.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-50627, Price codes:A03 in paper copy, A01 in microfiche. Progress Report No. 11, BNL 50627, April, 1977. 31 p, 6 fig, 17 ref.

Descriptors: *Thermal power, *Wells, *Brines, *Concrete mixes, *Polymers, Geothermal studies, Concrete pipes, Salinity, Acidity, Laboratory tests, On-site investigations, Concrete additives, Portland cements, The Geysers(Calif), Klamath Falls(Ore).

The feasibility of using concrete-polymer composites as materials in construction for handling hot brine was demonstrated in 1972 in work sponsored by the Atomic Energy Commission and the Office of Saline Water. A research program to determine if the composites were applicable to geothermal systems was initiated in April 1974; both laboratory and field tests have since been performed. Significant improvements in the thermal stability of polymer cement lining materials have been made by the use of various chemical additives and by increasing the amount of portland cement in the aggregate. An optimum aggregate composition of 50% sand to 50% cement has been determined. Laboratory tests of specimens under various temperatures, brine compositions, and acidity conditions have yielded encouraging results, as have initial field tests at Baca Wells, The Geysers, Klamath Falls, and Raft River. A second field test series has been initiated. Work accomplished during the period October 1 - December 31, 1976 is described in this report. (Eberle-NWWA)
W78-02290

SEWERAGE OUTFALL PROTECTED.
Corrosion Prevention and Control, Vol 24, No 4, p 30, August, 1977.

Descriptors: *Sewerage, *Pipes, *Outfalls, *Corrosion, *Construction materials, Sewage treatment, Sewers, Waste water disposal, Treatment facilities, Waste water treatment, Diffusers.

A sea outfall constructed in 1973 for the Southern Water Authority in England includes a diffuser system with 50 outlets at the sea floor and a terminal outlet. Winn and Coales (Denso) Ltd. supplied an anti-corrosion system to protect joints in the diffuser outlets, diffuser pipes, the main sluice valve, and bolted pipe couplings. A 42 inch steel pipe 3,350 m long will lead from the Mewbrook Treatment Works near Rustington to the diffuser system. (Schulz-FIRL)
W78-02303

AN OLD BRICK SEWER FINDS A SILVER LINING,
R. West.
Surveyor, Vol 150, No 4448, p 8-10, September, 1977.

Descriptors: *Combined sewers, *Construction materials, *Linings, *Epoxy resins, *Sewerage, Protective coatings, Pumps, Repairing, Pipes, Conveyance structures, Waste water treatment, Sewage treatment, Sewer linings.

A television monitoring program of the sewer system in the town of Kidderminster in England revealed the deteriorated condition of a 900 x 675-mm brick combined sewer. Conventional sewer repair processes were hindered by the fact that 65% of the sewer ran underneath the area's carpet factories. Edmund Nuttall's Instituform technique in which a tube of terylene needle felt, covered with polyethylene and impregnated with polyester resin, is used to line an existing sewer was chosen. The 12-mm thick tube is transported to the site and emplaced while still in a liquid state so that irregularities in the sewer contour did not pose severe problems in the lining process. Cement grouting was forced under pressure through holes drilled in the cured lining to backfill any cavities. Two 200-mm and one 150-mm Univac pumps were used to eliminate any danger from storm water flow during the lining processes. A 'flow-through' inflation bag was placed inside the lining tube to accomodate any surplus flow. The sewer was cleaned before emplacement of the lining and the lining material was transported to the site by refrigerated truck in 35-ft lengths. The lining is inflated with a low-pressure air blower and cured with a steam-air mixture at 70C. (Schulz-FIRL)
W78-02305

DEVELOPMENT AND LAYING OF PIPES.
Water Services, Vol 81, No 978, p 473-474, August, 1977. 1 ref.

Descriptors: *Construction materials, *Pipelines, *Pipes, *Plastic pipes, *Sewerage, Linings, Joints(Construction), On-site data collections, Costs, Metal pipes, Waste water treatment.

Various aspects of pipeline technology and pipeline design are discussed. Future developments in the use of flexible-type conduits are expected with increased interest in the use of glass fiber reinforced plastics, the use of pipe materials with thinner walls, and the use of larger-diameter bulk transmission mains. The use of a wide variety of pipe materials also requires the development of appropriate pipeline installation practices. Site evaluations are suggested to insure the most cost-effective method of installation. The development of equipment for backfilling and excavation and of other products such as self-anchoring joints is suggested to speed up installation and thereby significantly reduce total costs. Specialized construction materials or pipe linings to repair existing mains and to protect pipelines from corrosive soils, effluents, and soluble sulfates may reduce future maintenance and construction costs. (Schulz-FIRL)
W78-02306

SEWER REHABILITATION CUTS INFILTRATION,
E. C. C. Li.
Water and Sewage Works, Vol 124, No 11, p 86-87, November, 1977. 2 fig, 1 tab.

Descriptors: *Sewerage, *Pipes, *Infiltration, *Inflow, Analytical techniques, *Sewers, Manholes, Rehabilitation, Concrete pipes, Flow control, Joints(Connections), Municipal wastes, Waste water treatment, Sam Rayburn(TX).

An infiltration/inflow study was conducted by East Texas Engineering and Construction Company for Rayburn Country, a development in East Texas with 21 subdivisions and 204,294 ft of sewer line. Exfiltration and smoke tests indicated that much of the infiltration/inflow came from 40,470 ft of sewer lines and 195 manholes in 5 of the 21 subdivisions. The system, constructed in 1966 of concrete pipe with rubber gaskets, was checked by a three-man testing crew and three workers with a backhoe loader tractor. An air-loc ball was used to plug a water-filled section of sewer and the amount of water loss over a given time was used as a measure of exfiltration rate. Smoke tests with a portable 1,500-cfm blower and smoke bombs were used where exfiltration testing was difficult. Causes of the 217 sources of extraneous flow found in the testing program included: leaks in precast concrete manholes; inflow through low or perforated manhole covers: leakage through cracked, offset or open joints; deterioration of the concrete encasements which connected cast iron and concrete pipes; root intrusion; faulty house laterals; and pipe breakage, joint offsets, and cracked bells caused by reverse grade and improper bedding and backfilling. Shear pipe breaks were more commonly observed than beam breaks and no longitudinal breaks were found. The rehabilitation project has repaired 126 line leaks and 91 manhole perforations so far, as well as replacing 1,204 ft of sewer line, to reduce infiltration by 60%. (Schulz-FIRL)
W78-02307

I/I STUDY TURNS TO T. V.,
Larkin and Associates, Kansas City, MO.
R. Lamberton.
Water and Wastes Engineering, Vol 14, No 10, p 30-32, October, 1977.

Descriptors: *Sewerage, *Monitoring, *Infiltration, *Sewers, *Analytical techniques, Flow measurement, Inflow, On-site data collections, Municipal wastes, Conveyance structures, Waste water treatment, Warrensburg(MO).

A sewer infiltration/inflow study was conducted by Ace Pipe Cleaning, Inc., and Larkin and Associates of Kansas City, Missouri, for the city of Warrensburg at an estimated cost of $45,000. The study was required by the EPA and state agencies in Missouri as part of a proposed sewer system renovation project. A complete inventory and mapping of the sewer system was carried out to identify manholes subject to inflow because of top elevation, location, and condition. Smoke testing located point sources of direct entrance of storm water inflow and all sewer lines were cleaned and inspected by television. The program located 60 defective manholes and 160 inflow points which were designated for correction. (Schulz-FIRL)
W78-02308

BENEFITS FROM GROUTING AN ENTIRE SEWER SYSTEM,
Lower Allen Township Authority, Camp Hill, PA.
For primary bibliographic entry see Field 8F.
W78-02309

DESIGN OF A WATER JET DRILL FOR DEVELOPMENT OF GEOTHERMAL RESOURCES: PROGRESS REPORT, JUNE 1, 1975 - JUNE 1, 1976,
Missouri Univ.-Rolla. Rock Mechanics and Explosives Center.
For primary bibliographic entry see Field 8C.
W78-02543

8I. Fisheries Engineering

OBSERVATIONS ON THE STATUS OF THE DEVIL'S HOLE PUPFISH IN THE HOOVER DAM REFUGIUM,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. E. Williams.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, Report No REC-ERC-77-11, September 1977. 15 p, 8 fig, 2 tab, 7 ref.

Descriptors: *Refugium, Transplanted population, Establishment, *Pupfish, Sex ratio, Population

fluctuations, Morphometrics, Meristics, Desert fish, *Endangered species, Aquatic ecology, Hoover Dam refugium, Devil's Hole, Cyprinodon diabolis.

In October 1972, a multiagency effort at establishing a second population of the endangered Devil's Hole pupfish, Cyprinodon diabolis, was initiated with the transplanting of 27 fish into a refugium below Hoover Dam, Clark County, Nev. From October 1975 through March 1977, the first concentrated effort at examining the dynamics of this transplanted population was undertaken. About four or more generations of pupfish have now been produced in the refugium, establishing it as the species' second population. Population fluctuations correspond well with those observed in the fishes original habitat, with the highest numbers occurring in late summer and early fall and the lowest levels in late winter. Morphometric measurements showed an increase in standard length of the fish in the transplanted population, as well as significant differences in four of six other measurements taken. Meristic data, appearing less susceptible to change, showed insignificant variation between the transplanted population and the one in Devil's Hole. The Hoover Dam refugium, while an adequate environment for survival, and even reproduction, of Cyprinodon diabolis, fails to provide conditions equal to those existing in the fishes natural habitat, Devil's Hole. The presence of predatory dragonfly larvae may become an important factor in the refugium. (Bur Reclam)
W78-02268

THE LAKE TROUT OF TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
J. R. Griest.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, Report No REC-ERC-77-4, March 1977. 29 p, 8 fig, 11 tab, 42 ref.

Descriptors: *Lake trout, Fish management, Ecology, Aquatic habitats, Pumped storage, *Environmental effects, Powerplants, Environments, Fish populations, *Limnology, Colorado, *Twin Lakes(Colo), Fryingpan-Arkansas Proj(Colo).

Growth, survival, reproduction, recruitment, and food habits of lake trout in Twin Lakes, Colo., were examined during 1974-1975 to document the status of the trout population prior to completion of a 200-megawatt pumped-storage hydroelectric powerplant being constructed on the lake. The powerplant will become operational during 1977, and data collected during this study will be compared to similar data collected during the post-construction period to determine the effect of plant operation on the trout population. Growth of lake trout in Twin Lakes is comparable to that of other lake trout fisheries in the Western United States, such as Lake Tahoe, Nev.-Calif., and Fish Lake, Utah, and is somewhat faster than most lakes located in Canada. Annual mortality was near 50 percent, which compares with other lake trout fisheries of this type. Successful reproduction of lake trout was confirmed by the presence of age classes that had not been stocked. Approximately 90 percent of 4-year-old fish captured during the study were from natural reproduction. Lake trout reaching the legal size limit of 381 mm were usually 4-year-olds, with approximately 20 percent of the population reaching this size each year. Lake trout in Twin Lakes feed primarily on Mysis relicta. Chironomid larvae, white suckers, and rainbow trout are also eaten. Possible effects of powerplant operation on the lake trout population are outlined and discussed. (Bur Reclam)
W78-02269

ECOLOGY OF MYSIS RELICTA IN TWIN LAKES, COLORADO,
Colorado Cooperative Fishery Unit, Fort Collins.
R. E. Gregg.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado, Report No REC-ERC-76-14, December 1976. 70 p, 34 fig, 18 tab, 64 ref. W78-02655

Descriptors: *Limnology, Aquatic animals, Lakes, Reservoirs, Powerplants, *Pumped storage, *Environmental effects, Migration, Ecology, Aquatic environment, Benthos, Fish food organisms, Zooplankton, Colorado, *Lake trout, Oligotrophy, Turbulence, Turbidity, Fryingpan-Arkansas Project(Colo), Mt Elbert Pumped-Storage Powerplant(Colo), *Twin Lakes(Colo).

The Mt. Elbert Pumped-Storage Powerplant at Twin Lakes, Colo., is a major feature of the Bureau of Reclamation's Fryingpan-Arkansas Project. Twin Lakes are oligotrophic lakes of glacial origin located in the montane zone of the Rocky Mountains. The lake trout fishery at Twin Lakes is one of the best in Colorado. The major source of food for the lake trout in recent years has been Mysis relicta Loven, introduced to Twin Lakes in 1957. Vertical migrations of this freshwater mysid were studied using three ring nets and a benthic sled towed simultaneously on a single cable. Migrations vary in timing and magnitude and juveniles migrate more extensively than adults. Horizontal distribution and movements were determined from trawls taken at 17 stations monthly for 2 years. The frequency distribution of Mysis per square metre was fitted to the negative binomial frequency distribution, indicating a highly clumped distribution for benthic Mysis. Deep and shallow water sample comparisons showed Mysis prefer deeper, colder water in the summer, migrating into shallow water in the fall. Studies of the effects on Mysis mortality of turbulence and turbidity created by plant operation revealed that 8 hours of turbulence daily greatly increased mortalities due to exhaustion and mechanical abrasion. Whether such attrition will adversely affect the population is not known. (Bur Reclam)
W78-02270

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WISCONSIN, A SUMMARY OF ACTIVITIES AND PLANS OF THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1977,
Geological Survey, Madison, WI. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-02415

CONCENTRATION FACTORS AND TRANSPORT MODELS FOR RADIONUCLIDES IN AQUATIC ENVIRONMENTS. A LITERATURE REPORT,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 05C.
W78-02452

GEOTHERMAL RESOURCES, EXPLORATION AND EXPLOITATION: A BIBLIOGRAPHY.
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 08B.
W78-02553

ENVIRONMENTAL CONTAMINATION FROM TRACE ELEMENTS IN COAL PREPARATION WASTES. A LITERATURE REVIEW AND ASSESSMENT,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 05B.

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 7
APRIL 1, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 7
APRIL 1, 1978

W78-02701 -- W78-03200

e Secretary of the U.S. Department of the Interior has de-
rmined that the publication of this periodical is necessary in the
nsaction of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

STREAMFLOW SIMULATION-A MODEL BASED ON CANNONICAL EXPANSIONS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-02790

RUN-SUMS OF ANNUAL FLOW SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 4A.
W78-02792

A PARAMETRIC APPROACH TO STATION WEIGHTS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-02793

TESTING THE EFFICIENCY OF ALGORITHMS AND STRATEGIES FOR AUTOMATIC CALIBRATION OF RAINFALL-RUNOFF MODELS,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
G. Pickup.
Hydrological Sciences Bulletin, Vol 22, No 2, p 257-274, June 1977. 7 fig, 3 tab, 15 ref.

Descriptors: *Calibrations, *Model studies, *Rainfall-runoff relationships, Hydrology, Runoff, Simulation analysis, Computer models, Computers, Computer programs, Algorithms, Mathematical studies, *Automatic calibration, *Rainfall-runoff models, Boughton model, Nonlinear programming algorithms.

The efficiency of various methods of calibrating a rainfall-runoff model was examined. The model used was a 12 parameter version of the Boughton model which has been developed for large tropical basins. Attempts were made to improve the efficiency of calibration in three areas: selection of the best nonlinear programming algorithms; reduction of the number of objective functions required for calibration; and simplification of the model structure. The best algorithms were found to be those of Powell, Rosenbrock, and the simplex method of Nelder and Mead. The Davidon method did not perform well. The number of objective function evaluations can be reduced by performing a sensitivity analysis on the model and by selecting a small group of parameters which are not interdependent and which the objective function is sensitive to. This may yield a substantial reduction in the computer time required to calibrate the model. Simplification of the model structure also can yield substantial savings, especially where it removes calculations which are redundant and reduces the number of model parameters. (Lee-ISWS)
W78-02798

WATER BALANCE STUDIES IN THE EXPERIMENTAL BASINS OF THE UPPER HARZ MOUNTAINS,
Coblenz Federal Inst. of Hydrology (West Germany).
For primary bibliographic entry see Field 2D.
W78-02800

CORRELATION STRUCTURE AND TIME SCALE OF SIMPLE HYDROLOGIC SYSTEMS,
Swedish Meteorological and Hydrological Inst., Stockholm.
L. Gottschalk.
Nordic Hydrology, Vol. 8, No. 3, p 129-140, 1977. 7 fig, 6 ref.

Descriptors: *Runoff, *Watersheds(Basins), *Groundwater, *Model studies, Mathematical models, Rivers, Groundwater movement, Water levels, Precipitation(Atmospheric), Correlation analysis, Stochastic processes, Flow, Discharge(Water), Foreign research, Hydrology.

Correlation structure of river runoff is a complicated set of different persistence phenomena in the watershed itself and in the meteorological input to the watershed. Correlation functions and time scale of isolated processes in a watershed (groundwater level and river runoff) were derived analytically from the linearized equations of motion for these processes. Nonlinear effects on the correlation functions were shown for river runoff and for the watershed as a whole. (Sims-ISWS)
W78-02814

TOPOLOGICAL PROPERTIES OF SOME TRELLIS PATTERN CHANNEL NETWORKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 8B.
W78-02818

BEHAVIOR AND INTERACTION OF THE PHYSICAL PARAMETERS OF SEMI-ARID AND INTERTROPICAL SLOPED BASINS, (IN FRENCH),
P. Dubreuil, M. Morell, and P. Sechet.
Cah O R S T O M Ser Hydrol 12(1), p 13-36, 1975.

Descriptors: *Semi-arid lands, Slopes, *France, Distribution, Morphology, *Climates, *Geology, *Hydrological cycle, *Vegetation, Water balance.

A study was carried out on the influence of environmental factors on the hydrological cycle. Available information was collected from about 240 representative basins operated between 1951-1970. The data were distributed into homogeneous classes in terms of climate, vegetation and geology. Climate and vegetation are linked but vegetative and geological classes are independent. When class size was not enough to supply a significant statistical analysis, an association between adjoining classes was made. An analysis of behavior was made for every physical and morphological parameter with the help of empirical distributions. Relationships between parameters were then investigated. The influence of the environment and the classification of these relationships is analyzed and discussed. Copyright 1978, Biological Abstracts, Inc.
W78-03064

COMPUTER SIMULATION OF TWO-DIMENSIONAL UNSTEADY FLOWS IN ESTUARIES AND EMBAYMENTS BY THE METHOD OF CHARACTERISTICS--BASIC THEORY AND THE FORMULATION OF THE NUMERICAL METHOD,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-03130

2B. Precipitation

HOW MUCH RAIN DOES A RAIN GAGE GAGE,
Agricultural Research Service, Sidney, MT. Northern Plains and Water Research Center.
E. L. Neff.
Journal of Hydrology, Vol. 35, No. 3/4, p 213-220, November 1977. 1 fig, 1 tab, 39 ref.

Descriptors: *Rain gages, *Precipitation gages, *Rainfall, Measurement, Instrumentation, Winds, Effects, Equipment, Precipitation(Atmospheric), Correlation analysis, Regression analysis, Meteorology, Rain-gage errors, Wind effects, Pit gages.

Rain gages of various sizes and shapes have been used for hundreds of years to measure the amount of rain that actually reaches the ground surface. In this study, rainfall data from four locations for gages normally exposed with their orifices about 1 m (40 in) above ground were compared with control gages installed with their orifices at the ground surface. The normally exposed gages caught between 5 and 15% less rain for all rainfall events than did the control gages. For single rainfall events, where the total catch exceeded 12 mm (0.5 in), the error ranged between 0 and 75%, depending on wind characteristics during the storm. Attempts to develop a correction procedure based on conventional wind measurements were unsuccessful. It was concluded that the most expedient way to measure rainfall accurately in windy environments is with pit gages, which eliminate all wind effects. (Sims-ISWS)
W78-02786

STUDY ON THE ESTIMATE OF PRECIPITATION WITH THE HELP OF S-BAND AT RADAR CALCUTTA,
Regional Meteorological Center, Calcutta (India).
A. C. De, P. Bhattacharyya, and S. K. Ghosh.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 1, p 97-112, January 1977. 3 fig, 2 tab.

Descriptors: *Remote sensing, *Radar, *Precipitation(Atmospheric), Rainfall, Rainfall intensity, Storms, Tropical cyclones, Instrumentation, Equipment, Photography, Data processing, Rain gages, Meteorology, *India(Calcutta).

An attempt was made to study the amount of rainfall associated with the severe cyclonic storm of 14-16 August 1974 with the help of the S-band radar installed at Calcutta. The first two modes of the gray scale, viz, gray and white shades, were utilized in this study. It was found that these modes correspond fairly well with the rates of rainfall recorded at the self recording rain gauge stations and rainfall reported by ordinary rain gauge stations withing a radius of 200 km around Calcutta. Isogram analysis of the rates of rainfall at a particular time was made, and the results compared fairly well with the radar photographs at the corresponding time. (Sims-ISWS)
W78-02795

DESIGN OF REPRESENTATIVE AND KEY RAINGAUGE STATIONS NETWORK FOR FLOOD FORECASTING IN YAMUNA AND DAMODAR RIVERS,
Meteorological Office, New Delhi (India).
D. V. L. N. Rao, and V. K. Bhalla.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 1, p 63-73, January 1977. 8 fig, 13 tab, 8 ref.

Descriptors: *Networks, *Rain gages, *Network design, Flood forecasting, Rainfall, Precipitation(Atmospheric), Regression analysis, Design, Data collections, Hydrologic data, Planning, Stations, Measurement, Watersheds(Basins), Rivers, Hydrology, Meteorology, *Yamuna Watershed(India), *Damodar Watershed(India).

Representative rain gauge networks were determined for two selected catchments in India, and regression equations for working out estimates of areal rainfall over the catchment from the rainfall data recorded at these stations were developed. A few alternate key station networks also were indicated for yielding representative estimates of areal rainfall when data for some station in the

representative network may be missing. The stability of the various selected networks also was tested with different sets of rainfall data. It was possible to determine a small number of stations giving a multiple correlation coefficient of 0.96 and 0.98, and the regression explained about 92 and 97% of the variation in areal rainfall respectively for the two catchments. (Sims-ISWS)
W78-02797

CHARACTERISTICS OF RAINDROP CHARGE AND ASSOCIATED ELECTRIC FIELD IN DIFFERENT TYPES OF RAIN,
Inst. of Tropical Meteorology, Poona (India).
A. M. Selvam, G. K. Manohar, L. T. Khemani, and Bh. V. Ramana Murty.
Journal of the Atmospheric Sciences, Vol. 34, No. 11, p 1791-1796, November 1977. 4 fig, 4 tab, 15 ref.

Descriptors: *Raindrops, *Electrical properties, *Electric fields, Thunderstorms, Monsoons, Instrumentation, Measurement, Cloud physics, Precipitation(Atmospheric), Rainfall, On-site investigations, Data processing, Meteorology, *Raindrop charge, *India, Rainwater conductivity.

Simultaneous measurements of raindrop charge, atmospheric electric field, and rain intensity were made at Poona using fast response, continuous recording surface instruments during four types of rain: premonsoon (thunderstorm rain), monsoon rain type I (light intermittent rain), monsoon rain type II (heavy continuous rain) and post-monsoon (thunderstorm rain). Measurements also were made of the conductivity of rainwater samples collected during the monsoon season. On some days of this period, data on cloud thickness as obtained from the aircraft flights in the region also were made available. The electric field associated with negatively charged raindrops was less negative than that associated with positively charged drops. The raindrop charge spectrum showed different characteristics during the four types of rain studied. It was broadest during the pre-monsoon rain when the convective activity was a maximum. It followed a log-normal distribution during the monsoon rain type I, and it was peaked and skewed to the positive side during the monsoon rain type II. Rainwater conductivity was inversely correlated with the cloud vertical thickness. The results of the present study supported the warm cloud charge generation mechanism proposed by Takahashi. (Sims-ISWS)
W78-02802

POSSIBILITY OF IDENTIFYING PRECIPITATION FROM MICROWAVE MEASUREMENTS FROM SATELLITES,
Ye. P. Dombkovskaya, and V. V. Ozerkina.
Soviet Hydrology, Selected Papers, Vol. 15, No. 1, p 21-26, 1976. 2 fig, 3 tab, 11 ref. Translated from Transactions of the Hydrometeorological Center of the USSR (Trudy Gidromettsentra (SSR), No. 165, p 77-86, 1975.

Descriptors: *Microwaves, *Precipitation(Atmospheric), *Remote sensing, Satellites(Artificial), Rainfall, Clouds, Cloud physics, Moisture content, Model studies, Mathematical models, Radio waves, Thermal radiation, Meteorology, *Radioluminance, Microwave emission.

One of the ways of investigating the possibility of identifying precipitation zones and of quantitatively estimating the values of various meteorological elements from microwave measurements from satellites is by analyzing the results of model computations of this emission. The solution of the known radiation transport equation for conditions of pure absorption with addition of the coefficient of atmospheric attenuation produced by scattering was used to compute the intensity of the thermal radio emission of the earth-atmosphere system. The contribution of scattering (both multiple and single) to the intensity of microwave emission was disregarded. This method of computation can be used when rainfall intensity does not exceed 10 mm/hr. From this study, the following conclusions were drawn: The presence of precipitation in the atmosphere can be identified both from multichannel measurements and measurements on a single wavelength of 0.8 cm (at some angle to the nadir for vertical and horizontal polarizations). Precipitation intensity can be estimated only roughly from a visual analysis of the data (within three synoptic gradations). (Sims-ISWS)
W78-02803

LAKE-LAND PRECIPITATION RELATIONSHIPS USING NORTHERN LAKE MICHIGAN DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
S. J. Bolsenga.
Journal of Applied Meteorology, Vol. 16, No. 11, p 1158-1164, November 1977. 5 fig, 6 tab, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Lake Michigan, *Islands, *Great Lakes, Rainfall, Snowfall, Rain gages, Precipitation gages, Lakes, Effects, On-site investigations, On-site data collections, Monthly, Data processing, Meteorology, Climatology, *Lake-land precipitation relationships.

Data from a network of recording precipitation gages, operated over a 5-year period on islands in Lake Michigan, provided the basis for the first monthly analysis of the relationship of lake-to-land precipitation conducted on the Great Lakes. Wide monthly fluctuations in lake-to-land relationships, previously masked by seasonal analysis using storage gages, were shown. An examination of the significance of the findings indicated that all butthe largest differences are not statistically significant and that even the largest lake-land differences could possibly be attributed to gage errors. (Sims-ISWS)
W78-02807

THE EFFECT OF RAINDROP INTERACTIONS ON OBSERVED DROP SIZE DISTRIBUTIONS,
Auckland Univ. (New Zealand). Dept. of Physics.
S. D. Bradley, and C. D. Stow.
Journal of Applied Meteorology, Vol. 16, No. 11, p 1206-1213, November 1977. 7 fig, 3 tab, 20 ref.

Descriptors: *Raindrops, *Particle size, *Drops(Fluids), Rainfall, Precipitation(Atmospheric), Model studies, Mathematical models, Cloud physics, Coalescence, Evaporation, Effects, Meteorology, *Raindrop size, Drop collisions, Drop breakup, Drop coalescence.

A model for raindrop interactions incorporating satellite droplet production was used to determine drop size distributions at the ground. Assuming an exponential distribution at cloud base and using known meteorological conditions, the theoretical drop size distribution agrees well with distributions observed in the field; both predicted and observed distributions have reduced numbers of drops of radius near 0.35 mm. A time series analysis was facilitated by using a running-mean technique on each part of observed drop size distributions. A cross correlation was then performed between the time-series for large, medium, and small drop concentrations. It was found that the smallest drops are associated in time with drops having a high satellite droplet producton rate. On the other hand, the time delay at ground level between changes in large-drop concentration and small-drop concentration can be interpreted in terms of fallspeed differences. This allows the effective altitude of the active rain-producing region to be determined. (Sims-ISWS)
W78-02809

HAILSTORMS IN THE TRANSVAAL ON 29 NOVEMBER 1972,
National Physical Research Lab., Pretoria (South Africa).
A. E. Carte, and G. N. Mader.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 438, p 731-749, October 1977. 7 fig, 3 tab, 20 ref.

Descriptors: *Hail, Africa, *Precipitation(Atmospheric), *Thunderstorms, Storms, Weather, On-site data collections, On-site investigations, Radar, Remote sensing, Networks, Lighting, Winds, Rainfall, Weather patterns, Meteorology, *Transvaal(South Africa), Hailstones.

A broad band of non-frontal storms moved northwards across a dense hail-reporting network. The precipitation patterns of two isolated storms that produced hailstones greater than 5 cm in diameter were studied in detail. Both storms gave a burst of large hailstones, then declined in severity, and ultimately merged. Radar reflectivity structures showed both to be essentially unicellular, but one showed evidence of pulsating growth. Internal structures of several hundred hailstones from these two storms and a third less severe storm were examined. The growth centers of most were found to be rime, but a few were concluded to have been frozen drops. The layering of the hailstones, the fallout pattern on the ground, and features of the radar echoes all indicated greater complexity of the two severe storms than a single updraught that steadily built up to a maximum speed then faded out. Deuterium contents, reported in a companion paper, were determined for many of the hailstones. Storms on this day showed a spectrum of behavior; some were organized multicellular complexes. (Sims-ISWS)
W78-02812

PRECIPITATION SCAVENGING (1974).
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 5A.
W78-02886

AN EXAMPLE OF THE EXPERIMENTAL ANALYSIS OF RUNOFF FACTORS UNDER SIMULATED RAINFALLS, (IN FRENCH),
A. Lafforgue, and E. Nash.
Cah O R S T O M Ser Hydrol 13(3), p 195-237, 1976.

Descriptors: *Simulated rainfall, *Runoff, Africa, *Ivory Coast, *Upper Volta, Soil moisture, Vegetation, Cultivation.

In the framework of surface runoff measurements under simulated rainfalls in various countries of Ivory Coast and Upper-Volta, the 1st results obtained on a ferrallitic sandy soil of South Ivory Coast are presented. The apparatus and experimental methods used are described just as runoff characteristics resulting on experiment plots under simulated rainfalls. Connections between runoff characteristics and various factors such as shower intensity, initial soil moisture, slope, vegetation cover and tillage practices are drawn. For the type of soil studied, when it is not protected by vegetation, a pelting crust appears on its surface during the 1st rainfalls, impeding infiltration. Consequently, the vegetal cover is the most important factor. The paradoxical role of the slope is a moderator or runoff, the pelting crust decreasing when the slope increases. Significant correlation are found between initial soil moisture, rain intensity and runoff characteristics. Copyright 1978, Biological Abstracts, Inc.
W78-02898

MODEL FOR CALCULATING PRECIPITATION PENETRATING UNDER THE CANOPY OF MIXED STANDS, (IN RUSSIAN),
Akademiya Nauk SSSR, Zvenigorod (USSR). Lab. of Forestry.
L. P. Kharitonov.
Lesovedenie 1, p 74-83, 1977.

Descriptors: Forests, *Forest canopy, *Model studies, *Precipitation(Atmospheric), Birch, Moisture content, Pine, Spruce, *Trees(Water absorption).

A model for estimation of precipitation penetrating forest canopy is suggested. The calculation is given for pine, birch and spruce and includes ability of tree surface organs to absorb water, shape of a tree and its parts, and air moisture. Data estimated by the precipitation model and experimental ones are similar.--Copyright 1978, Biological Abstracts, Inc.
W78-03033

2C. Snow, Ice, and Frost

FREEZE-THAW ENHANCEMENT OF THE DRAINAGE AND CONSOLIDATION OF FINE-GRAINED DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Cold Regions Research and Engineering, Hanover, NH.
For primary bibliographic entry see Field 4A.
W78-02777

PRECIPITATION SCAVENGING (1974).
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 5A.
W78-02886

ARCTIC COASTAL PROCESSES: AN OVERVIEW,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
W. J. Wiseman, Jr., and A. D. Short.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 794, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 214, to Office of Naval Research, Reprinted from: Naval Research Reviews, Vol 29, No 5, p 35-47, May 1976. 5 fig, 25 ref. ONR-N00014-75-C-0192.

Descriptors: *Coasts, *Arctic, *Ice cover, *Seasonal, Geomorphology, Erosion, Deposition(Sediments), Sedimentation, Coastal processes, Nearshore processes.

Nearshore processes active along the Arctic coast are presented according to chronological format. During the winter months when both the land and sea are ice-covered, sedimentary and oceanographic processes are minimal. As breakup occurs, rapid changes are effected in the nearshore morphology. During open water, when the wind can act to force water motions, the same processes observed on temperate beaches and in temperate waters are active in the Arctic. Significant erosion and deposition may take place during these periods. As freezeup approaches and an ice-foot forms along the coast, nearshore sedimentary processes are inhibited. Finally, when freezeup is complete, the relatively inactive regime characteristic of winter is again achieved. (Sinha-OEIS)
W78-03093

2D. Evaporation and Transpiration

THE EVAPORATION FROM THETFORD FOREST DURING 1975,
Institute of Hydrology, Wallinford, (England).
J. H. C. Gash, and J. B. Stewart.
Journal of Hydrology, Vol 35, No 3/4, p 385-396, November 1977. 2 fig, 2 tab, 20 ref, 1 append.

Descriptors: *Evaporation, *Forests, *Model studies, Mathematical models, Trees, Pine trees, Vegetation, Vegetation effects, On-site investigations, Rainfall, Water loss, Temperature, Air temperature, Humidity, Meteorology, Forestry, Hydrology, *England, *Thetford Forest(Norfolk England).

Previous measurements of the surface resistance of pine forest were used in the Monteith version of the Penman equation to obtain an estimate of transpiration from automatic weather station data. This result, combined with measurements of the loss of water by evaporation of intercepted rainfall, was used to provide a quantitative estimate of the evaporation from Thetford Forest during 1975. (Sims-ISWS)
W78-02794

WATER BALANCE STUDIES IN THE EXPERIMENTAL BASINS OF THE UPPER HARZ MOUNTAINS,
Coblenz Federal Inst. of Hydrology (West Germany).
H-J. Liebscher.
Hydrological Sciences Bulletin, Vol. 22, No. 2, p 283-296, June 1977. 7 fig, 2 tab, 16 ref.

Descriptors: *Water balance, *Mountains, *Basins, Europe, Forest, Reforestation, Evaporation, Transpiration, Rain gages, Demonstration watersheds, Equations, *Upper Harz Mountains(Germany), *Lange Bramke Basin(Germany), *Winteral Basin(Germany), *Dicke Bramke Basin(Germany), *Steile Bramke Basin(Germany), Spruce trees, Potential evaporation.

Evaporation in the Upper Harz experimental basins was computed and compared to the values calculated according to formulas. Potential evaporation was determined for mean daily and monthly values by different methods. For the computation of the terms generally lacking in water balance studies, such as actual evaporation and changes in snow and soil storage, a model was established on the basis of daily values. As a result, water balances also could be drawn up for shorter periods, such as single years or months. One graph showed the annual variation of the actual evaporation as it resulted from the mean of 4 basins studied. Plotted for comparison was the potential evaporation according to Penman; using the Clausthal climatic data, the mean daily relative humidity was reduced by 1% and the daily sunshine duration increased by 1% as long as they remained below the possible values. (Roberts-ISWS)
W78-02800

ESTIMATE OF THE ACCURACY OF VARIOUS METHODS FOR COMPUTING TOTAL EVAPORATION IN THE MOUNTAINS OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
A. F. Litovchenko.
Soviet Hydrology, Selected Papers, Vol. 15, No. 1, p 50-53, 1976. 2 tab, 6 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy Kazakhskogo Nanchno-Issledovatel'skogo Gidrometeorologicheskogo Instituta), No. 48, p 156-162, 1975.

Descriptors: *Evaporation, *Mountains, *Model studies, Mathematical models, Equations, Formulas, Soil moisture, Elevation, Temperature, Air temperature, Humidity, Precipitation(Atmospheric), Analytical techniques, On-site investigations, On-site data collections, Evaporimeters, Meteorology, *USSR(Kazakstan and Central Asia).

There are many methods for computing evaporation from land. All have been developed for lowland conditions, and therefore, they do not allow for several factors typical of the mountains. This is the reason why the many attempts to apply them to the mountains failed to give the desired results. Only a few methods have been proposed for computing evaporation in the mountains and their error has not yet been sufficiently studied. The accuracy of several computation methods was estimated by comparing the results of the computations with observations taken with GGI-500 evaporimeters at several mountainous stations. Results of these comparisons were reported. (Sims-ISWS)
W78-02804

A PARAMETERIZATION OF GROUND-SURFACE MOISTURE CONTENT FOR USE IN ATMOSPHERIC PREDICTION MODELS,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2G.
W78-02808

EFFECT OF MINERAL NUTRITION ON TREE SEEDLING TRANSPIRATION UNDER NATURAL CONDITIONS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Forestry.
Z. Stoyanov, and T. Dakev.
Fiziol Rast (Sofia) 2(3), p 77-82, 1976.

Descriptors: *Transpiration, Trees, *Plant transpiration, *Mineral nutrition, *Oak, *Fertilization, Fertilizers, Irrigation, *Nitrogen, *Phosphorus.

The effect of mineral nutrition on trees was studied in 5 yr old oak seedlings planted in the field under natural conditions. Ammonium nitrate (200 kg/ha) and ordinary super-phosphate (400 kg/ha) were applied on separate plots. Transpiration was measured psychometrically; relative air humidity was determined at the inlet and outlet of a plastic envelope placed on leaves and shoots attached to the plant. With data on air humidity and with the use of psychometric tables, the water content was calculated per liter of air at the inlet and at the outlet of the envelope. From this data the water transpired by the leaves per unit time was derived. The transpiration was then estimated per leaf fresh weight. N fertilizer application considerably reduced oak leaf transpiration, while P fertilizer application had either no effect on or slightly enhanced transpiration. With the aid of N fertilizer application the water expenditure per unit leaf weight can be considerably reduced and in this way irrigation water could be spared.-Copyright 1978, Biological Abstracts, Inc.
W78-03101

2E. Streamflow and Runoff

GEOMETRIC PARAMETERS THAT INFLUENCE FLOODPLAIN FLOW,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02767

STREAMFLOW SIMULATION-A MODEL BASED ON CANNONICAL EXPANSIONS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
S. K. Spolia, and S. Chander.
Journal of Hydrology, Vol. 35, No. 3/4, p 279-298, November 1977. 2 fig, 3 tab, 7 ref.

Descriptors: *Streamflow, *Model studies, *Expansion, Hydrologic systems, Hydrology, Statistical methods, Streamflow forecasting, Monthly, Foreign countries, Foreign research, *India, Operational hydrology, Cannonical expansions, Autoregressive model.

A representation of a stochastic process in cannonical expansion form was introduced. A model based on these expansions was proposed for streamflow synthesis. It was shown that the proposed model not only reproduces the mean, the variance, and the first-order serial correlation coefficient, but also the entire correlation-cross-correlation matrix, which implies the reproduction of total persistence. Further, it was shown that the proposed model is more parsimonious in parameters than an equivalent autoregressive model and does not require the use of a three-stage iterative procedure, viz, identification, estimation, and validation, for its fitting to actual data. The model, with its parameters derived from a 49-year recorded sequence, was used to generate monthly streamflow sequences for some rivers of Punjab, India. (Lee-ISWS)
W78-02790

ASYMPTOTIC DISTRIBUTION OF MAXIMUM DEFICIT FOR LINEARLY DEPENDENT INFLOWS IN FULL FLOW REGULATION,
Engineering Consultants, Inc., Denver, CO.
K. N. Mutreja, and V. Yevjevich.
Journal of Hydrology, Vol 38, No 3/4, p 299-309, November 1977. 7 fig, 1 tab, 4 ref. NSF ENG74-17396.

Descriptors: *Reservoirs, *Water storage, *Model studies, *Mathematical models, Flow, Regulated flow, Inflow, Discharge(Water), Markov processes, Stochastic processes, Correlation analysis, Analytical techniques, Reservoir operation, Rivers, Statistics, Hydrology.

No close-form expression is available from the exact asymptotic expected value and variance of the maximum deficit of linearly dependent, either Markov or ARMA-model, net inflows into reservoirs. For a higher-order Markov model, parameters of asymptotic distributions of various statistics of partial sums for fixed sample size can be obtained either by equating this model to an equivalent first-order model, with its rho sub 1 equal to the sum of autoregression coefficients of the higher-order model, or parameters can be derived from those of the corresponding time-independent stochastic component (TISC). For ARMA models, these parameters may be derived from the TISC-variable and ARMA-model coefficients. This result is relevant for practical storage problems, enabling the determination of means and variances for various statistics of partial sums of higher-order Markov or ARMA models, with these means and variances then being used to compute probability distributions of these statistics. (Sims-ISWS)
W78-02791

RUN-SUMS OF ANNUAL FLOW SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 4A.
W78-02792

A PARAMETRIC APPROACH TO STATION WEIGHTS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
S. Ramaseshan, and R. S. Anant.
Journal of Hydrology, Vol 35, No 3/4, p 325-340, November 1977. 4 fig, 4 tab, 38 ref.

Descriptors: *Hydrologic systems, *Stations, *Weight, Model studies, Optimization, Hydrology, Rainfall-runoff relationships, Foreign research, Watersheds(Basins), Equations, Mathematical studies, Linear multiple input-single output systems, Nash model, Thiessen method.

A linear multiple input-single output system model with noninteracting Nash-type components was proposed for the hydrologic basin. Such a model permits the use of the observed station precipitation and streamflow data without averaging or areal interpolation. The station weights are among parameters of the system to be optimized. A gradient search technique was used to determine the optimum parameter values. Results from a number of storms for a basin indicated that Thiessen weights are satisfactory approximations to locally optimal values of the station weights. Their dependence, if any, on hydrometeorological and physiographic characteristics need further investigation. (Lee-ISWS)
W78-02793

TESTING THE EFFICIENCY OF ALGORITHMS AND STRATEGIES FOR AUTOMATIC CALIBRATION OF RAINFALL-RUNOFF MODELS,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W78-02798

ESTIMATION OF LOW RETURN PERIOD FLOODS,
Institute of Hydrology, Wallingford (England).
M. A. Beran, and M. J. Nozdryn-Plotnicki.
Hydrological Sciences Bulletin, Vol 22, No 2, p 275-282, June 1977. 3 fig, 4 tab, 4 ref, 2 append.

Descriptors: Europe, *Floods, *Estimating, Flood damage, Flood discharge, Flood frequency, Hydrology, Frequency, Foreign research, Return flow, Mathematical studies, Equations, *United Kingdom, *Low return period floods, Annual maximum return period, Langbein formula.

A method was sought for estimating low return period floods (0.2-5 years) from annual maximum data. The theoretical relationship between the peak over threshold and annual maximum return periods was re-examined, and an empirical relationship based upon United Kingdom flood data was proposed. (Lee-ISWS)
W78-02799

ACCURACY OF SYNTHETIC HYDROGRAPHS DERIVED FROM REPRESENTATIVE BASINS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
G. Hoffmeister, and R. N. Weisman.
Hydrological Sciences Bulletin, Vol. 22, No. 2, p 297-312, June 1977. 6 fig, 5 tab, 20 ref.

Descriptors: *Watersheds(Basins), *Runoff, *Unit hydrographs, Hydrology, Peak discharge, Rainfall-runoff relationships, Equations, Mathematical studies, Forecasting, Precipitation(Atmospheric), Hydrographs, Modified Snyder method, Dimensionless hydrograph, Runoff distribution.

This study was undertaken to test methods by which a representative basin could be used to develop a synthetic unit hydrograph for an ungauged basin within its hydrological region. Three synthetic hydrograph methods were tested in two hydrological regions using three basins in each region. The methods tested were: (1) a modified Snyder method, (2) Commons' dimensionless hydrograph, and (3) Soil Conservation Service dimensionless hydrograph. The synthetic unit hydrographs were compared with unit hydrographs derived from actual storm data. The Snyder method proved reasonably accurate for the basins studied, producing synthetic hydrographs within the range of the individual storm hydrographs. The dimensionless graphs did not consistently overpredict or underpredict a hydrograph peak or give an accurate description of the unit hydrograph shape. (Lee-ISWS)
W78-02801

CORRELATION STRUCTURE AND TIME SCALE OF SIMPLE HYDROLOGIC SYSTEMS,
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 2A.
W78-02814

FLOODS IN OHIO--MAGNITUDE AND FREQUENCY,
Geological Survey, Columbus, OH. Water Resources Div.
E. E. Webber, and W. P. Bartlett, Jr.
Ohio Department of Natural Resources, Columbus, Division of Water Bulletin 45, May 1977. 74 p, 4 fig, 7 tab, 15 ref.

Descriptors: *Ohio, *Floods, *Flood frequency, *Flood peak, *Flood forecasting, Flood recurrence interval, Analytical techniques, Regression analysis, Equations, Gaging stations, Flow rates, Flow characteristics, Channel morphology, Drainage area, Small watersheds, Rainfall-runoff relationships, Hydrologic data, Maps.

Techniques are presented for estimating the magnitude and frequency of floods on Ohio streams. Regression analysis is used to develop equations which relate physical and climatic factors of river basins to peak discharge at stream gaging stations. The equations can be used to estimate flood magnitude with recurrence intervals from 2 to 100 years on drainage areas between 0.01 and 7,400 square miles. A summary of flood and watershed data for gaging stations with 10 or more years of record is included. Records for 215 gaging stations are used to develop the regression equations. Flood records of streams with significant regulation or urbanization are excluded from this analysis. (Woodard-USGS)
W78-03120

HYDRAULIC ANALYSIS, MAD RIVER AT STATE HIGHWAY 41, SPRINGFIELD, OHIO,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-03134

DRAINAGE AREAS OF THE GUYANDOTTE RIVER BASIN, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03135

APPLICATION OF REMOTELY SENSED LAND-USE INFORMATION TO IMPROVE ESTIMATES OF STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-03136

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
G. S. Craig, Jr., and J. G. Rankl.
Open-file report 77-727, September 1977. 88 p, 31 fig, 15 tab, 24 ref.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Model studies, *Design criteria, *Flood frequency, Flow characteristics, *Wyoming, Analytical techniques, Regression analysis, Synthetic hydrology, Hydrographs, Road design, *Culverts, Planning.

A flood-hydrograph study has defined the magnitude and frequency of flood volumes and flood peaks that can be expected from drainage basins smaller than 11 square miles in the plains and val-

ley areas of Wyoming. Rainfall and runoff data, collected for 9 years on a seasonal basis (April through September), were used to calibrate a rainfall-runoff model on each of 22 small basins. Long-term records of runoff volume and peak discharge were synthesized for these 22 basins. Flood volumes and flood peaks of specific recurrence intervals (2, 5, 10, 25, 50, and 100 years) were then related to basin characteristics with a high degree of correlation. Flood volumes were related to drainage area, maximum relief, and basin slope. Flood peaks were related to drainage area, maximum relief, basin slope, and channel slope. An investigation of ponding behind a highway embankment, with available storage capacity and with a culvert to allow outflow, has shown that the single fast-rising peak is most important in culvert design. Consequently, a dimensionless hydrograph defines the characteristic shape of flood hydrographs to be expected from small drainage basins in Wyoming. For design purposes, a peak and volume can be estimated from basin characteristics and used with the dimensionless hydrograph to produce a synthetic single-peak hydrograph. Incremental discharges of the hydrograph can be routed along a channel, where a highway fill and culvert are to be placed, to help determine the most economical size of culvert if embankment storage is to be considered. (Woodard-USGS)
W78-03137

2F. Groundwater

UNSTEADY FLOW TO A PUMPED WELL IN A FISSURED WATER-BEARING FORMATION,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova.
Journal of Hydrology, Vol. 35, No. 3/4, p 257-269, November 1977. 9 fig, 3 ref.

Descriptors: *Unsteady flow, *Groundwater movement, *Mathematical models, *Fissures(Geologic), *Water wells, Equations, Drawdown, Compressibility, Curves, Hydraulic properties, Porosity, Aquifer characteristics, Pumping, Discharge(Water), Flow, Permeability, *Type curves, Blocks.

New equations were derived for the drawdown in a water-bearing fissured rock formation, consisting of a set of horizontal low-permeability porous blocks separated by highly permeable fissures. Porous blocks and fissures were assumed to be compressible. The depth of the fissure is small compared with that of the block. The abstraction well, lined along the block, is pumped at a constant rate. The discharge per unit length of the unlined part in the fissure is constant, and the radius of the well is vanishingly small. Type curves for the drawdown in the fissure and the porous block were computed and plotted for some selected parameters involved. Procedure for determining the fissured aquifer parameter constants was outlined. (Visocky-ISWS)
W78-02787

UNSTEADY FLOW TO A PUMPED WELL IN A TWO-LAYERED WATER-BEARING FORMATION,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova.
Journal of Hydrology, Vol. 35, No. 3/4, p 245-256, November 1977. 5 fig, 1 ref.

Descriptors: *Unsteady flow, *Groundwater movement, *Mathematical models, *Water wells, Equations, Drawdown, Fissures(Geologic), Compressibility, Hydraulic properties, Aquifer characteristics, Pumping, Curves, Discharge(Water), Permeability, *Layered aquifers, *Type curves, Vertical flow, Horizontal flow, Blocks.

New equations were derived for the drawdown in an aquifer, consisting of two horizontal layers, referred to as the block and the fissure, which have different hydraulic properties. The block and the fissure are compressible. Account was taken of both the horizontal and vertical flow components in the block and the fissure. The depth of the fissure was assumed to be small compared with that of the block. The abstraction well, which is pumped at a constant rate, has a vanishingly small radius. Type curves for drawdowns in the fissure and the block were computed and plotted for some values of the aquifer constants involved. (Visocky-ISWS)
W78-02788

ANALYTICAL SOLUTION FOR A TWO-FLUID FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH PRECIPITATION,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
For primary bibliographic entry see Field 2L.
W78-02789

CORRELATION STRUCTURE AND TIME SCALE OF SIMPLE HYDROLOGIC SYSTEMS,
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 2A.
W78-02814

GEOLOGY AND GROUND WATER IN WESTERN SANTA CRUZ COUNTY, CALIFORNIA, WITH PARTICULAR EMPHASIS ON THE SANTA MARGARITA SANDSTONE,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03129

GROUND-WATER HYDROLOGY OF THE LOWER MILLIKEN-SARCO-TULUCAY CREEKS AREA, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
M. J. Johnson.
Water-Resources Investigations 77-82, August 1977. 40 p, 15 fig, 4 tab, 30 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Withdrawal, *Water demand, Water utilization, California, Water level fluctuations, Groundwater recharge, Surface-groundwater relationships, Evapotranspiration, Storage capacity, Specific yield, Groundwater availability, Water supply, Napa County(Calif), Milliken Creek, Sarco Creek, Tulucay Creek.

The Sonoma Volcanics are the principal water-bearing materials in the lower Milliken-Sarco-Tulucay Creeks area, which occupies about 15 square miles in and east of Napa, Calif. The distribution and composition of these volcanic units are highly variable and complex. Annual pumpage of 3,000 acre-feet, mostly from the Sonoma tuffs, represents a significant portion of the groundwater discharge. The seasonal change in groundwater storage was about 6,600 acre-feet in 1975. Water-level data from the area reflect the seasonal change in ground-water storage, with fluctuations of 3 to 60 feet. The storage capacity to a depth of 500 feet may be as much as 196,000 acre-feet in the study area, but physical and economic factors may restrict the usable capacity to about 20,000 acre-feet. Recharge is generally inadequate to marginal under 1975 demand. There is insufficient recharge in the Milliken and Sarco Creeks area to support 1975 pumpage. Long-term changes in the seasonal peak water levels indicate an average decline of 1.5 feet per year. By 1975 annual pumpage was not exceeding recharge in the Tulucay Creek area. Although a downward trend in water levels was noted in the western part of this basin in the late 1940's, the pumping distribution and its stress on the ground-water system have since changed, and no overall downward trend was evident in the Tulucay Creek area in 1975. (Woodard-USGS)
W78-03133

2G. Water In Soils

FLOW THROUGH SOIL WITH INITIAL GRADIENT,
Punjab Agricultural Univ., Ludhiana (India).
P. Basak.
Indian Journal of Meteorology, Hydrology and Geophysics, Vol 28, No 1, p 103-106, January 1977. 4 fig, 1 tab, 18 ref.

Descriptors: *Soil water movement, *Hydraulic gradient, *Model studies, *Laboratory tests, Mathematical models, Equations, Soils, Clay loam, Soil water, Saturation, Saturated soils, Saturated flow, Groundwater movement, Hydraulic conductivity, Drainage, Irrigation, Capillary conductivity, Capillary water, Hydrology.

A short review of the phenomenon of initial gradient in irrigation, drainage, and consolidation problems was made, and an analysis was presented to show that for the problem of horizontal and vertical capillary saturation, nonrecognition of initial gradient would lead to serious error in the estimation of ultimate travel length and the time rate on progress of saturation lines. (Sims-ISWS)
W78-02796

A PARAMETERIZATION OF GROUND-SURFACE MOISTURE CONTENT FOR USE IN ATMOSPHERIC PREDICTION MODELS,
National Center for Atmospheric Research, Boulder, CO.
J. W. Deardorff.
Journal of Applied Meteorology, Vol. 16, No. 11, p 1182-1185, November 1977. 1 fig, 8 ref.

Descriptors: *Soil moisture, *Moisture content, Irrigation, *Model studies, Mathematical models, Precipitation(Atmospheric), *Evaporation, Evapotranspiration, Diurnal, Soils, Solar radiation, Drying, Vegetation, Vegetation effects, Atmosphere, Atmospheric physics, Meteorology, *Soil-surface moisture.

A rate equation for soil-surface moisture fraction was developed which makes use of the more customary bulk soil moisture content, as well as the soil-surface evaporation rate minus precipitation rate. Two empirical constants involved were estimated from soil measurements. The evaporation rate relative to potential evaporation was taken as the ratio of soil-surface moisture fraction to its saturated threshold value. It was shown how the parameterization simulates the drying of the soil surface on a diurnal and longer time scale following irrigation or precipitation and eliminates large errors of up to a factor of 5 which can be incurred by atmospheric prediction models that treat only the bulk soil moisture in the absence of foliage. (Sims-ISWS)
W78-02808

OBSERVATIONS ON LONG-TERM FERTILITY OF CULTIVATED SOILS AT GRIMARI (CENTRAL AFRICAN REPUBLIC): RESULTS OF SEMI-INTENSIVE MECHANIZED CULTIVATION TESTS ON MODERATELY DESATURATED RED FERRALITIC SOILS IN THE SUDANO-GUINEAN CLIMATE OF CENTRAL AFRICA,
R. Morel, and P. Quantin.
Agron Trop Ser Agron Gen Etud Sci. 27(6/7), p 667-729, 1972.

Descriptors: *Africa, *Climates, *Cultivated soils, *Cultivation, Desaturated red soils, *Fertility, Soils, Tests.

At Grimari, 3 trials with mechanical cultivation were made on moderately desaturated and red colored ferralitic soils, derived from gneiss under a soudano-guinean climate in Central Africa: the 1st trial, with cultivation on large areas, was intended to test a semi intensive rotation (4 yr in cultivation, 4 yr in fallow) on large plots (0.5 ha) with alternating belts of cultivation and fallow according to the Australian antierosion system; with the second, called 'of erosion,' the erosion was studied on 10 small plots with different variates: grade of declivity, antierosion treatment, rotation of crops and fertilization: the 3rd, called 'of rotation,' compared the effect on the yield of many rotations with long, mean or short time of fallow or continuous cultivation. In these trials, the evolution of the physical and chemical characteristics of soils with the time was compared with the yields of crops, which were used to determine soil fertility. The traditional rotation with a long fallow period must no longer be considered as a necessity for the maintenence of soil fertility. With mechanical cultivation and suitable techniques (rotation, pesticide and fertilizer application, weed control) have allowed yield increases within fairly economical limits. The productivity of soil per unit area was increased by about 2.5 times. This allows reduction of the area of cultivated ground and choice of the best lands for agriculture without damage to soil conservation.--Copyright 1974, Biological Abstracts, Inc.
W78-02867

AN EXAMPLE OF THE EXPERIMENTAL ANALYSIS OF RUNOFF FACTORS UNDER SIMULATED RAINFALLS, (IN FRENCH),
For primary bibliographic entry see Field 2B.
W78-02898

STUDY OF THE SIMULTANEOUS MOVEMENT OF WATER AND AIR IN SOILS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidrotekhniki i Melioratsii, Moscow (USSR).
V. V. Vedernikov, and V. F. Nikitenkov.
Pochvovedenie 12, p 73-78, 1976.

Descriptors: *Soil water movement, Capillary water, Moisture content, *Soil moisture, Capillarity, *Infiltration, Mathematical analysis.

The effect of air in the soil on both the infiltration and capillary rising of moisture was subjected to mathematical analysis. The described mathematical approach to processes of moisture movement in incompletely saturated soils offers possibilities for predicting not only the water regime but also the gas and other regimes of soils. Copyright 1978, Biological Abstracts, Inc.
W78-02998

THE APPLICATION OF POLYMERS TO INCREASE SOIL PERMEABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration; and Moscow State Univ. (USSR). Dept. of Physics.
A. I. Mosolova, and V. F. Utkaeva.
Vestn Mosk Univ Ser Vi Biol Pochvoved 31(6), p 109-115, 1976.

Descriptors: *Soil permeability, Polymers, Porosity, Soil conditioners, Soil treatments, Soil moisture, Acrylamides, Alcohol compounds.

The effect of some soil-conditioning polymers on water-stability, porosity and permeability of soils was studied. Such soil-conditioning polymers as K-4, K-9, Gupan, PVA (polyvinyl alcohol) PAA (polyacrylamide) applied in doses of 001% to the weight of soils were favorable for improvement of water-stability of soils.--Copyright 1978, Biological Abstracts, Inc.
W78-03055

CHANGES IN THE MICROSCOPIC STRUCTURE OF SODPODZOLIC SOILS CAUSED BY THE ARTIFICIAL GROUNDWATER FLOODING AND SUBMERGING, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Geography.
K. N. Fedorov, and Ya. M. Gadzhiev.
Vestn Mosk Univ Ser Vi Biol Pochvoved 31(6), p 121-126, 1976.

Descriptors: *Sod-podzolic soils, Groundwater, *Soil microstructure, Soil compaction, Carbonates, Clays, Organic matter.

Prolonged flooding and submergence of sod-podzolic soils results in changes of compactness, anisotrophy of clay substances, changes in proportion of micromorphological forms of organic matter and the dissolution of carbonates.--Copyright 1978, Biological Abstracts, Inc.
W78-03060

DETERMINATION OF SOIL MOISTURE IN STUDYING ROOT COMPETITION ON MOUNTAIN SLOPES, (IN RUSSIAN),
I. I. Khanbekov, and N. G. Ivanov.
Lesovedenie 1, p 84-87, 1977.

Descriptors: *Soil moisture, Mountain slopes, Roots, *Plant growth, Growth rates.

Investigations of the amount of soil moisture along slopes with plots isolated by means of trenches, and comparison of humidity dynamics in isolated and unisolated plots showed that registration of local moisture is necessary to study the effect of mature stand roots on regrowth in mountains.--Copyright 1978, Biological Abstracts, Inc.
W78-03061

EVALUATION OF ARID ZONE SOILS FOR THE PURPOSE OF IRRIGATION, (IN RUSSIAN),
G. G. Reshetov, and V. R. Shredder.
Pochvovedenie 3, p 103-107, 1977.

Descriptors: *Arid lands, Evaluation, Soils, *Irrigation, Indicators, Classification, *Soil classification, Cultivation.

A qualitative evaluation of lands according to classes and groups of fertility is presented. Evaluation according to classes is based on the quality of soil forming materials; the other soil indicators are, to a large degree, levelled by irrigation and serve as a basis for subdivision of classes into groups. The presented evaluation scale corresponds to 3 periods of cultivation.--Copyright 1978, Biological Abstracts, Inc.
W78-03150

IRRIGATION EROSION OF LANDS AND ITS CONTROL, (IN RUSSIAN),
For primary bibliographic entry see Field 2J.
W78-03151

INFLUENCE OF THE CONSTITUTION OF CALCAREOUS SOILS FROM SOUTH-EASTERN FRANCE ON THEIR STRUCTURAL PROPERTIES AND MOISTURE CHARACTERISTICS, (IN FRENCH),
Nice Univ. (France). Lab. of Botany.
J. Chiaverini, and R. Gras.
Bull Assoc Fr Etude Sol 4, p 227-239, 1976.

Descriptors: *Calcareous soils, *Soil moisture, *France, Porosity, *Capillary action, Adsorption, *Calcium carbonate, *Limestone, Particle size.

The effect of limestone on structural properties and moisture characteristics of soils is studied statistically. The sample concerns calcareous soils collected in SE France. It presents an important and continuous scale of variation of CaCO. Particle size composition accounts for a great portion of the water retention. Sand negative effects at high moisture levels and clay positive effects at low moisture levels express the relative weight of the 2 main mechanisms of water retention, capillary effects in pores and adsorption of colloids. CaCO percentages supply a contribution distinct from particle-size distribution. The most efficient parameter is the ratio (CT/CA) between the whole carbonate (CT) and the active carbonate (CA) which acts negatively at a 5% significance level. The calcareous fraction plays a significant part in moisture characteristics, particle size composition explains a small part of the aggregates stability index. Aggregate stability when CT increases but CA has no effect.--Copyright 1978, Biological Abstracts, Inc.
W78-03152

PHYSICAL PROPERTIES OF SILT CRUSTS, (IN GERMAN),
W. Ehlers.
Z Pflanzenernaehr Bodenkd 140(1), p 79-90, 1977.

Descriptors: *Soil physical properties, *Silts, Soil erosion, Porosity, Organic carbon, Hydraulic conductivity, Loess, Organic matter, Porosity, Rainfall, *West Germany.

The physical properties of silt crusts of 2 locations within the eastern part of the Soiing mountains in Western Germany were investigated. They were found downhill on top of sloping grey brown podzolic soils derived from loess during heavy rainfall, which caused aggregate breakdown and erosion. The crusts were several cm in thickness. They consisted of 80% coarse silt (20-60 micrometers), 12% medium silt (6-20 micrometers) and 5% clay (<2 micrometers). The content of organic matter was low. Porosity of the silt crusts was 47-51 vol%. Compressed silt crusts with 40% porosity contained only 2.5 vol% of large pores >15 micrometers. The unsaturated hydraulic conductivity remained almost constant when tensions were increasing, but it dropped immediately when the 15 micrometers pores drained at 200 cm H2O pressure. The saturated conductivity varied with porosity in the range of 10-50 cm/day. In the Ap-horizon of a grey brown podzolic soil with higher contents in clay and organic C the saturated conductivity varied with porosity in the range of 10-10,000 cm/day. Only during rainstorms with high intensity did silt crusts impede rapid water infiltration into the underlying grey brown podzolic soil.--Copyright 1978, Biological Abstracts, Inc.
W78-03153

EFFECT OF ROOT SYSTEMS AND SOIL DENSITY ON ANTIEROSION STABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Melioration.
For primary bibliographic entry see Field 4D.
W78-03157

2H. Lakes

RESPONSES OF ALGAE AND BACTERIA TO NUTRIENT ADDITIONS IN BOTTLED LAKE WATER,
Tokyo Metropolitan Univ., Tokyo (Japan). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-02708

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED FOUNTAIN LAKE, COLORADO.
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02755

SUMMARY REPORT, ARCADIA LAKE WATER-QUALITY REPORT STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02756

DESIGN WAVE INFORMATION FOR THE GREAT LAKES; REPORT 4, LAKE HURON,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02769

MARYSVILLE LAKE HYDROTHERMAL STUDY; REPORT 1, 900-MW PROJECT; HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02773

FREEZE-THAW ENHANCEMENT OF THE DRAINAGE AND CONSOLIDATION OF FINE-GRAINED DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Cold Regions Research and Engineering, Hanover, NH.
For primary bibliographic entry see Field 4A.
W78-02777

WATER-QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02780

FORECAST OF THE CHANGE IN THE HYDROLOGIC BUDGET, LEVEL, AND MINERAL CONTENT OF LAKE BALKHASH IN THE NEXT TEN YEARS,
R. D. Kudrin, and S. A. Rubinovich.
Soviet Hydrology, Selected Papers, Vol. 15, No. 1, p 54-64, 1976. 9 fig, 5 tab, 21 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No. 52, 1975, p 64-86.

Descriptors: *Hydrologic budget, *Forecasting, *Lakes, *Salt balance, *Asia, Water levels, Water quality, Salts, Water balance, Hydrology, Data collections, Lake stages, Water level fluctuations, Runoff, Surface waters, Evaporation, Precipitation(Atmospheric), Foreign research, Foreign countries, *USSR, *Lake Balkhash(USSR).

The amplitude of multisecular water level fluctuations in Lake Balkhash reaches 10-14 m. Three successive intrasecular cycles with a period of 50-60 years and amplitude of 2.5-4.0 m have been identified from observational (1911-1972), historical, and geomorphological data. The amplitude of these fluctuations is comparable with the variations in lake levels that can be produced by industrial activity. The two factors, climate and industry, must be taken into account in forecasting future variations in the hydrologic budget and level of the lake for long-period planning. The filling of the Kapchagay Reservoir in 1970 produced a sharp change in the natural regime of the Ili River and Lake Balkhash. Prior to 1970, the fluctuations of the hydrologic budget and levels of the lake were determined by climatic fluctuations (precipitation and air temperature) as well as by the change in the magnitude of runoff losses in the Ili River delta. The average mineral content of the hydrochemical regions of the lake was computed, and results of the computations were tabulated. The increase in the average mineral content of the eastern Balkhash (by a factor of 1.7) will exceed somewhat that of the western Balkhash (an increase by a factor of 1.5). The presented results of the forecast of the hydrologic budget, level, and mineral content of Lake Balkhash are preliminary and will be refined in the future as the method of determining the components of the water and salt budgets, of estimating the effect or irrigation on runoff, and the forecasts of climatic fluctuations are refined. (Humphreys-ISWS)
W78-02805

LAKE-LAND PRECIPITATION RELATIONSHIPS USING NORTHERN LAKE MICHIGAN DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W78-02807

FEEDING AND GROWTH OF PLANT-EATING FISH IN PONDS OF THE CHITA STATE REGIONAL ELECTRIC POWER PLANT,
For primary bibliographic entry see Field 5C.
W78-02837

DATA ON THE HYDROBIOLOGY OF THE FISH PONDS OF THE 'URAI' FISHERY, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. Zoologii i Parazitologii.
E. A. Tashpulatov.
Uzb Biol Zh. 17(4), p 48-49, 1973.

Descriptors: Aristichthys-Nobilis, Benthos, Cladocera, Copepoda, Ctenopharyngodon-Idella, *Cyprinus-Carpio, *Fish ponds, Fishery, *Hydrobiology, Hypophthalmichthys-Molitrix, Plankton, Seasons, Urai, USSR, Uzbek-SSR, Zooplankton, *Carp.

A hydrobiological characterization of the fish ponds of the 'Urai' fishery in the vicinity of Kokand in Uzbek SSR, USSR in which the pond carp (Cyprinus carpio), grass carp (Ctenopharyngodon idella), silver carp (Hypophthalmichthys molitrix) and speckled carp (Aristichthys nobilis) are raised is presented and observations on the formation of zooplankton and benthos in them are given. Copepods and Cladocera predominated in the zooplankton during all seasons.--Copyright 1974, Biological Abstracts, Inc.
W78-02858

ICHTHYOFAUNA OF THE MALA HANA STREAM IN RELATION TO THE WATER RESERVOIR AT OPATOVICE,
Ceskoslovenska Akademie Ved, Brno. Inst. of Vertebrate Zoology.
S. Lusk.
Zool Listy. 22(3), p 253-263, 1973.

Descriptors: Cottus-Poecilopus, Czechoslovakia, Fauna, Feeding, *Ichthyo fauna, *Mala-Hana, *Opatovice Reservoir(Czech), Plankton, Rainbow trout, Reproduction, Reservoirs, Stocking, Streams.

Species composition, abundance and biomass of the fish population was investigated in the Mala Hana Stream with respect to the storage type water reservoir constructed at Opatovice, Czechoslovakia (45 ha in water surface area). Altogether 6 spp. of fishes were ascertained in the stream, with Salmo trutta m. fario and Cottus poecilopus predominating. The orignial fish population of the stream is very suitable both for the maintenance of the trout character of the reservoir and with respect to the water management purpose of the reservoir, as it does not contain plankton feeders capable of overpopulation. The fish population of the reservoir should consist of brown and rainbow trout to prevent the occurrence of other fish species and thus indirectly act as one of positive factors affecting the quality of the water stored in the reservoir. The initial brown and rainbow trout population will be stocked at 300 individuals/species. It is intended to regulate the fish population by angling according to a specific fishing regulation. Natural reproduction of both trout species is not expected to occur and the fish population will be mantained by stocking.--Copyright 1974, Biological Abstracts, Inc.
W78-02859

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH). I. THE PHYTOPLANKTON COMMUNITY AND ITS ENVIRONMENT,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02987

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION, AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH) II. PHYTOPLANKTON PRODUCTION AND ITS CHIEF DETERMINANTS,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02988

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH) III. INTERSPECIFIC COMPETITION IN RELATION TO IRRADIANCE AND TEMPERATURE,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02989

LIMNOLOGICAL COMPARISON OF CULTURALLY EUTROPHIC SHAGAWA LAKE AND ADJACENT OLIGOTROPHIC BURNTSIDE LAKE, MINNESOTA,
Pacific Northwest Environmental Research Laboratory, Corvallis, OR.
For primary bibliographic entry see Field 5C.
W78-02991

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, MANGANESE, AND IRON CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA,
Kyoto Univ., Otsu (Japan). Otsu Hydrobiological Station.
For primary bibliographic entry see Field 5B.
W78-02999

DYNAMICS OF WATER-SOLUBLE ORGANIC MATTER AND BIOGENIC ELEMENTS IN BOTTOM SEDIMENTS OF THE TSYBUL'NIK BAY IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-03001

EFFECT OF SULFATE ON CARBON AND ELECTRON FLOW DURING MICROBIAL METHANOGENESIS IN FRESHWATER SEDIMENTS,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W78-03003

SALMONELLA IN SURFACE WATERS OF CENTRAL NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5C.
W78-03004

EFFECTS OF DESTRATIFICATION AND AERATION OF A LAKE ON THE DISTRIBUTION OF PLANKTONIC CRUSTACEA, YELLOW PERCH, AND TROUT,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.
W78-03006

CHROMATOGRAPHIC INVESTIGATION OF INOSITOL PHOSPHATE ESTERS IN LAKE WATERS.
Wisconsin Univ.-Madison. Water Chemistry Lab., Water Chemistry Laboratory, University of Wisconsin, Madison.
For primary bibliographic entry see Field 5A.
W78-03007

PHOSPHORUS MODELS FOR EUTROPHIC LAKES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5C.
W78-03008

THE MINERAL NUTRIENTS LEVELS IN THREE NORFOLK BROADS DIFFERING IN TROPHIC STATUS, AND AN ANNUAL MINERAL CONTENT BUDGET FOR ONE OF THEM,
University of East Anglia, Norwich (England). Schools of Biological; and University of East Anglia, Norwich (England). Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-03011

CORRESPONDENCE OF AMMONIA CONTENT AND ACETYLENE REDUCTION ACTIVITY IN SLUDGE SAMPLES OF LAKE HARKORT (RUHR VALLEY), (IN GERMAN),
Staatliches Amt Wasser-und Abfallwirtsch. Hagen (West Germany).
For primary bibliographic entry see Field 5C.
W78-03012

DISTRIBUTION, ABUNDANCE, AND RESOURCE UTILIZATION OF LITTORAL ZONE FISHES IN RESPONSE TO A NUTRIENT/PRODUCTION GRADIENT IN LAKE MEMPHREMAGOG,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-03013

SOMATIC AND GENERATIVE PRODUCTION AND SIZE OF PLANKTONIC CRUSTACEANS,
Belorussian State Univ., Minsk (USSR).
For primary bibliographic entry see Field 5C.
W78-03015

STRUCTURE OF SEASONAL ZOOPLANKTON COMPLEXES OF VOLGO GRAD RESERVOIR,
Gosudarstvennyi Nauchno-Issledovatelskii Inst. Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
For primary bibliographic entry see Field 5C.
W78-03016

A NOTE ON SOME DISTINCTIVE LIMNOLOGICAL FEATURES OF GOVINDSAGAR RESERVOIR, HIMACHAL PRADESH,
Central Inland Fisheries Research Inst., Barrackpore (India); and All-India Coordinated Research Project on Ecology and Fisheries of Fresh Water Reservoirs, Hazribagh (India).
For primary bibliographic entry see Field 5C.
W78-03017

PLANKTONIC DIATOMS AND SOME DIATOM-SILICA RELATIONS IN A SHALLOW EUTROPHIC SCOTTISH LOCH,
Institute of Terrestrial Ecology, Edinburgh (Scotland). Wetlands Research Group.
For primary bibliographic entry see Field 5C.
W78-03020

MACROPHYTE SUCCESSION IN SWEDISH LAKES CAUSED BY DEPOSITION OF AIRBORNE ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5C.
W78-03022

EXPERIMENTAL LAKES AREA AND CANADIAN LIMNOLOGY, (IN GERMAN),
Max-Planck-Inst. fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 5C.
W78-03026

CARBON BUDGETS IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-03027

THERMALLY STRATIFIED ACID WATER IN LATE WINTER - A KEY FACTOR INDUCTING SELF-ACCELERATING PROCESSES WHICH INCREASE ACIDIFICATION,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5C.
W78-03028

L OLIVIER LAGOON, (IN FRENCH),
Centre Univ. de Luminy, Marseille (France). Lab. du Histol. Morphogen. Anim.
For primary bibliographic entry see Field 5C.
W78-03039

GREAT LAKES WATER QUALITY, FIFTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION.
International Joint Commission-United States and Canada. Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5G.
W78-03041

PARTICULAR CHARACTER OF THE EUTROPHICATION MECHANISM IN THE ETANG DE BERRE, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5C.
W78-03065

PRIMARY PRODUCTION, ORGANIC MATTER DESTRUCTION AND BACTERIAL NUMBERS IN THE SARATOV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 5C.
W78-03066

BENTHIC FAUNA SPECIES DIVERSITY IN SIX CENTRAL FLORIDA LAKES IN SUMMER,
Florida Technological Univ., Orlando.
For primary bibliographic entry see Field 5C.
W78-03072

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Asian Inst. of Tech., Bangkok (Thailand).
R. B. Banks, and F. Flores.
Journal of the Environmental Engineering Division, Proceedings of ASCE Vol. 103, No. 3, p. 489-504, June 1977. 9 fig, 3 tab, 20 ref, append.

Descriptors: *Rainfall, *Wind velocity, *Lakes, *Lagoons, Biochemical oxygen demand, Dissolved oxygen, Mathematical studies, Air-water interfaces, Reaeration, Surface reaeration coefficient.

Results of a study of the surface reaeration coefficient are presented. An examination is made of the effect of wind action and rainfall on the value of the coefficient in lakes and lagoons. It is concluded that the effects of wind action and rainfall cause an increase in the magnitude of the oxygen transfer coefficient in lakes and lagoons. The study concludes that the transfer coefficient due to the combined effects of wind and rain is less than the sum of the transfer coefficients due to the two effects considered separately. The basic assumption is that the transfer coefficient due to rainfall is directly proportional to the power of the rainfall. It is suggested that additional experiments be conducted with artificial and natural rainfalls, to confirm or modify the assumption. It is also noted that the amount of oxygen added directly to a lake by raindrops can be significant if the drops are oxygen saturated. And it is suggested study results may have additional application in the problem of erosion or soil due to rainfall. (Coyle-Wisconsin)
W78-03073

WATER RESOURCES RESEARCH PROGRAM. TRANSPORT AND DISPERSION OF OIL-REFINERY WASTES IN THE COASTAL WATERS OF SOUTHWESTERN LAKE MICHIGAN (EXPERIMENTAL DESIGN--SINKING-PLUME CONDITION),
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W78-03092

ENVIRONMENTAL BASELINE FOR MAUMEE BAY,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W78-03095

QUANTITATIVE DYNAMICS OF ZOOPLANKTON AND ZOOBENTHOS IN REARING PONDS IN THE UKRAINIAN SSR WITH DIFFERENT FISH DENSITIES, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
S. A. Krazhan, N. N. Kharitonova, K. I. Benko, S. A. Isaeva, and N. M. Mikulina.
Gidrobiol Zh Zh 13(1), p 40-47, 1977.

Descriptors: *Zooplankton, *Benthos, *Fish production, Zoobenthos, Ponds, *Carp, Chironomids, Crustaceaus, Forests, Larvae, Rotatoria, *USSR(Ukranian SSR).

An increase in density of fish location in the principal carp ponds of the Ukraine (USSR) with respect to zones, causes a rise in the quantitative development of zooplankton from the steppe to the forest-steppe and polessie (6.1-11.1-15.6 g/m to the third power) and zoobenthos from polessie to the forest-steppe 1.6-3.2 g/m to the second power). In the steppe ponds with the maximal density of fish (6.0-12.0 thousand individuals +/ha) these values were 1.3 and 0.4 g/m to the second power and with the minimal density (3.4-6.0 thousand individuals/ha), 10.9 g/m to the second power. A considerable part of the zooplankton at all values

of density belongs to the Rotatoria (42.6-65.8%), and of biomass to Crustacea (52.3-74.6%). Zoobenthos consisted mainly of the chironomid larvae (54.8-98.7% of the number, 65.5-99.1% of the biomass).--Copyright 1978, Biological Abstracts, Inc.
W78-03096

THE RELATIONSHIP OF BACTERIOPLANKTON WITH PHYTO- AND ZOOPLANKTON IN FISH-REARING PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
For primary bibliographic entry see Field 5C.
W78-03097

DYNAMICS AND PRODUCTION OF POPULATIONS OF MASS SPECIES OF POND PLANKTON CLADOCERANS, (IN RUSSIAN),
Belorusski Nauchno-Issledovatelskii Inst. Rybnogo Khoziaistva, Minsk (USSR).
L. V. Kamlyuk, and V. P. Lyakhnovich.
Gidrobiol Zh 13(1), p 48-55, 1977.

Descriptors: *Crustaceans, Biomass, Carp, *Productivity, Ponds, *Bosmina-longirostris, *Ceriodaphnia-quadrangula, *Daphnia-longispina, Fish predation, Seasonal, Somatic production.

The productivity of Bosmina longirostris, Ceriodaphnia quadrangula and Daphnia longispina was studied depending on seasonal dynamics of population biomass under conditions of different intensity of elimination by 2 yr carp. A close correlation of fertility with the character of biomass dynamics is shown for populations of Bosmina and Ceriodaphnia. For water fleas the dependence is complicated by pressure of selective consumption of large individuals by carp. The analogous dependence is found for specific productivity of species populations. Ratios of generative and somatic production were determined. The regularities considered are in good agreement with the degree of fish predation pressure on the Cladocera populations.--Copyright 1978, Biological Abstracts, Inc.
W78-03155

2I. Water In Plants

WOODS OF THE PUNIOS SILAS RESERVATION (THE LITHUANIAN SSR): 1. GEOBOTANICAL REVIEW, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
Yu. Yu. Strazdaite, Zh. P. Lazdauskaite, and R. L. Yankyavichene.
Liet Tsr Moksiu Akad Darbai Ser C. 2, p 29-50, 1973.

Descriptors: Alder, Birch, Carpinus-betulus, Fir, *Geobotanical review, Grasses, Hylocomium-proliferum, Hylocomium-spp, Lichens, *Lithuanian-SSR, Oxalis-acetosella, Pine, Punios, Quercus-robur, Reservation, Silas, Soil, Sorrel, Terrain, Tilia-cordata, USSR, *Woods, Forests.

The Punia Pine forest reservation (about 2700 ha) stretches over the loop of the river Nemunas near the village of Punia (South Lithuania (USSR)). According to the physical and geographical division of Lithuania into districts, the reservation territory enters the physical and geographical district of the plateau of the middle reaches of the river Nemunas and the lower reaches of the river Neris. Pine Forests with Hylocomium and lichen pine forests were found to be predominant in the reservation. A considerable fir admixture had been observed in the pine forests with Hylocomium. In the herb layers Oxalis acetosella was predominant, while the moss cover H. proliferum prevailed. In the reservation, big fir-grove areas were found side by side with the pine forests. Floral composition of the fir-groves investigated was found to be close to the broad-leaved fir-grove type. They abound with oaks (Quercus robur), hornbeams (Carpinus betulus) and Tilia cordata. Nemorose grass cover was observed in the herb layer. The fir-grove communities were found to abound with wood sorrel. Rather small areas are occupied by oak-groves (Querceta), hornbeam-groves (Carpineta), black aldertree-groves (Alneta glutinosae) and birch-groves (Betuleta pendula). They interve in the predominant trees of the pine forest. Small patches of flood plains stretch over the littor al of the river Nemunas and sometimes mesoxerophytic meadows in the forest. The location of the communities investigated depends on relief and mechanical composition of soil. The amount of nutrient substances in the surface soil layers is not the determinant factor in the community formation.--Copyright 1974, Biological Abstracts, Inc.
W78-02732

HYDROLOGIC AND METEOROLOGICAL ROLE OF FOREST PLANTATIONS OF VARIOUS TREE SPECIES,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
For primary bibliographic entry see Field 4C.
W78-02806

A CONTRIBUTION TO THE MORPHOLOGY AND ECOLOGY OF SHEMAIA CHALCALBURNUS CHALCOIDES (GULD) FROM THE BERDA RIVER, (IN RUSSIAN),
Melitopolskii Pedagogicheskii Inst. (USSR).
A. S. Loshakov.
Vopr Ikhtiol. 13(4), p 603-610, 1973.

Descriptors: *Berda River(USSR), *Chalcalburnus-Chalcoides, Dams, *Ecology, *Morphology, Productivity, Rivers, Shemaia.

Comparative data on plastic and meristic indices of shemaia of the Southern Bug, the Sulinsk branch of the Dunaya and the Berda River since 1949 are presented. Shemaia of the Dunaya type had higher plastic and meristic indices than shemaia from the Dnepr-Azov (the highest and lowest body height, length of tail, number of scales on the lateral line, etc.). Shemaia spawn at different times (from Jan.-Apr.) in different years, depending on the hydrological conditions, at a water temperature of 4-7 degrees. Before erecting dams in the Berda River, egg-laying began in the last 10 days of May at a water temperature of 16-22 degrees. After damming of the river, spawning below the dam began in the last 10 days of May and 1st 10 days of June. A decline in the productivity of shemaia of the Berda River begins several days after casting out the final portions of the sexual products and continues until the end of July. In order to preserve the natural spawning grounds of the Berda River and safeguard the productivity of shemaia and other valuable fish, the following measures are suggested: establish a 3-km forbidden zone below the dam; prohibit fishing from March-July below the forbidden zone and remove silt from the river, from the forbidden zone to the dam.--Copyright 1974, Biological Abstracts, Inc.
W78-02860

OBSERVATION ON THE EFFECT OF FEEDING LABEO ROHITA (HAM) WITH CHLORELLA VULGARIS BEIJERINCK AND SCENEDESMUS OBLIQUUS (TURPIN) KUETZING,
Christ Church Coll., Kanpur (India).
A. B. Gupta, and D. C. Roy.
Labdev J Sci Technol Part B Life Sci. 10(3/4), p 142-147, 1972.

Descriptors: *Chlorella-vulgaris, Feeding, *Labeo-rohita, *Scenedesmus-obliquus, Weight, Fingerlings.

Feeding experiments with Chlorella vulgaris and Scenedesmus obliquus were carried out on the fingerlings of Labeo rohita. The observations show an increase in weight and volume and an overall improvement in the general condition of the fingerlings fed with these algae.--Copyright 1974, Biological Abstracts, Inc.
W78-02868

MODEL FOR CALCULATING PRECIPITATION PENETRATING UNDER THE CANOPY OF MIXED STANDS, (IN RUSSIAN),
Akademiya Nauk SSSR, Zvenigorod (USSR). Lab. of Forestry.
For primary bibliographic entry see Field 2B.
W78-03033

INFLUENCE OF DROUGHT ON THE MORPHOLOGY OF THE ROOT SYSTEM OF CAREX SETIFOLIA, (IN FRENCH),
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Lab. du Phytotron.
S. Da, C. Hubac, and H. Vartanian.
Can J Bot 55(9), p 1236-1245, 1977.

Descriptors: Droughts, *Drought resistance, *Plant growth, *Growth rates, Cortex, *Root systems, *Carex setifolia.

Two kinds of roots, differing in width, were grown from the regularly watered rhizome of C. setifolia in strict cultural conditions. When plants are subjected to drought, which increases water deficit in the plants, root growth stops and the root tip necroses while lateral root initiation is stimulated. After rewatering, growth of aerial parts is resumed, either from the oldest tiller after greatest diameter show an increase in thickness just behind the tip. The thickening lasts 48 h after the beginning of watering, then roots grow normally again. Sometimes, several roots initiate from the thickened portion of the tuberized zone. A histological study of the normal roots and tuberized zones indicates that the difference occurs in the cortex. The cortex is lacunar in normal roots, but it looks dense in tuberized parts of the roots and consists of radial rows of cells apparently generated from an extra-endodermic layer. This generative zone is normally present, though undeveloped and nonfunctional in normal roots of C. setifolia. A large amount of starch is found in the cortex of the thickened parts of the roots.--Copyright 1978, Biological Abstracts, Inc.
W78-03035

STUDIES ON MUD-FLOW IN THE DAISEN WATER SYSTEM, (IN JAPANESE),
Tottori Univ. (Japan). Lab. of Erosion Control.
T. Sugimoto, K. Tanaka, and S. Ikeda.
Bull Tottori Univ For 8, p 41-62, 1975.

Descriptors: *Roots, Trees, Distribution, Muds, Plant growth, Growth rates, Tree scars, *Dendrological methods.

Dendrological methods, including study of reaction wood, stem analysis, adventitious root age and distribution of tree scars, were used to determine mud deposition and movement.--Copyright 1978, Biological Abstracts, Inc.
W78-03056

DETERMINATION OF SOIL MOISTURE IN STUDYING ROOT COMPETITION ON MOUNTAIN SLOPES, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W78-03061

EFFECT OF MINERAL NUTRITION ON TREE SEEDLING TRANSPIRATION UNDER NATURAL CONDITIONS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Forestry.
For primary bibliographic entry see Field 2D.
W78-03101

EFFECT OF MINERAL NUTRITION AND WATER SUPPLY ON POPLAR TREE PHOTOSYNTHESIS AND GROWTH, (IN BULGARIAN),
Research Station of Rapid-Growth Tree Species, Svistov (Bulgaria).
K. Dimitrov, and M. Dimitrova.
Fiziol Rast (Sofia) 2(3), p 43-51, 1976.

Descriptors: *Photosynthesis, *Mineral nutrition, Trees(Photosynthesis), *Poplars, Plant growth, Fertilizers, Fertilization, Soils, Irrigation, *Nitrogen, *Phosphorus, Populus bachelieri, *Potassium.

Photosynthesis and growth were studied in 5 yr old poplar plantations of Populus I-214 and P. bachelieri clones in dry locations. The soil was carbonate-chernozem containing in its upper 60 cm the more important elements: N, 37 mg/1000 g (after Tyurin-Kononova); P, 1.3 mg/1000 g (after Olsen); and K, 46 mg/1000 g (after Milcheva). Mineral fertilizer application at a N, P and K rate was performed 3 times, while irrigation with 240 mm of water was effected in the 4th year and with 600 mm in the 6th year. A positive correlation was established between soil nutrient substances and poplar leaves. The differences were insignificant and existed only during the 1st half of the vegetation period. Under conditions without irrigation poplar trees needed largest quantities of nutrient elements at the beginning of vegetation, May and June. With irrigation the need for nutrient elements was high also during the 2nd half of the vegetation period. At the locations situated far away from rivers, irrigation only, during the 4th and 5th yr the biomass was doubled. The effect of mineral fertilizer application was lower in dry years. The combined application of mineral fertilizers in spring and irrigation during the entire vegetation period resulted in a 3-fold increase of the productivity of poplar plantations grown at dry locations. Copyright 1978, Biological Abstracts, Inc.
W78-03138

BENTHOS BIOMASS IN SOME WATERCOURSES OF THE CHUKOTSKI PENINSULA, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Inst. of Biology and Soil Science.
V. Ya. Levanidov.
Gidrobiol Zh 13(1), p 56-62, 1977.

Descriptors: *Benthos, *Biomass, *Daphnia, Bosmina-longirostris, Ceriodaphnia-quadrangula, Daphnia-longispina, Daphnia-pulex, Density, *USSR(Chukotski pennisula).

Benthos biomass (Bosmina longirostris, Daphnia longispina, D. pulex, Ceriodaphnia quadrangula) in the Chukotsk small streams running in the mountain tundra amounts to 3.2 plus or minus 2.2 g/m2 (95% level of reliability). Population density depends on the season and character of the stream and varies from 667-3368 specimens/m2. An inverse relationship is observed between benthos biomass and contact of land waters with ever-frozen layers. The obtained values are compared with those determined for submontane rivers of lower latitudes.--Copyright 1978, Biological Abstracts, Inc.
W78-03156

2J. Erosion and Sedimentation

GUIDELINES FOR MONITORING AND REPORTING DEMONSTRATION PROJECTS; SECTION 32 PROGRAM, STREAMBANK EROSION CONTROL EVALUATION AND DEMONSTRATION ACT OF 1974,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4D.
W78-02754

IMPERIAL BEACH, CALIFORNIA, DESIGN OF STRUCTURES FOR BEACH EROSION CONTROL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02768

MATHEMATICAL MODEL OF ESTUARIAL SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-02774

LITERATURE SURVEY AND PRELIMINARY EVALUATION OF STREAMBANK PROTECTION METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. P. Keown, N. R. Oswalt, E. B. Perry, and E. A. Dardeau.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-042 052, Price codes: A12 in paper copy, A01 in microfiche. Technical Report H-77-9, May 1977. 262 p, 68 fig, 5 tab, 1635 ref, 5 append.

Descriptors: *Bank erosion, *Bank protection, *Bibliographies, Evaluation, *Erosion control, Evaluation.

A preliminary study of streambank erosion control was conducted with the major emphasis on an extensive literature survey of known streambank protection methods. In conjunction with the survey, preliminary investigations were conducted to identify the mechanisms that contribute to streambank erosion and to evaluate the effectiveness of the most widely used streambank protection methods. The results of the literature survey and the two preliminary investigations are presented herein. The text of the 'Streambank Erosion Control Evaluation and Demonstration Act of 1974' is presented in Appendix A. A list of commercial concerns that market streambank protection products is provided in Appendix B. Appendix C contains a glossary of streambank protection terminology. A detailed bibliography resulting from the literature survey is provided in Appendix D, and a listing of selected bibliographies related to streambank protection are provided in Appendix E. (WES)
W78-02776

INCREASING SHORELINE EROSION RATES WITH DECREASING TIDAL RANGE IN THE VIRGINIA CHESAPEAKE BAY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-02811

CHARACTERISTICS OF DREDGED BOTTOM SEDIMENTS,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-02813

UNDERWATER SAMPLER,
Benthos, Inc., N. Falmouth, MA. (Assignee).
S. O. Raymond.
U.S. Patent No. 4,019,380, 14 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 957, No 4, p 1367, April 26, 1977.

Descriptors: *Patents, *Sampling, *Bottom sampling, Sediments, Bottom sediments, Mechanical properties, Equipment, Free-fall samplers.

Ocean of lake floor samplers or the recoverable free-fall type are usually dropped in the area where a specimen is to be taken and allowed to free-fall to the bottom of the body of water where the sampler obtains a specimen of the bottom and then floats to the water's surface where it can be retrieved with the specimen intact. These samplers have particular utility for obtaining specimens of an oceanic bottom to determine the presence of manganese nodules in preparation of oceanic mining. This invention provides an underwater sampler in which the ballast releasing mechanism and the jaw members operate independently of one another. It has a jaw biasing means which is not as susceptible to damage or interference from objects passing between the jaw members when the latter are in an open position. Accidnetal actuating of the triggering mechanism and premature closing of the jaw members and release of the ballast is prevented. The invention also provides means for resistance to soft muck to prevent the sampler from sinking too deeply. (Sinha-OEIS)
W78-02903

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, MANGANESE, AND IRON CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA,
Kyoto Univ., Otsu (Japan). Otsu Hydrobiological Station.
For primary bibliographic entry see Field 5B.
W78-02999

EFFECT OF SULFATE ON CARBON AND ELECTRON FLOW DURING MICROBIAL METHANOGENESIS IN FRESHWATER SEDIMENTS,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W78-03003

ESTIMATION OF NATURAL POLLUTION LOADS FROM STREAMFLOW MEASUREMENTS IN REMOTE CATCHMENTS,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 5B.
W78-03005

INVESTIGATIONS OF ENERGY FLOW IN SEDIMENTS OF KIEL BAY (BALTIC SEA), (IN GERMAN),
Akademiya Nauk URSR, Kiev. Inst. Zoologii.
For primary bibliographic entry see Field 2L.
W78-03029

CHNSED: SIMULATION OF SEDIMENT AND TRACE CONTAMINATION TRANSPORT WITH SEDIMENT/CONTAMINANT INTERACTION,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-03057

PROCESSES OF SEDIMENT TRANSPORT AND TIDAL DELTA DEVELOPMENT IN A STRATIFIED TIDAL INLET,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-03089

NEARSHORE PROCESSES ON A FRINGING REEF,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-03090

SEDIMENT TRANSPORT AND DEPOSITION IN A MACROTIDAL RIVER CHANNEL: ORD RIVER, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

For primary bibliographic entry see Field 2L.
W78-03091

ARCTIC COASTAL PROCESSES: AN OVERVIEW,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W78-03093

ENVIRONMENTAL BASELINE FOR MAUMEE BAY,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W78-03095

IRRIGATION EROSION OF LANDS AND ITS CONTROL, (IN RUSSIAN),
Yu. P. Polyakov.
Pochvovedenie 3, p 91-97, 1977.

Descriptors: Crops, *Irrigation practices, *Soil erosion, *USSR(North Caucasus).

Practices controlling irrigational erosion with the use of different methods of soil irrigation on the North Caucasus (USSR) are described. Quantitative parameters of (crop) irrigation under different conditions are presented.--Copyright 1978, Biological Abstracts, Inc.
W78-03151

EFFECT OF ROOT SYSTEMS AND SOIL DENSITY ON ANTIEROSION STABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Melioration.
For primary bibliographic entry see Field 4D.
W78-03157

2K. Chemical Processes

A TITRATION APPARATUS FOR THE DETERMINATION OF DISSOLVED OXYGEN IN SEAWATER,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W78-02815

AVAILABILITY AND CHEMICAL CHARACTERISTICS OF GROUND WATER IN CENTRAL LA PLATA COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03118

AVAILABILITY AND CHEMICAL QUALITY OF GROUND WATER IN THE CRYSTAL RIVER AND CATTLE CREEK DRAINAGE BASINS NEAR GLENWOOD SPRINGS, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03119

WATER QUALITY OF TAMPA BAY, FLORIDA: WET-WEATHER CONDITIONS, OCTOBER 1971,
Geological Survey, Tampa, FL. Water Resources Div.; and Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03128

GEOLOGY AND GROUND WATER IN WESTERN SANTA CRUZ COUNTY, CALIFORNIA, WITH PARTICULAR EMPHASIS ON THE SANTA MARGARITA SANDSTONE,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03129

2L. Estuaries

ON THE BENTHIC COMMUNITY OF YOKKAICHI HARBOR,
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W78-02709

POLLUTION OF THE BALTIC BY CRUDE OIL PRODUCTS (ZANLECZYSZCZENIE BALTYKU SUBSTANCJAMI ROPOPOCHODNYMI),
For primary bibliographic entry see Field 5A.
W78-02716

MASS STRANDING OF THE LONG-FINNED PILOT WHALE, GLOBICEPHALA MELAENA, ON SABLE ISLAND, NOVA SCOTIA,
Ontario Veterinary Coll., Guelph.
For primary bibliographic entry see Field 5C.
W78-02735

COASTAL WATER RESEARCH PROJECT, ANNUAL REPORT 1975,
Southern California Coastal Water Research Project, El Segundo, CA.
W. Bascom.
Coastal Water Research Project, Annual Report for the Year Ended 30 June 1975. 212 p, 69 fig, 50 tab, 120 ref, 4 append.

Descriptors: *Publications, *Coasts, *Path of pollutants, *Water pollution sources, *California, Research and development, Biology, Fish, Invertebrates, Distribution, Speciation, Laboratory tests, Sampling, Water pollution effects, Chemistry, Toxicity, Ecology, DDT, Domestic wastes, Industrial wastes, Seawater, Southern California, Los Angeles, Toxicants.

A broad overall study of the southern California coastal waters ecology was reviewed. Areas of study included a biology program (microbiology, fish diseases, toxicity, invertebrate ecology, fish ecology), a chemistry program (chlorinated hydrocarbons, trace metals), an engineering program, management and facilities, and appendices. Pollutants in municipal wastewaters were found to have decreased slowly from 1971-1975, with the exception of DDT which dropped dramatically. Water pollution sources including municipal wastes, air and harbors were discussed in addition to the water motions which influence the movement of pollutants. 500 species of fish and 4,000 species of invertebrates were determined to inhabit the coastal waters. Methodologies in data analysis, sampling, laboratory tests, and evaluation determinations were discussed. (Klein)
W78-02740

ECOLOGICAL AND DISEASE STUDIES OF DEMERSAL FISHES IN PUGET SOUND NEAR METRO-OPERATED SEWAGE TREATMENT PLANTS AND IN THE DUWAMISH RIVER,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5A.
W78-02741

A COMPUTER-AIDED AERIAL PHOTOGRAPHIC ANALYSIS OF FIRE ISLAND INLET GEOMORPHOLOGY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02761

A CONSULTANT'S REVIEW OF THE LOS ANGELES-LONG BEACH HARBORS STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. O. Reid, R. G. Dean, and L. E. Borgman.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-043 734, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Paper M-77-10, August 1977. 23 p, 1 append.

Descriptors: *Harbors, California, Waves(Water), Hydraulics, *Los Angeles Harbor(Calif), *Long Beach Harbor(Calif).

A consultant's review of the Los Angeles-Long Beach Harbors Study was performed by Professor Robert O. Reid of Texas A&M University, Professor Robert G. Dean of the University of Delaware, and Professor Leon E. Borgman of the University of Wyoming. The review primarily covers the acquisition and analyses of prototype wave and ship motion data. Comments and suggestions are offered regarding improvements and methods of attack for the present and future studies of this type. (WES)
W78-02763

A NUMERICAL HINDCAST MODEL FOR WAVE SPECTRA ON WATER BODIES WITH IRREGULAR SHORELINE GEOMETRY; REPORT 1, TEST OF NONDIMENSIONAL GROWTH RATES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02764

DETAILED DESIGN FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02765

IMPERIAL BEACH, CALIFORNIA, DESIGN OF STRUCTURES FOR BEACH EROSION CONTROL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02768

TSUNAMI-WAVE ELEVATION FREQUENCY OF OCCURRENCE FOR THE HAWAIIAN ISLANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02770

MATHEMATICAL MODEL OF ESTUARIAL SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
R. Ariathurai, R. C. MacArthur, and R. B. Krone.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-047 202, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-12, October 1977. 158 p, 39 fig, 11 tab, 6 append, 31 ref.

Descriptors: *Deposition(Sediments), *Erosion, *Estuaries, *Finite element analysis, *Mathematical models, *Sediment transport, *Sedimentation, *Suspended load.

A two-dimensional finite element model that simulates erosion, transport, and deposition of suspended sediments is presented. The breadth-averaged or depth-averaged equations may be used depending on the problem to be solved. The governing equations for two phase transport are derived and then solved by the finite element method using isoparametric quadrilateral elements in which a quadratic approximation is made for the suspended sediment concentrations. Expressions used for the rates and conditions under which erosion and deposition occur are from previous experimental studies. Continuing aggregation is accounted for by specifying the settling velocity of the flocks in each element at each time step. The bed is considered to be formed of a number of layers of sediment whose physical properties change with overburden pressure. The model provides suspended sediment concentrations and bed profile at each time step. (WES)
W78-02774

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX A: INVESTIGATIONS OF THE HYDRAULIC REGIME AND THE PHYSICAL CHARACTERISTICS OF BOTTOM SEDIMENTATION,
Yale Univ., New Haven, CT. Dept.of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W78-02782

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX D: PREDISPOSAL BASELINE CONDITIONS OF DEMERSAL FISH ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02783

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX E: PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02784

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX F: PREDISPOSAL BASELINE CONDITIONS OF PHYTOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02785

ANALYTICAL SOLUTION FOR A TWO-FLUID FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH PRECIPITATION,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
P. Van der Veer.
Journal of Hydrology, Vol. 35, No. 3/4, p 271-278, November 1977. 3 fig, 15 ref.

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Groundwater, *Model studies, Coasts, Interfaces, Water levels, Aquifers, Groundwater movement, Salinity, Rainfall, Precipitation(Atmospheric), Flow, Mathematical models, Analytical techniques, Saline water, Freshwater, Surfaces, Hydrology, Two-fluid flow.

The problem of determining the steady position of an interface and a phreatic surface in a coastal aquifer was investigated. Fresh groundwater flows towards the sea. Simultaneously, there is a salt water flow which may be directed seawards or landwards. The upper boundary of the flow region involves a phreatic surface with precipitation. The analytical solution of the problem was given in the form of two expressions of complex parameters. Expressions for the position of the interface and the phreatic surface were given. It appears that salt water flow may have a great influence on the steady positions of the phreatic surface and interface. (Sims-ISWS)
W78-02789

THE VARIABILITY OF ANTICYCLONIC CURRENT PATTERNS IN THE GULF OF MEXICO,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
D. W. Behringer, R. L. Molinari, and J. F. Festa.
Journal of Geophysical Research, Vol. 82, No. 34, p 5469-5476, November 20, 1977. 15 fig, 1 tab, 19 ref.

Descriptors: *Water circulation, *Gulf of Mexico, *Water temperature, On-site data collections, Data processing, Ocean circulation, Eddies, Seasonal, Variability, Circulation, Oceanography, *Loop Current(Gulf of Mexico), *Gulf of Mexico currents, Eddy separations, Gyres.

A recent twofold increase in the number of temperature observations available in the Gulf of Mexico has prompted a reappraisal of several ideas regarding the temporal variability of the Loop Current in the eastern gulf and the anticyclonic gyre in the western gulf. The analysis included both synoptic data drawn from 47 cruises in the eastern gulf and monthly maps of temperature at 200 m prepared from observations over the entire gulf. It was found that on average the penetration of the Loop Current into the gulf increases during the winter and spring, reaching a maximum in the early summer, at which time a large anticyclonic eddy probably separates from the loop. It also was found that there are substantial deviations from this average sequence of events; during the past dozen years the period between eddy separations has been as short as 8 months and as long as 17 months. The data coverage of the western gulf was sparse, but there was evidence for the year-round persistence of the anticyclonic gyre and some indications that the gyre may be strongest in summer and winter. (Sims-ISWS)
W78-02810

INCREASING SHORELINE EROSION RATES WITH DECREASING TIDAL RANGE IN THE VIRGINIA CHESAPEAKE BAY,
Virginia Inst. of Marine Science, Gloucester Point.
P. S. Rosen.
Chesapeake Science, Vol. 18, No. 4, p 383-386, December 1977. 3 fig, 3 tab, 7 ref.

Descriptors: *Beach erosion, *Virginia, *Chesapeake Bay, *Erosion rates, Tides, Tidal waters, Surveys, Erosion, Geomorphology, Estuaries, Bays, Water levels, Data collections, On-site investigations.

The Virginia Chesapeake Bay has a large variation (200%) in tidal range (0.36 m to 1 m) over a relatively short (120 km) distance. Analysis of a regional sampling of shoreline morphology and processes demonstrated that decreasing tidal ranges result in increasing long-term erosion rates. This results because larger water levels increased by storm surges have a lower probability of reaching the elevation of the fastland (bluff or dune) material to augment erosion. Secondly, the wave energy is distributed over a greater distance in the course of a tidal cycle. (Humphreys-ISWS)
W78-02811

A TITRATION APPARATUS FOR THE DETERMINATION OF DISSOLVED OXYGEN IN SEAWATER,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W78-02815

ESTUARINE SANCTUARY GUIDELINES.
National Oceanic and Atmospheric Administration, Washington, DC.
Federal Register, Vol 42, No 175, p 45522-23, September 9, 1977.

Descriptors: *Estuarine environment, Grants, *Ecosystems, *Conservation, *Governmental interrelations, Research and development, Government finance, Cost repayment, Appraisals, Cost sharing, Maintenance costs, Economic impact, Management, Operations research, Legislation, Project planning, Financing.

The proposed Estuarine Sanctuary Guidelines, issued by the National Oceanic and Atmospheric Administration, are designed to modify existing policy and procedures for the selection, acquisition, and management of estuarine sanctuaries. The guidelines create a new grant procedure, designed to reduce economic waste and to allow for greater cost specificity in Environmental Impact Statements. Under subsection 315(1) of the Coastal Zone Management Act, the Secretary of Commerce is authorized to make available to coastal states grants up to 50 per cent of the cost of acquisition, development, and operation of estuarine sanctuaries. The new guidelines establish a two-stage method of authorizing acquisition grants: first, a small preliminary acquisition grant may be authorized to develop the proposed sanctuary more fully; and second, an actual acquisition grant may follow. The preliminary grant covers the cost of surveying and assessment of the land to be acquired. The making of the actual acquisition grant depends on the research detailed in the preliminary grant. An operation grant may be authorized later. (Thomas-Florida)
W78-02826

COASTAL ZONE PROBLEMS: A BASIS FOR EVALUATION,
Washington Univ., Seattle. Dept. of Business, Government and Society.
For primary bibliographic entry see Field 6E.
W78-02829

TIDAL TITLE AND THE BOUNDARIES OF THE BAY: THE CASE OF THE SUBMERGED 'HIGH WATER' MARK,
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 6E.
W78-02843

REAL TIME SIMULATION OF NITROGEN CYCLE IN AN ESTUARY,
Resource Analysis, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5B.
W78-03010

ANALYSIS OF ZOOPLANKTON POPULATION FLUCTUATIONS IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-03014

BIOMASS PRODUCTION IN MASS CULTURES OF MARINE PHYTOPLANKTON AT VARYING TEMPERATURES,
Woods Hole Oceaographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-03018

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DISTRIBUTION OF PLANKTONIC OSTRACODA (HALOPRIDIDAE) IN THE NORTH ADRIATIC WITH THE DESCRIPTION OF A NEW SUBSPECIES, CONCHOECIA PORRECTA ADRIATICA,
Institute of Oceaographic Sciences, Wormley (England).
For primary bibliographic entry see Field 5C.
W78-03019

CONSEQUENCES OF DETERGENT POLLUTION OF THE SEA: EFFECTS ON REGENERATING SPONGE CUBES OF GEODIA CYDONIUM,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5C.
W78-03025

INVESTIGATIONS OF ENERGY FLOW IN SEDIMENTS OF KIEL BAY (BALTIC SEA), (IN GERMAN),
Akademiya Nauk URSR, Kiev. Inst. Zoologii.
S. Boje-Volkmann.
Inst Rev Gesamten Hydrobiol 62(1), p 63-96, 1977.

Descriptors: *Sediments, *Baltic Sea(Kiel Bay), Oxygen consumption(Sediments), ATP, *Bacteria, Carbon, Chlorophyll, Detritus, Fauna, Germany, Nitrogen, Pheo, Pigments, West Germany.

Over a course of 1 yr total O2 consumption of sediment cores was determined for the period of 1 wk in a laboratory flow-through system. The cores were collected during different months of the year and at 2 localities. One of the areas, at about 1 m water depth near the beach, has a C demand of 160 gC/m2/yr. The other one at a water depth of 11 m, a very heterogeneous sediment with a large gravel fraction, had a C demand of 100 gC/m2/yr. As additional parameters for characterization of the sediments and interpretation of the determined metabolic rates particulate organic C and N, ATP, chlorophyll and pheopigment, bacterial counts and fauna composition were used. Both areas can be described as non detritus-accumulating sediments.
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W78-03029

ABYSSAL MEIOBENTHOS IN THE BAY OF BISCAY: I. CONSIDERATIONS ON QUANTITATIVE DATA, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5A.
W78-03030

A QUANTITATIVE STUDY OF THE STRUCTURE AND DYNAMICS OF BENTHIC SUBTIDAL ALGAL VEGETATION IN GHANA (TROPHICAL WEST AFRICA),
Ghana Univ., Legon. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-03037

ENERGY FLOW MODEL OF AN OXYGEN-DEFICIENT ESTUARY ON THE SWEDISH WEST COAST,
Swedish Water and Air Pollution Research Lab., Gothenberg.
For primary bibliographic entry see Field 5C.
W78-03067

EFFECTS OF A FRESHWATER EFFLUENT ON THE DEVELOPMENT OF BENTHIC COMMUNITIES IN A MARINE LAGOON, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5C.
W78-03076

RESONANT SCATTERING BY A HARBOR WITH TWO COUPLED BASINS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-03088

PROCESSES OF SEDIMENT TRANSPORT AND TIDAL DELTA DEVELOPMENT IN A STRATIFIED TIDAL INLET,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, and C. J. Sonu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 556, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 221, to Office of Naval Research, Reprinted from: Estuarine Research, Vol 2, p 63-76, 1975, December 1976. 6 fig, 17 ref. ONR-N00014-75-C-0192.

Descriptors: *Sediment transport, *Deltas, *Estuaries, Florida, Stratification, Inlets(Waterways), Tidal deltas, Tidal inlets.

Flood-tidal and ebb-tidal deltas in East pass, on the northwestern coast of Florida, contrast sharply in form and absolute size. The flood-tidal delta, the more extensive, is characterized by a broad middle-ground shoal separating two diverging flood channels, whereas the ebb-tidal delta consists of a single seaward-narrowing channel flanked by subaqueous levees and having a symmetrical, crescentic, subaqueous bar at the outlet. Form differences result partially from variations in the intensities of different effluent expansion and deceleration mechanisms arising from vertical density stratification. Over the flood-tidal delta, bayward flood flow is concentrated near the bottom beneath lighter bay water. This inflow expands as a hyperpycnal effluent under the influence of bottom friction to produce the observed configuration of the flood-tidal delta. Because flood currents attain their velocity and duration maxima in the lower layer near the bottom, bed-load transport in the channels of the flood-tidal delta is flood-dominated. During ebb, outflow over the ebb-tidal delta is initially buoyant and is restricted to the upper layer as dense sea water intrudes into the inlet near the bottom. With increasing ebb velocities, the salt wedge is forced seaward to a stationary position over the bar front, and outflow in the region between the outlet and the bar crest becomes turbulent. This sequence is similar to that which characterizes the stratified mouths of the Mississippi between low and high river stages. The morphology of the ebb-tidal delta appears to be roughly analogous to that exhibited by stratified river mouths. (Sinha-OEIS)
W78-03089

NEARSHORE PROCESSES ON A FRINGING REEF,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
J. N. Suhayda, H. H. Roberts, and S. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 108, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 225 to Office of Naval Research, Reprinted from: Preprints-Third International Ocean Development Conference held Tokyo, Japan, August 5-8, 1975, Vol 5, p 63-75, December 1976. 6 fig, 1 tab, 32 ref. ONR-N00014-69-A-0211-0003.

Descriptors: *Reefs, *Sedimentation, *Geomorphology, *Waves(Water), Lagoons, Ocean currents, Ocean waves, *Nearshore processes, *Fringing reefs, Grand Cayman Island, Barbados, Wave height.

A field experiment was conducted on Grand Cayman island during 1972 and on Barbados during 1973 to determine the characteristics of wave-dominated nearshore processes in a fringing reef. Results from these field experiments indicate that nearshore processes on reefs occur in a distinctly different pattern from that on sandy coasts. Deep-water wave characteristics are significantly modified by reef morphology before the waves reach the shoreline. Shelf morphologic features produce a significant reduction in wave height, owing to the combined effects of friction, scattering and reflection, at a rate significantly greater than that occurring on sandy coasts. At the fringing reef crest energy loss resulting from breaking produces a substantial reduction in wave height which is accompanied by an extreme modification to the wave spectrum, including the introduction of multiple low-frequency peaks. Wave-induced currents cross the fringing reef crest and interact with lagoon geometry to produce a circulation pattern in the back-reef lagoon characterized by velocities which increase toward the main lagoon outlet. Sediment thickness within the lagoon decreases toward the lagoon opening and increases toward the shoreline. This pattern is in qualitative agreement with the generally predicted lagoon current movement. (Sinha-OEIS)
W78-03090

SEDIMENT TRANSPORT AND DEPOSITION IN A MACROTIDAL RIVER CHANNEL: ORD RIVER, WESTERN AUSTRALIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
L. D. Wright, J. M. Coleman, and B. G. Thom.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 555, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 219, to Office of Naval Research, Reprinted from: Estuarine Research, Vol 2, p 309-321, 1975, December 1976. 7 fig, 1 tab, 7 ref. ONR-N00014-75-C-0192.

Descriptors: *Sediment transport, *Deposition(Sediments), *Estuaries, *Rivers, *Tidal waters, *Australia, Bed load, *Tidal currents, *Ord River(Australia).

The funnel-shaped channel of the lower Ord River in Western Australia, experiences a semidiurnal spring-tide range of 5.9 meters. The tidal prism substantially exceeds river discharge throughout the lower 65 km of the channel, and most of the sediments contributed to the system by the river are transported and deposited by tidal currents. The tide wave is symmetrical at the mouth but becomes deformed upstream owing to a high amplitude/depth ratio. Accordingly, the velocity of flood currents increasingly exceeds ebb velocities upstream, whereas ebb flow increases in duration. In and seaward of the mouth, bed-load transports by flood- and ebb-tide currents are approximately equal. Linear subaqueous sand ridges parallel to tidal currents separate mutually evasive zones of flood- and ebb-dominated sediment transport and appear to be related to convergence of flood- and ebb-oriented bedforms. In response to the upstream increase in tide-wave asymmetry, the largest bedforms within the channel migrate upstream under the influence of flood currents. The upstream increase in asymmetry of the channel cross section and in channel sinuosity. This results in concentrating ebb flows in the decreased cross section of channels, where bed-load transport is ebb-dominated, thereby balancing the sediment budget. (Sinha-OEIS)
W78-03091

ARCTIC COASTAL PROCESSES: AN OVERVIEW,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W78-03093

AN ECOLOGICAL STUDY OF THE EFFECTS OF POWER PLANTS ON BENTHIC

MACROPLANT MICROCOSMS IN SUBTROPICAL AND TROPICAL ESTUARIES,
For primary bibliographic entry see Field 5C.
W78-03094

IMPLICATIONS OF THE U.S. COAST GUARD SEGREGATED BALLAST RETROFIT RULING ON IMPORT ALTERNATIVES AND POLLUTION OF THE MARINE ENVIRONMENT,
Operations Research, Inc., Silver Spring, MD.
For primary bibliographic entry see Field 5G.
W78-03099

PROBABILISTIC TRAJECTORY ASSESSMENTS FOR OFFSHORE OIL SPILLS IMPACTING LONG ISLAND,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W78-03100

AN ESTIMATE OF THE INFLUENCE OF SEDIMENT CONCENTRATION AND TYPE ON REMOTE SENSING PENETRATION DEPTH FOR VARIOUS COASTAL WATERS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-03102

A COMPUTER ANALYSIS OF THE SPREAD OF POLLUTION ON LONG ISLAND BEACHES,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5B.
W78-03103

BASELINE STUDY PROGRAM, NORTH PUGET SOUND. BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL I - TEXT,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 5C.
W78-03104

STUDIES AND INVESTIGATIONS OF THE FATE AND EFFECT OF THE SHELL OIL SPILL, PLATFORM B, BLOCK 26, SOUTH TIMBALIER BAY (DECEMBER 1, 1970 - NOVEMBER 30, 1971),
Resources Technology Corp., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-03106

BASIC REMOTE SENSING INVESTIGATION FOR BEACH RECONNAISSANCE,
Environmental Research Inst. of Michigan, Ann Arbor.
F. Thomson, R. Shuchman, C. Wezernak, D. Lyzenga, and D. J. Leu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 041, Price codes: A06 in paper copy, A01 in microfiche. Interim Report No. ERIM-108900-5-P, to Office of Naval Research, Geography Branch, Arlington, VA, July 1976. 125 p, 25 fig, 10 tab, 55 ref, 4 append. ONR-N00014-74-C-0273.

Descriptors: *Remote sensing, *Beaches, *Coasts, *Water pollution effects, Baseline studies, Water quality control, Pollution abatement, *Outer Continental Shelf.

Progress is reported on three tasks designed to develop remote sensing beach reconnaissance techniques applicable to the benthic, beach intertidal and beach upland zones. Task 1 is designed to develop remote sensing indicators of important beach composition and physical parameters which will ultimately prove useful in models to predict beach conditions. Task 2 is designed to develop remote sensing techniques for survey of bottom features in the benthic zone. Task 3 is designed to develop radar processing techniques to delineate important beach intertidal and upland parameters and to better understand the potential of radar-derived information when used with optical sensor data. (Sinha-OEIS)
W78-03107

A NUMERICAL OIL TRAJECTORY FORECAST MODEL USED TO ASSESS THE HAZARD TO LONG ISLAND BEACHES FROM OIL ENTERING THE NEW YORK BIGHT APEX FROM FEBRUARY 11-24, 1977,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5B.
W78-03109

SALT FLUX AND EDDY STRESSES IN A SHALLOW ESTUARY OF HIGH TIDAL RANGE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 842, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 209, June 1976. 8 p, 1 tab, 6 ref. Reprinted from: Conference on Marine and Freshwater Research in Southern Africa, Port Elizabeth, South Africa, July 1976. ONR-N00014-75-C-0192.

Descriptors: *Estuaries, *Mixing, *Tidal effects, *Salinity, *Eddies, *Ecuador(Rio Guayas estuary), Tidal currents.

Detailed measurements over a tidal cycle of salinity and current speed were taken across a section of the high-tidal-range, shallow estuary of the Rio Guayas in Ecuador. Despite a low freshwater discharge and intense mixing by the strong tidal currents, an ideal well mixed estuary does not develop; a weak vertical salinity gradient persists along the channel. A decomposition of the time-averaged salt flux into 18 terms accounting for the mean advective salt flux, changing cross-sectional area, vertical and lateral gradients in speed and salinity, and time deviations from the time means show that 87% of the total downstream salt flux is accounted for by the freshwater discharge but that 61% of the upstream salt flux necessary to maintain the salt balance is produced by upstream turbulent diffusive flux. This high value for he diffusive flux is predicted by the theories of Hansen and Rattray. Gravitational convection and lateral shear effects make unimportant contributions to the salt balance. Further computations are made of the temporal and spatial variations of the eddy stresses in the channel. The role of the time-dependent nature of the cross-sectional area on the structure of the eddy stresses is isolated for the first time. (Sinha-OEIS)
W78-03111

WATER QUALITY OF TAMPA BAY, FLORIDA: WET-WEATHER CONDITIONS, OCTOBER 1971,
Geological Survey, Tampa, FL. Water Resources Div.; and Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03128

COMPUTER SIMULATION OF TWO-DIMENSIONAL UNSTEADY FLOWS IN ESTUARIES AND EMBAYMENTS BY THE METHOD OF CHARACTERISTICS--BASIC THEORY AND THE FORMULATION OF THE NUMERICAL METHOD,
Geological Survey, Reston, VA. Water Resources Div.
C. Lai.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 162, Price codes: A05 in paper copy, A01 in microfiche. Water-Resources Investigations 77-85, August 1977. 72 p, 12 fig, 2 tab, 16 ref.

Descriptors: *Model studies, *Unsteady flow, *Estuaries, *Computer programs, *Numerical analysis, Shallow water, Mathematical models, Analytical techniques, Computer models, Flow characteristics, Two-dimensional flow, Specified-time-interval scheme, Second-order approximation.

Two-dimensional unsteady flows of homogeneous density in estuaries and embayments can be described by hyperbolic, quasi-linear partial differential equations involving three dependent and three independent variables. A linear combination of these equations leads to a parametric equation of characteristic form, which consists of two parts: total differentiation along the bicharacteristics and partial differentiation in space. For its numerical solution, the specified-time-interval scheme has been used. The unknown, partial space-derivative terms can be eliminated first by suitable combinations of difference equations, converted from the corresponding differential forms and written along four selected bicharacteristics and a streamline. Other unknowns are thus made solvable from the known variables on the current time plane. The computation is carried to the second-order accuracy by using trapezoidal rule of integration. Means to handle complex boundary conditions are developed for practical application. Computer programs have been written and a mathematical model has been constructed for flow simulation. The favorable computer outputs suggest further exploration and development of model worthwhile. (Woodard-USGS)
W78-03130

ASPECTS OF THE VIRAL CONTAMINATION OF SEA WATER: PRELIMINARY RESULTS, (IN ITALIAN),
Messina Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5B.
W78-03147

TUNICATE SPECIES AS MARINE POLLUTION INDICATORS,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5B.
W78-03148

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE APPLICATION OF WIND ENERGY SYSTEMS TO DESALINATION,
Williamson Engineering Associates, Inc., Navarre, FL.
E. A. Cadwallader, J. E. Westberg, and W. R. Williamson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 174, Price codes: A04 in paper copy, A01 in microfiche. Report No. OWRT/S--78/1, April 22, 1977. 59 p, 21 fig, 7 tab, 15 ref, 2 append. 14-34-0001-7523.

Descriptors: *Desalination, Desalination processes, *Wind energy, Energy, Winds, *Membrane processes, Brackish water, *Electric power costs, Electric power production, *Wind turbines, Potable water, Electrodialysis, Reverse osmosis.

The impact of rapidly increasing fuel costs has all but made saline water conversion uneconomical. However, the application of wind energy systems to membrane processes for brackish water conversion offers an economical solution. Commercially

available wind turbines and those under development appear promising for producing electrical energy at costs ranging from five cents down to 1.8 cents per kilowatt hour. It is still possible to reach costs for desalting brackish water at less than $1.00 per thousand gallons with large wind energy/desalination systems. The coupling of wind energy turbines to electrodialysis and reverse osmosis also offers technological advantages, such as variable energy outputs from wind turbines, to optimize variable fluid flows in the desalination processes for maximum, economic production of potable water. Research and development efforts in this direction are indicated.
W78-02701

PURIFICATION OF SALINE WATER,
D. R. Anderson.
U.S. Patent No. 4,036,749, 9 p, 2 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1270, July 19, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Desalination, *Separation techniques, Scaling, Water reuse, Dissolved solids, Chemical precipitation, Pre-treatment(Water).

A method for the pretreatment of water is useful in combination with a subsequent processing involving concentration of the water such as a desalinazation process, e.g., distillation, reverse osmosis, vapor compression, electrodialysis, freezing, ion exchange, etc., or use of the water in evaporative cooling or as boiler feedwater. The pretreatment method as applied to ay of these processes results in a substantial decrease in the scale-depositing impurities of the water prior to the salt concentrating steps of the water processes. The method also utilizes precipitants obtained and is therefore substantially self-sufficient in reagents. The method of the invention comprises the pretreatment of water prior to its use or subsequent treatment, e.g., desalinization, by the addition of a sufficient quantity of magnesium hydroxide and any necessary carbonate source, e.g., carbon dioxide, to the raw water to precipitate a substantial quantity of the dissolved calcium present as insoluble calcium carbonate. The calcium carbonate is recovered, converted to calcium hydroxide which is used as the reagent to treat the brine separated during the desalinization process and to recover magnesium hydroxide. The recovered magnesium hydroxide can then be employed as the precipitant for the precipitation of the calcium as insoluable calcium carbonate from the raw water. (Sinha-OEIS)
W78-02910

NEW ASPECTS OF CLOSED-UP PAPERMAKING SYSTEMS,
Sulzer Bros. Ltd., Winterthur (Switzerland).
For primary bibliographic entry see Field 5D.
W78-03188

3B. Water Yield Improvement

THE APPLICATION OF POLYMERS TO INCREASE SOIL PERMEABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration; and Moscow State Univ. (USSR). Dept. of Physics.
For primary bibliographic entry see Field 2G.
W78-03055

3C. Use Of Water Of Impaired Quality

WEISER-LOWER PAYETTE WATER QUALITY SURVEYS,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5A.
W78-02994

3D. Conservation In Domestic and Municipal Use

IMPACTS OF THE WESTERN DROUGHT ON REGIONAL ELECTRICITY GENERATION.
Federal Power Commission, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-02879

TECHNOLOGY IS NOT ENOUGH: THE PROVISION AND MAINTENANCE OF APPROPRIATE WATER SUPPLIES,
For primary bibliographic entry see Field 6B.
W78-03059

3E. Conservation In Industry

THE APPLICATION OF WIND ENERGY SYSTEMS TO DESALINATION,
Williamson Engineering Associates, Inc., Navarre, FL.
For primary bibliographic entry see Field 3A.
W78-02701

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS. PHASE II. (CHEMICAL 61-79),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-02878

IMPACTS OF THE WESTERN DROUGHT ON REGIONAL ELECTRICITY GENERATION.
Federal Power Commission, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 556, Price codes: A07 in paper copy, A01 in microfiche. Joint FEA/FPC Interim Report No. FEA/D-77/128, March 1977. 117 p, 4 fig, 10 tab, 6 append.

Descriptors: *Electricity, *Droughts, *Water shortage, *Hydroelectric power, Electrical networks, California, Idaho, Oregon, Washington, Hydroelectric plants, Electric power, Electric power demand, Electric power production, Hydroelectricity, Power deficiency, Energy conservation, Emergencies, Contingency planning.

Projected electrical demand and power supply situation in the Western United States, generally, and in the states of Washington, Oregon, Idaho, and California, particularly, were examined for the summer of 1977, noting the impact of the precceding period of drought. The hydro-electric deficiency for summer 1977 (June through September), based on 1976 projections for the region, was estimated to range as high as 19,000 gigawatthours, depending upon spring precipitation for the total U.S. portion of the Western Systems Coordination Council (WSCC) area. For the period considered, the deficiency could have been as high as 39% of the hydroenergy production projected in April 1976. Suggested methods to combat the deficiency included curtailments of interruptible customers; reduction of customer energy use, to be achieved by voluntary and state mandated conservation; and voltage reduction or rotating disconnections of service by the utilities, amounting to about 5% of the projected firm load. However, the balance of the deficiency was to be supplied by fossil fuel plant generation at higher costs to the customer. Recommendations were made for measures to ameliorate problems anticipated, such as conservation of both electricity and water. Appendices describe installed capacities and distribution by type of the WSCC region, current water conditions, drought impacts on electricity situations in specific northwestern U.S. regions, California's thermal generating capacity, other generating facilities, and system contingency procedures in a long-term emergency. (Wares-IPA)
W78-02879

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE CHAPTER 1, INTRODUCTION,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5B.
W78-02881

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE SOAP AND DETERGENT INDUSTRY. PHASE I,
Environmental Protection Agency, Washington, DC. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W78-03053

TECHNOLOGY IS NOT ENOUGH: THE PROVISION AND MAINTENANCE OF APPROPRIATE WATER SUPPLIES,
For primary bibliographic entry see Field 6B.
W78-03059

NATURAL RESOURCES POLICY 1975-1985,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-03083

TREATING WASTEWATER FOR RECYCLING,
Ecodyne Corp., Union, NJ. Industrial Wastewater Div.
For primary bibliographic entry see Field 5D.
W78-03176

ROTATING DISC WASTE TREATMENT SYSTEM MAKES LOW HP DEMANDS, OCCUPIES 1/3 THE SPACE OF PONDS,
Lion Oil Co., Martinez, CA. Avon Refinery.
For primary bibliographic entry see Field 5D.
W78-03186

NEW ASPECTS OF CLOSED-UP PAPERMAKING SYSTEMS,
Sulzer Bros. Ltd., Winterthur (Switzerland).
For primary bibliographic entry see Field 5D.
W78-03188

WATER TREATMENT AND RECYCLING IN A PAPER MILL (RECYCLAGE ET TRAITEMENT DES EAUX DANS UNE PAPETERIE),
For primary bibliographic entry see Field 5D.
W78-03189

ENVIRONMENTALLY SOUND PAPER TECHNOLOGY (UMWELTFREUNDLICHE PAPIERTECHNOLOGIE),
Technische Univ., Darmstadt (West Germany). Waser- und Abwasserforschungsstelle; and Technische Univ., Darmstadt (West Germany). Inst. fuer Paperfabrikation.
For primary bibliographic entry see Field 5D.
W78-03190

THE IMPORTANCE OF THE 'EFFLUENT-FEE-LAW' EXEMPLIFIED BY THE CALCULATION FORMULA FOR THE PULP INDUSTRY (DIE BEDEUTUNG DES ABWASSERABGABENGESETZES NACH MASSGABE DER BEMESSUNGSFORMEL FUER DIE ZELLSTOFFINDUSTRIE),
Papierwerke Waldhof-Aschaffenburg A. G., Raubling (Switzerland).
For primary bibliographic entry see Field 5G.
W78-03191

RAYONIER SPENDS BIG FOR SULFITE RECOVERY.
For primary bibliographic entry see Field 5D.
W78-03192

POLLUTION ABATEMENT=GOOD HOUSEKEEPING=ENERGY/MATERIAL CONSERVATION,
For primary bibliographic entry see Field 5D.
W78-03196

A REVIEW OF THE STATE OF THE ART, (TREATMENT FACILITIES).
For primary bibliographic entry see Field 5D.
W78-03197

FRP TOWER IS KEY PART OF MILL'S RECOVERY UNIT.
For primary bibliographic entry see Field 5D.
W78-03199

3F. Conservation In Agriculture

TIME-LIMITED WATER PERMITS: LEGAL AND ECONOMIC CONSIDERATIONS,
Oklahoma City Univ., School of Law.
R. W. Andersen, and L. F. Rogers.
Gonzaga Law Review, Vol 12, No 2, p 193-230, Winter 1977.

Descriptors: *Water permits, *Irrigation permits, *Water rights, *Washington, *Water allocation(Policy), Irrigable land, Irrigation effects, Administrative agencies, Agriculture, Agricultural runoff, Legal aspects, Land development, Environmental effects, Irrigation efficiency, Regulation, Water utilization, Cost allocation, Economic efficiency, Water distribution(Applied), Permits, Farms, Equitable apportionment, Beneficial use.

Time-limited water permits, issued by the Department of Ecology, are the subject of debate in the state of Washington. The term permits are designed to deal with the increasing demand for the finite water supply from both agricultural and nonagricultural factions. There are competing interests involved. There is an economic interest in maximum efficiency which may be adverse to conservation interests. Economic growth often conflicts with the public interest. The problems are diverse: determining who gets a term permit and who gets a life permit; allocating permits between private and public enterprise; the effects of agricultural irrigation on neighboring states' water supplies. The Water Code of 1917 and the Water Resources Act of 1971 have supplied guidance in the past. In 1976 administrative regulations were developed in response to legislative inaction. The problem at present is in determining who gets preferred status and why. Although public irrigation operations and family farms are currently favored for term permits, such treatment is not supported by either legislation or administrative regulations. The Washington legislature should act to integrate private irrigation development and corporate farming into the term permit system. It should also clarify what right Washington has to interstate water supplies. (Thomas-Florida)
W78-02842

FARMERS INVESTMENT COMPANY V. BETTWY: A JUDICIAL RESTRICTION OF GROUND WATER WITHDRAWALS, COERCING THE ARIZONA LEGISLATURE TO ACT,
For primary bibliographic entry see Field 6E.
W78-02846

THE WATER DEPLETION DEDUCTION IN KANSAS, ITS STATUS AND PROSPECTIVE USE,
For primary bibliographic entry see Field 6E.
W78-02851

OBSERVATIONS ON LONG-TERM FERTILITY OF CULTIVATED SOILS AT GRIMARI (CENTRAL AFRICAN REPUBLIC): RESULTS OF SEMI-INTENSIVE MECHANIZED CULTIVATION TESTS ON MODERATELY DESATURATED RED FERRALITIC SOILS IN THE SUDANO-GUINEAN CLIMATE OF CENTRAL AFRICA,
For primary bibliographic entry see Field 2G.
W78-02867

END-CONTROL AGRICULTURAL SPRINKLER IRRIGATION SYSTEM,
G. Vollmer.
U.S. Patent No. 4,016,902, 9 p, 10 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 957, No 2, p 548, April 12, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Control, Application equipment.

The invention concerns an agricultural sprinkler irrigation system in which a mover unit, equipped with power drive, is located intermediate the length of a sprinkler-carrying pipeline made up of coupled, wheel-mounted sections that are rotated in unison by the power drive during movement of the system from place to place in an area to be irrigated. Effective control for various types of center-powered, agricultural sprinkler irrigation systems is provided by combining control mechanisms, placed between the pipeline and themover unit for transmitting rectilinear movement of a rotating member as rectilinear movement of a non-rotating member; a switch assembly mounted on the mover unit in association with and to control operation of the power drive; operating means associated with the movement-transmitting means; and a control line mounted on and extending along the pipeline to or near one end for operating the operating means to effect actuation of the switch assembly. (Sinha-OEIS)
W78-02893

WATER SCREEN,
R. A. Hensley.
U.S. Patent No. 4,017,394, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 957, No 2, p 711, April 12, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Filtration, Water delivery, Water conveyance, Engineering structures, Hydraulic structures, Filters.

A water screen is provided which as a stream-powered rotary filter member which can be positioned in running water to facilitate the removal of filtered water for irrigation purposes. A filter in the form of a cylindrical perforated drum is rotatably mounted on a frame which is supported by a float in a river or stream. The drum has a means to rotate itself by using power of the moving water. A conduit mounted with the frame and extending into the drum provides a filtered inlet for a conduit to an irrigation pump at a remote location. Moving water of the stream or river rotates the drum, thus passing debris around the drum and clear of the inlet to the conduit. In use the drum is positioned in a partially submerged condition and the means to rotate the drum rotate it regardless of whether or not water is being pumped from the interior of the drum. (Sinha-OEIS)
W78-02896

IRRIGATION APPARATUS,
R. E. Diggs.
U.S. Patent No. 4,017,958, 7 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 957, No 3, p 908, April 19, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Irrigation effects, Application equipment, Pipes, Drip irrigation, Drip emitters.

This invention relates to a trickle type irrigation system and to fittings for use so that irrigating water is caused to trickle or drip in a controlled root zone area to be irrigated at a very low rate of flow. The apparatus is usable either above the surface of the ground or below the surface. The drip emitter is a simple calibrated orifice fitting with a shrouded discharge with a piercing means on one end for quick and easy connection to a plastic water supply pipe. The shroud prevents a spray of water and instead, the water strikes the shroud and is caused to fall in a puddle. The drip emitters are provided in several sizes, color coded, for use in hilly terrain or on long irrigation lines where excessive pressure drop is encountered. A special tool is described for use in installing the drip emitter to a plastic line. (Sinha-OEIS)
W78-02899

RESILIENT SPRINKLER RISER,
Michener Associates, Inc., Pasco, WA. (Assignee).
G. D. Barichello.
U.S. Patent No. 4,018,386, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 957, No 3, p 1053, April 19, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, *Irrigation practices, Application equipment, Mechanical properties, Flexibility.

A resilient sprinkler riser is described for mounting a pulsating type sprinkler head where a nozzle is utilized to direct a spray jet of water in a radial direction from a vertical axis of rotation while a pivoted deflector member operates to rotate the nozzle about the vertical axis. The riser includes a flexible tube that is coaxially mounted within an elongated closed helical tension spring. The spring is fastened at its lower end relative to the tube while its upper end is free to slide coaxially over the tube length. The spring is pretensioned to hold the pipe in an upright condition under the reaction forces exerted by a jet of water exiting through the sprinkler nozzle. However, the spring tension is not sufficient to hold the tube in an upright condition when excessive external lateral forces are applied (i.e. an animal or vehicle coming into contact with the sprinkler head or riser body). When this happens, the riser will deflect in the direction of the force. When the force is removed, the riser will spring back to a normal upright condition. (Sinha-OEIS)
W78-02900

WATER SPRINKLER OPERATED BY REGULARLY VARYING WATER PRESSURE,
F. N. Palma.
U.S. Patent No. 4,019,686, 7 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 957, No 4, p 1469, April 26, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Water delivery, Distribution patterns.

A sprinkler system is provided which can lay down a uniform amount of precipitation upon an odd shaped surface area. This is accomplished by a combination of a plate member having the pattern of the area to be watered and a decoding plate, operated by a stepping mechanism. The patterned plate is situated adjacent to a slotted opening in the lower solid side of a hollow head moveable under water pressure within a cavity formed between the base and a cap of the sprinkler. A nozzle is attached to the upper end of the head to distribute the water passing the restricting window and segment of pattern places in its path in the base. Springs are associted with the head to provide a torque to the sprinkler head as the head rises in the cavity under pressure of the water on the lower side of the head. A gear and ratchet is provided on the head to prevent the head from returning to the

first position upon reduction of the water pressure and resultant reaction of the springs to return the head to its position of rest within the cavity. (Sinha-OEIS)
W78-02904

DRIP IRRIGATION EMITTER,
G. J. Pecaro.
U.S. Patent No 4,036,435, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1171, July 19, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Rates of application, Flow control, Fertilization, *Drip irrigation.

An improved emitter design permits the application of water to plants and trees at a predetermined constant flow rate over a wide range of incoming water pressures. The emitter is constructed of an elongated hollow body, one end of which contains an inlet connector for receiving incoming water and/or fertilizer solution. The other end of the emitter body is fitted with a fluid flow adjusting capping mechanism. A pin, with a tapered end functioning as a reamer, is attached to the emitter and extends axially within the interior of the hollow body. A collar is positioned about the tapered end of the pin, the collar being axially movable to form a varying volume orifice for fluid flow between the collar and the pin. Sealing means are provided to prevent fluid flow between the interior body walls and the collar, thereby preventing fluid flow between the inlet and outlet other than through the orifice. A spring member, constrained between the adjustable capping member and the collar creates an axial force on the collar, forcing it in a direction to close the orifice in the absence of incoming water. (Sinha-OEIS)
W78-02907

SELF-PROPELLED LINEAR IRRIGATION SYSTEM,
N. S. Standal.
U.S. Patent No 4,036,436, 15 p, 16 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1171, July 19, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, *Distribution systems, Lateral conveyance systems, Water distribution(Applied), Sprinkler irrigation.

A self-propelled linear irrigation system is propelled by a high pressure fluid, pneumatic or hydraulic. Energy storage means are provided so that the system can be propelled while disconnected from any supply line. The main tractor has automatic coupling members for coupling to the water supply and compressed air supply and automatically propels itself from one compressed air and water station to the next compressed air and water station along a main supply line. The main tractor travels along a linear guide system, which may be the main water supply line and/or a compressed air line or alternatively a separate guide means such as a taut cable. The tractor has a rigid, central section supported on wheels or other transport means, with interconnecting means between the central section and a line move. (Sinha-OEIS)
W78-02908

EVALUATION OF ARID ZONE SOILS FOR THE PURPOSE OF IRRIGATION, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W78-03150

IRRIGATION EROSION OF LANDS AND ITS CONTROL, (IN RUSSIAN),
For primary bibliographic entry see Field 2J.
W78-03151

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 590, Price codes: A14 in paper copy, A01 in microfiche. Miscellaneous Paper A-77-3, August 1977. 322 p.

Descriptors: *Aquatic plants, *Aquatic weed control, Water hyacinth, White amur, Macrophyte sampling, *Water analysis, *Water quality, Herbicides, Remote sensing.

Contains 37 papers on aquatic plant control that were given at this conference. Some of the subjects covered are U.S. Corps of Engineers involvement in aquatic plant research, water hyacinth infestation, white amur research, macrophyte sampling, water quality analysis, response of hydrilla to herbicides, and remote sensing of aquatic plants. (WES)
W78-02757

A MANAGEMENT PROCEDURE FOR THE INTRODUCTION OF BIOLOGICAL AGENTS FOR CONTROL OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
W. E. Grabau.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 302, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper A-77-2, June 1977. 36 p, 1 fig.

Descriptors: *Aquatic weed control, *Aquatic plants, *Biocontrol, Environmental engineering, Management.

The entire process of introducing a biological control agent for control of a problem aquatic plant species is complex and lengthy. All of it is governed by regulations and sound scientific procedures. A management concept for accomplishing the procedures has been developed for use by those responsible for aquatic plant control using biological agents. (WES)
W78-02758

A CONCEPT FOR THE DEVELOPMENT OF LONG-TERM MANAGEMENT PLANS FOR AQUATIC PLANT CONTROL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. R. Sanders, and J. L. Decell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 301, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper A-77-1, June 1977. 24 p, 1 fig.

Descriptors: *Aquatic plants, *Aquatic weed control, Environmental engineering, Management, Evaluation, Planning, Project planning, Water quality control.

This paper describes a general concept that will serve as a basis for developing well-conceived aquatic plant management plans, as well as a step-by-step guide for implementing measures for long-term aquatic plant control while giving proper consideration to their potential long-term effects on the environment. More specifically, the concept provides a procedure for federal, state, and local agencies to use in the systematic assessment of the aquatic plant problem in a water body, the objective evaluation of all potential control measures, the consideration of water body user demands and environmental constraints, and the development of an operational plan including provisions for monitoring and updating. (WES)
W78-02759

EFFECT OF LOSS OF VALLEY STORAGE IN THE CANNELTON POOL ON OHIO RIVER FLOOD HEIGHTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02760

A COMPUTER-AIDED AERIAL PHOTOGRAPHIC ANALYSIS OF FIRE ISLAND INLET GEOMORPHOLOGY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. H. Barwis, F. C. Perry, and V. E. LaGarde.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 187, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-12, September 1977. 82 p, 16 fig, 19 tab, 1 append.

Descriptors: *Aerial photography, Surveys, *Geomorphology, Computers, New York, *Channels, Dredging, *Fire Island Inlet(NY).

In order to provide information on channel location and configuration and assist in planning of dredging operation, the geometry of Fire Island Inlet, New York, is analyzed. using the 18 sets of aerial photographs taken between April 1962 and April 1972, the locations of shoals, beaches, and channels were determined, digitized for computer analysis, and displayed on drum plots. One of two channel locations proposed by the New York District is considered more appropriate in terms of matching the average channel location. (WES)
W78-02761

A FIELD TEST OF SELECTED INSECTS AND PATHOGENS FOR CONTROL OF WATERHYACINTHS; REPORT 1, PRELIMINARY RESULTS FOR THE 1975-76 SEASON,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
E. E. Addor.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 392, Price codes: A04 in paper copy, A01 in microfiche. Technical Report A-77-2, September 1977. 54 p, 9 fig, 6 tab, 18 ref, 2 append.

Descriptors: *Aquatic plants, *Aquatic weed control, *Insects, *Pathogenic fungi, *Water hyacinth, Louisiana, *Lake Concordia(La), Water quality control.

During the growing season of 1975, a field experiment was initiated on Lake Concordia, Louisiana, to test the potential effectiveness of selected organisms as control agents against waterhyacinths, Eichhornia crassipes (Mart.) Solms. This report describes the experiment, presents the collected data, and summarizes the observations. Statistical analyses and interpretation of the data are also presented. Preliminary indications are that significant reductions in the growth rate or total accumulation of waterhyacinth mass in the test plots were not achieved by any of the treatment combinations during the first season's tests, but the potential for some of the treatments to effect the desired control began to emerge during the second year of observations. Appendix A discusses the life systems of the control organisms; Appendix B discusses the flowering activity of the waterhyacinths. (WES)
W78-02766

GEOMETRIC PARAMETERS THAT INFLUENCE FLOODPLAIN FLOW,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02767

FREEZE-THAW ENHANCEMENT OF THE DRAINAGE AND CONSOLIDATION OF FINE-GRAINED DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Cold Regions Research and Engineering, Hanover, NH.
E. J. . Chamberlain, and S. E. Blouin.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-046 400, Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-16, October 1977. 85 p, 61 fig, 20 ref, 2 append.

Descriptors: *Consolidation, *Drainage, *Freeze-thaw tests, Permeability, *Great Lakes region, *Dredged material.

Fine-grained dredged material obtained from disposal sites in the Great Lakes region was subjected to controlled freeze-thaw cycling in a special laboratory consolidometer. Volume changes and permeabilities were observed after full consolidation and freeze-thaw cycling for applied pressures in the range of 0.93 to 30.73 kPa. It was observed that as much as 20 percent or more volume reduction results when dredged material with liquid limits in the range of 60 to 90 percent is subjected to one cycle of freezing and thawing. The degree of overconsolidation by freezing and thawing appears to decrease with increasing amounts of coarse materials and with increasing plasticity. The vertical permeability of all materials examined was increased as much as two orders of magnitude, the greatest increase in permeability occurring for the fine-grained materials at the lowest stress levels. The application of the phenomenon of overconsolidation by freezing and thawing to disposal sites is discussed and site management procedures are suggested. (WES)
W78-02777

STREAMFLOW SIMULATION-A MODEL BASED ON CANNONICAL EXPANSIONS,
Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-02790

ASYMPTOTIC DISTRIBUTION OF MAXIMUM DEFICIT FOR LINEARLY DEPENDENT INFLOWS IN FULL FLOW REGULATION,
Engineering Consultants, Inc., Denver, CO.
For primary bibliographic entry see Field 2E.
W78-02791

RUN-SUMS OF ANNUAL FLOW SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
Z. Sen.
Journal of Hydrology, Vol 35, No 3/4, p 311-324, November 1977. 1 fig, 2 tab, 7 ref.

Descriptors: Water resources, *Reservoirs, *Flow, *Model studies, Mathematical models, Markov processes, Statistical models, Correlation analysis, Drainage, Storage, Discharge(Water), Rainfall, Precipitation(Atmospheric), Precipitation excess, Probability, Temporal distributions, Hydrology.

One of the main problems in water resources system design is to predict the total amount of water available over an operational period of the project considered. For instance, in reservoir design, if the total amount of water is in excess of the demand, the excess water will be stored; whereas during a deficit period, the extraction of water is necessary, either from the previously stored water in the reservoir or/and if possible, from alternative water resources. Thus, the accumulated water excess plays an important role in the reservoir design. A general methodology which is very useful for determining various run-sum properties of a given hydrologic process was developed on the basis of the random sum of random variables. Application of the method to some independent and dependent processes was given. (Sims-ISWS)
W78-02792

A PARAMETRIC APPROACH TO STATION WEIGHTS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-02793

DESIGN OF REPRESENTATIVE AND KEY RAINGAUGE STATIONS NETWORK FOR FLOOD FORECASTING IN YAMUNA AND DAMODAR RIVERS,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W78-02797

ESTIMATION OF LOW RETURN PERIOD FLOODS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W78-02799

ACCURACY OF SYNTHETIC HYDROGRAPHS DERIVED FROM REPRESENTATIVE BASINS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-02801

TOPOLOGICAL PROPERTIES OF SOME TRELLIS PATTERN CHANNEL NETWORKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 8B.
W78-02818

THE MARSHLAND ISSUE: LEGISLATIVE COMPENSATION FOR LOSSES RESULTING FROM GOVERNMENTAL LAND USE REGULATIONS -- FROM INVERSE CONDEMNATION TO PRODUCTIVE USE,
For primary bibliographic entry see Field 6E.
W78-02853

THE TAKINGS ISSUE IN A NATURAL SETTING: FLOODLINES AND THE POLICE POWER,
Tennessee Univ., Knoxville. School of Law.
For primary bibliographic entry see Field 6F.
W78-02857

SOME RESULTS OF COMPARING THE ECOLOGICAL SCALES OF RAMENSKII, ELLENBERG, HUNDT AND KLAPP, (IN RUSSIAN),
Leningrad State Univ. (USSR). Biological Inst.
For primary bibliographic entry see Field 6G.
W78-02874

AN EXAMPLE OF THE EXPERIMENTAL ANALYSIS OF RUNOFF FACTORS UNDER SIMULATED RAINFALLS, (IN FRENCH),
For primary bibliographic entry see Field 2B.
W78-02898

FLOOD CONTROL SYSTEM FOR A DAM,
Hitachi Ltd. (Japan). (Assignee).
For primary bibliographic entry see Field 8A.
W78-02905

FINGER-FILL CANAL STUDIES, FLORIDA AND NORTH CAROLINA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-03079

REMOVAL OF ALGAE IN NATURAL BODIES OF WATER,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W78-03080

SURFACE-WATER AVAILABILITY, CALHOUN COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03113

SURFACE WATER, BULLOCK COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03114

WATER AVAILABILITY AND GEOLOGY OF HALE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03115

WATER AVAILABILITY OF RANDOLPH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03116

WATER AVAILABILITY, ELMORE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03117

FLOODS IN OHIO--MAGNITUDE AND FREQUENCY,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-03120

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1976.
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03122

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1976.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03123

TIME OF TRAVEL OF SOLUTES IN THE TUSCARAWAS RIVER BASIN, OHIO, AUGUST AND SEPTEMBER, 1974,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03131

TIME OF TRAVEL OF SOLUTES IN SELECTED REACHES OF THE SANDUSKY RIVER BASIN, OHIO, 1972 AND 1973,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03132

DRAINAGE AREAS OF THE GUYANDOTTE RIVER BASIN, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03135

APPLICATION OF REMOTELY SENSED LAND-USE INFORMATION TO IMPROVE ESTIMATES OF STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
E. J. Pluhowski.
Open-file report 77-632, 1977. 85 p, 12 fig, 2 tab, 11 ref.

Descriptors: *Remote sensing, *Aerial photography, *Streamflow, *Land use, *Satellites(Artificial), Delaware, Maryland, Virginia, Evaluation, Regression analysis, Equations, Streamflow, Flow characteristics, Estimating, Landsat imagery.

Land-use data derived from high-altitude photography and satellite imagery are presented for 49 basins in Delaware, and eastern Maryland and Virginia. Based on 1:100,000 scale maps from high-altitude photography, basin land cover was extracted at the generalized Level I and the more detailed Level II classification categories. Level I land-use data summaries were prepared for 46 of the basins using the 1:250,000 scale maps derived from Landsat imagery. Land cover in the basins ranged from 93.9 percent urban at Little Falls Branch near Bethesda, Maryland, to 96.2 percent agricultural at Morgan Creek near Kennedyville, Maryland. Applying multiple regression techniques to a network of gaging stations monitoring runoff from 39 of the basins, it was demonstrated that land-use data from high-altitude photography provides an effective means of significantly improving estimates of streamflow. Forty streamflow-characteristics equations incorporating remotely sensed land-use information, were compared with a control set of equations using map derived land cover. (Woodard-USGS)
W78-03136

POTENTIAL WATER RESOURCES IN THE TURKMEN SSR AND PROSPECTS OF THEIR UTILIZATION, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
B. T. Kirsta.
Probl Osvo Pustyn 6, p 30-35, 1976.

Descriptors: Water utilization, *Water resources development, *Potential water resources, Forests, Pastures, *Rainfall, *USSR(Turkmen SSR).

Potential water resources in Turkmen SSR (USSR) include rainfall floods in ephemeral water courses and short rivers from mountain and hill areas, the runoff on takyrs-like soils in plains. The potential water resources (p.w.r.) are estimated to be 540 million m3 in mountains and nolls and 330 millions m3 in plains. Part of p.w.r. should be used for pasture water supply but most (90%) should be used for takyr reclamation and smooth slopes and mountain valleys afforestation. To use p.w.r. for systematic irrigation is irrational.--Copyright 1978, Biological Abstracts, Inc.
W78-03154

4B. Groundwater Management

UNSTEADY FLOW TO A PUMPED WELL IN A FISSURED WATER-BEARING FORMATION,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2F.
W78-02787

UNSTEADY FLOW TO A PUMPED WELL IN A TWO-LAYERED WATER-BEARING FORMATION,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2F.
W78-02788

FARMERS INVESTMENT COMPANY V. BETTWY: A JUDICIAL RESTRICTION OF GROUND WATER WITHDRAWALS, COERCING THE ARIZONA LEGISLATURE TO ACT,
For primary bibliographic entry see Field 6E.
W78-02846

EXPANSION OF THE RESERVATION OF WATER RIGHTS DOCTRINE,
Nebraska Univ., Lincoln. School of Law.
For primary bibliographic entry see Field 6E.
W78-02850

THE WATER DEPLETION DEDUCTION IN KANSAS, ITS STATUS AND PROSPECTIVE USE,
For primary bibliographic entry see Field 6E.
W78-02851

SURFACE-WATER AVAILABILITY, CALHOUN COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03113

SURFACE WATER, BULLOCK COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03114

WATER AVAILABILITY AND GEOLOGY OF HALE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03115

WATER AVAILABILITY OF RANDOLPH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03116

WATER AVAILABILITY, ELMORE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03117

AVAILABILITY AND CHEMICAL CHARACTERISTICS OF GROUND WATER IN CENTRAL LA PLATA COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03118

AVAILABILITY AND CHEMICAL QUALITY OF GROUND WATER IN THE CRYSTAL RIVER AND CATTLE CREEK DRAINAGE BASINS NEAR GLENWOOD SPRINGS, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03119

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1976.
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03122

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1976.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03123

RISING GROUND-WATER LEVEL IN DOWNTOWN LOUISVILLE, KENTUCKY, 1972-1977,
Geological Survey, Louisville, KY. Water Resources Div.
J. M. Kernodle, and D. V. Whitesides.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 067, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Investigations 77-92, September 1977. 24 p, 9 fig, 27 ref.

Descriptors: *Kentucky, *Groundwater recharge, *Water table, *Potentiometric level, *Foundation failure, Buildings, Saturated soils, Data collections, *Water levels, Observation wells, Forecasting, Evaluation, Louisville area(KY).

Ground-water levels in the alluvial aquifer in Louisville, Jefferson County, Kentucky, are rising at a rate which could cause wet basements and possible structural damage to buildings in the downtown area by 1982. The predicted water level for 1982 is based on the nearly linear increase which has been observed from 1972 to 1977, during which period a rise of as much as 32 feet was recorded in water-level observation wells. Foremost among the possible causes of the rise is a decrease in withdrawal of ground water. (Woodard-USGS)
W78-03124

GROUND-WATER RESOURCES OF DESOTO AND HARDEE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. E. Wilson.
Florida Bureau of Geology, Tallahassee, Report of Investigations No 83, 1977. 102 p, 42 fig, 1 plate, 10 tab, 47 ref, append.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Florida, *Water utilization, Irrigation, Citrus fruits, Water supply, Water quality, Water wells, Pumping, Drawdown, Groundwater recharge, Transmissivity, Potentiometric level, *Floridan aquifer, *DeSoto County(Fla), *Hardee County(Fla).

Ground water in DeSoto and Hardee Counties, Florida, is obtained from a surficial aquifer, which is principally fine sand, and the Floridan aquifer, which consists of two limestone-dolostone units. Average transmissivity of the surficial aquifer is 1,300 feet squared per day, and transmissibity of the combined upper and lower units of the Floridan aquifer is as high as 270,000. Seasonally, the potentiometric surface fluctuates as much as 30 ft. From 1949 to 1973, net declined throughout the area ranged from a few feet to 20 ft. Data from a citrus-grove well field with a pumping capacity of 86 million galons per day indicate drawdowns 5 mi from the grove center will be about 5 ft at the end of each spring pumping period. Water levels will recover during summer non-pumping periods. Water from the upper unit of the Floridan aquifer generally has alower mineral concentration than water from the lower unit. In parts of both counties, concentrations of sulfate, chloride and fluoride exceed limits recommended for drinking water. Ground-water withdrawals averaged 94 million gallons per day in 1970: about 96 percent was for irrigation purposes. Several water-management techniques are hydrologically feasible. (Woodard-USGS)
W78-03125

HYDROLOGIC MONITORING OF A WASTE-INJECTION WELL NEAR MILTON, FLORIDA, JUNE 1975 - DECEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03126

PRELIMINARY STUDY OF SOURCES AND PROCESSES OF ENRICHMENT OF MANGANESE IN WATER FROM UNIVERSITY OF RHODE ISLAND SUPPLY WELLS,
Geological Survey, Boston, MA. Water Resources Div.; and Geological Survey, Providence, RI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03127

GEOLOGY AND GROUND WATER IN WESTERN SANTA CRUZ COUNTY, CALIFORNIA, WITH PARTICULAR EMPHASIS ON THE SANTA MARGARITA SANDSTONE,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03129

GROUND-WATER HYDROLOGY OF THE LOWER MILLIKEN-SARCO-TULUCAY CREEKS AREA, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03133

4C. Effects On Water Of Man's Non-Water Activities

TRANSMISSION LINE RIGHTS-OF-WAY MANAGEMENT,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 6B.
W78-02730

HYDROLOGIC AND METEOROLOGICAL ROLE OF FOREST PLANTATIONS OF VARIOUS TREE SPECIES,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
N. A. Voronkov, S. A. Kozhevnikova, L. T. Pavlushkin, and V. A. Shompolova.
Soviet Hydrology, Selected Papers, Vol. 15, No. 1, p 75-79, 1976. 3 fig, 5 tab, 9 ref. Translated from Forestry (Lesovedeniye), No. 1, p 3-10, 1976.

Descriptors: *Forests, *Runoff, *Forest watersheds, Meteorological data, Hydrologic data, Forestry, Temperature, Air temperature, Evaporation, Humidity, Precipitation(Atmospheric), Rainfall, Snowfall, Hydrographs, Microclimatology, Trees, Vegetation, Vegetation effects, *USSR.

The results of a study of the microclimate and water regime of deciduous, mixed, and pure spruce plantations at the Istra base station of the All-Union Scientific Research Institute of Silviculture and Forestry Mechanization were generalized. A comparative description was given of the air and soil temperature regimes, precipitation interception by the tree crowns, soil freezing, soil moisture, penetration of solar radiation through the crowns, and other meteorological elements. Surface runoff characteristics in basins wooded to different degrees were analyzed. The influence of various tree species on moisture accumulation under the plantations was estimated. (Sims-ISWS)
W78-02806

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT OF RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
D. H. Taylor.
Water Resources Research, Vol. 13, No. 2, p. 464-468, 1977. 1 fig, 1 tab, 11 ref.

Descriptors: *Urban runoff, *Suburban areas, Runoff, *Canada, Snowmelt, Storm runoff, Agricultural runoff, Drainage, Drains, Drainage water, *Rural runoff, Peterborough(Canada).

Rural and suburban runoff in a small basin in Peterborough, Ont., Canada were compared in summer, fall and spring. The study basin, in Kawartha Heights on Peterborough's western periphery, has a mean annual precipitation of 780 mm spread fairly evenly over the year, and is underlain by unconsolidated sandy till. Spring snowmelt usually provides peak runoff flow. The upper rural sector (1.14 sq km) is pasture, woodland, and scrub. In the lower urban sector (0.70 sq km), 38% of the surface was impervious to infiltration (due to paving and buildings) during the study period of all 1973 and spring and summer 1974. An underground storm sewer network plus open ditches drain the urban area. A strong seasonal variation in the runoff-rainfall ration was observed in the urban area, but not in the rural sector. The ratio for urban runoff ranged from 0.06 for summer to 0.16 for fall and 0.76 for spring, compared to 0.05, 0.07 and 0.06 for rural runoff. Urban direct runoff volumes exceeded rural volumes by factors of 1.23 for summer rainstorms, 2.28 for fall rainstorms, and 7.49 for spring snowmelt and rain on snow. Urban peak discharges exceeded rural peaks for the same seasons by ratio of 4.46, 2.42 and 7.10. These seasonal variations in urban runoff-rainfall ratios contradict the usual assumption that urban runoff is controlled in a consistent way by the impervious surface and drain network. (Lynch-Wisconsin)
W78-03062

AERIAL INPUT OF HEAVY METALS INTO AN AQUATIC ECOSYSTEM,
Greenfield, Attaway and Tyler, Inc., San Rafael, CA.
For primary bibliographic entry see Field 5B.
W78-03074

HYDRAULIC ANALYSIS, MAD RIVER AT STATE HIGHWAY 41, SPRINGFIELD, OHIO,
Geological Survey, Columbus, OH. Water Resources Div.
R. I. Mayo.
Open-file report 77-399, 1977. 25 p, 12 fig, 5 tab, 3 ref.

Descriptors: *Hydrologic data, *Floods, *Flood plains, *Highway effects, *Bridges, Ohio, Flood discharge, Flood profiles, Backwater, Storm drains, *Mad River basin, Springfield(Ohio).

A hydraulic analysis of the Mad River in a reach at Springfield, Ohio, was made to determine the effects of relocating State Highway 41. The main channel was cleaned by dredging in the vicinity of the new highway bridge and at the Detroit, Toledo and Ironton Railway bridge upstream. The new highway was placed on a high fill with relief structures for flood plain drainage consisting of a 12-foot corrugated metal pipe culvert and a bridge opening to accommodate the Detroit, Toledo and Ironton Railway and a property access road. The improvement in the capacity of the main channel to carry water was such that, up to a discharge equivalent to a 25-year frequency flood, the water-surface elevation in the reach upstream from the Detroit, Toledo and Ironton Railway bridge would be about 0.6 foot lower than under conditions prior to the construction on State Highway 41. The maximum difference in elevation of the flood water between the upstream and downstream side of the new State Highway 41 embankment would be about 0.2 foot, with an additional 0.2 foot to be expected if the access road were raised 1.5 feet. (Woodard-USGS)
W78-03134

4D. Watershed Protection

GUIDELINES FOR MONITORING AND REPORTING DEMONSTRATION PROJECTS; SECTION 32 PROGRAM, STREAMBANK EROSION CONTROL EVALUATION AND DEMONSTRATION ACT OF 1974,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
E. B. Pickett, and B. J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 397, Price codes: A04 in paper copy, A01 in microfiche. Instruction Report H-77-1, September 1977. 52 p, 9 fig, 9 photo, 15 pl.

Descriptors: *Bank protection, *Erosion control, Monitoring, Projects, Evaluation.

These guidelines are to aid in providing brief, thorough, uniform documentation of the data to be collected by field monitoring and reported for the numerous demonstration projects to be conducted under the Streambank Erosion Control Evaluation and Demonstration Act of 1974 (Section 32 of Public Law 93-251). (WES)
W78-02754

DETAILED DESIGN FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02765

LITERATURE SURVEY AND PRELIMINARY EVALUATION OF STREAMBANK PROTECTION METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2J.
W78-02776

HYDROLOGIC AND METEOROLOGICAL ROLE OF FOREST PLANTATIONS OF VARIOUS TREE SPECIES,
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
For primary bibliographic entry see Field 4C.
W78-02806

BUILDING A BETTER SMALL WATERSHED PROGRAM,
Journal of Soil and Water Conservation, Vol 32, No 4, p 150-57, July 1977.

Descriptors: *Small watersheds, *Water policy, *Project purposes, *Watersheds(Basins), *Watershed managment, Soil conservation, Water conservation, Cost sharing, Treatment, Federal project policy, Project post-evaluation, Agriculture, Project planning, Operation and maintenance, Developed waters, Environmental control, Legislation, Programs, Public benefits, State governments, Local governments.

Early in 1977 the National Watershed Congress asked a special study commission to determine how America's small water watershed program could be improved. The commission stressed that the overall small watershed program is a valuable and important one. It also overwhelmingly endorsed the development of a national water policy. This report sets out those findings as well as the commission's recommendations. Eight areas of concern are covered in the report: program orientation, additional authorities for cost-sharing, public participation, watershed planning, state and local responsibilies, land treatment, federal funding policies, and post-project evaluations. The commission suggests an orientation shift from strictly econmic development to 'quality of life' considerations. There should also be increased local, state and public participation and responsibility in small watershed program planning, development, operation and maintenance. Other recommendations include streamlining program procedures, expansion of post-project evaluations, and federal funding of new planning starts. The report is also interspersed with comments the commission has received from interested parties and knowledgeable sources in the fields of natural resource conservation, environmental protection and agriculture. (Spector-Florida)
W78-02876

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-03137

EFFECT OF ROOT SYSTEMS AND SOIL DENSITY ON ANTIEROSION STABILITY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Melioration.
M. S. Kuznetsov.
Vestn Mosk Univ Ser Vi Biol Pochvoved 31(6), p 100-108, 1976.

Descriptors: Root systems, Soil density, Erosion control, Soil stability, *Scouring velocity(Soils).

The influence of small roots and soil density on the value of bottom scouring velocity was studied. Empirical factors that reflect influence of these agents allows use of calculation scouring velocities more precisely.--Copyright 1978, Biological Abstracts, Inc.
W78-03157

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TOXICITY EVALUATION OF A COMPLEX METAL MIXTURE TO THE SOFTSHELL CLAM MYA ARENARIA,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-02703

THE RAPID ALGAE TEST - A CONTRIBUTION TO THE MEASUREMENT OF TOXICITY (DER ALGENSCHNELL TEST - EIN BEITRAG ZUR TOXIZITATMESSUNG),
Landesanstalt fuer Wasser und Abfall Nordrhein-Westfalen, Duesseldorf (West Germany).
G. Freidrich.
Gewasser und Abwasser, No 57/58, 1975. p 117-120. 1 fig, 5 ref.

Descriptors: *Pollutant identification, *Methodology, *Bioassay, Laboratory tests, Analytical techniques, Toxicity, Wastes, Water quality, Oxygen, Oxygen demand, Primary productivity, *Algae, Phytoplanktobn, *Algal poisoning, Plant growth, Plant physiology.

A rapid test for toxicity using algae is described. Changes in the oxygen production and oxygen consumption of an algae culture are used as indicators of the acute toxicity potential of dissolved toxic substances. (Katz)
W78-02714

TOXICITY TOLERANCE STUDIES UTILIZING PERIPHYTON (TOXITOLERANZVERUCHE AN WASSERMOOSEN),
Duisburg Univ. (West Germany). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-02715

POLLUTION OF THE BALTIC BY CRUDE OIL PRODUCTS (ZANLECZYSZCZENIE BALTYKU SUBSTANCJAMI ROPOPOCHODNYMI),
E. Rakowska, and E. Lysiak.
Prace Morskiego Instytutu Rybackiego, Vol 18, Series A, 1976, p 49-62, 8 tab, 5 fig, 15 ref.

Descriptors: *Pollutant identification, *Oil, *Oil pollution, On-site-investigations, *Water quality, Water pollution effects, Methodology, *Analytical techniques, Laboratory tests, *Spectrophotometry, Oil spills, Surface waters, *Baltic Sea, *Crude oil, Carbon tetrachloride extractabls, *Polar fractions, *Non-polar fractions.

The method of infrared spectrophotometry was applied to determine small amounts of crude oil products polluting sea water. The pollutants extractable with carbon tetrachloride were separated into two fractions, the non-polar regarded as a real oil pollution, and the polar one containing such compounds as glycerides, alcohols, acids, etc. The distribution of oil in the Baltic in 1973 and 1974 was examined with the accuracy of 0.050 mg/l. The concentrations of carbon tetrachloride extractable material ranged from 0.100 to 0.200 mg/l, mainly, and 70% of these values was the non-polar fraction - oil derived hydrocarbons. (Katz)
W78-02716

THE POLLUTION OF THE RHINE ZOOCENOSIS BY MERCURY AND BY ORGANOCHLORINE COMPOUNDS (LA POLLUTION DE LA ZOOCENOSE RHENANE PAR LE MERCURE ET LES PRODUITS ORGANOCHLORES),
Institut de Botanique, Strasbourg (France). Lab. de Ecologie Vegetale.
C. Kempf, and B. Sittler.
La Terre et la Vie, Vol 31, No 4, October 1977, p 661-668. 3 tab, 2 fig, 8 ref. (English Summary).

Descriptors: *Metals, *Mercury, *Fishkills, *Chlorinated hydrocarbon pesticides, DDE, *Polychlorinated biphenyls, Arochlor, *DDT, Minnows, Perches, Wildlife, Birds, Yellow perch, Gulls, *Rhine River, Rutilus, Leuciscus, Perca, Larus, Sterna, Grebes, Podiceps, *Herons, *Hawks, *Swallow, Bird eggs.

After a mass mortality of fish in river Rhine, determinations of various toxichemicals (Mercury and organochlorine compounds) were made in five species of fish and in the eggs of six species of birds. The high concentrations of these pollutants found both in fish and birds quite probably explain their increased mortality rate during the period 1973-1975; it might also be responsible for some abnormal behaviour patterns recently noticed among gulls. (Katz)
W78-02718

INTERCALIBRATION OF GAS CHROMATOGRAPHIC ANALYSES FOR HYDROCARBONS IN TISSUES AND EXTRACTS OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, MA.
J. W. Farrington, J. W. Teal, G. C. Medeiros, K. A. Burns, and E. A. Robinson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 949, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. WHO 1-76-107, IDOE 76-310, November 1976, 6 p. Reprinted from Analytical Chemistry, Vol. 48, Oct. 1976, p 1711-1716. 5 tab, 9 ref.

Descriptors: *Pollutant identification, *Methodology, *Laboratory tests, Lipids, Laboratory methods, Chemical analysis, *Oil, *Oil pollution, *Laboratories, Biochemistry, Water pollution effects, Path of pollutants, *Instrumentation, *Calibrations, Chromatography, *Gas chromatography, *Hydrocarbons, Intercalibration, Tuna meal, Cod liver lipids, *Petroleum hydrocarbons, *South Louisiana crude, *No. 2 Fuel oil, *Wilmington crude oil, *Pristane.

Gas chromatographic analyses of hydrocarbons separated from tuna meal samples and cod liver lipid extracts have been intercalibrated among three laboratories. Measurement of petroleum hydrocarbons spiked to samples of cod liver oil gave values as follows: distillate cut of South Louisiana crude oil--372 microg/g, 0.09, 0.06; No. 2 fuel oil--1163 microg/g, 0.50, 0.26; Wilmington crude oil--913 microg/g, 0.69, 0.34. The estimates of petroleum hydrocarbons in tuna meal subsamples gave an average of 37.7 plus or minus 4.6 microg/g dry weight. Measurements of pristane in cod liver lipid samples gave an average of 35.7 plus or minus 3.5 microg/g lipid and 271 plus or minus 4.5 microg/g lipid. Measurements of pristane in tuna meal were less precise with an average of 2.4 plus or minus 1.5 microg/g dry weight. Some limitations to current methods of analysis as applied in this study and in several current oil pollution studies are demonstrated and discussed. (Katz)
W78-02729

GROWTH OF ROCK BASS, AMBLOPLITES RUPESTRIS, IN RELATION TO THE MORPHOEDAPHIC INDEX AS AN INDICATOR OF AN ENVIRONMENTAL STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.
P. M. Ryan, and H. H. Harvey.
Journal of the Fishery Research Board of Canada, Vol. 34, 1977, p 2079-2088. 4 tab, 6 fig, 27 ref.

Descriptors: *Bioindicators, *Air pollution, *Air pollution effects, Environmental effects, *Stress, Lakes, *Acidic water, Acids, Bass, Freshwater fish, *Fish populations, Growth rates, Hydrogen concentration, *Rock bass, *Ambloplites, *Morphoedaphic index, Environmental stress, *Lake acidification, Fish growth rate, Population density.

Atmospheric contamination by sulfur dioxide in the Sudbury region and the associated acidification has reduced population densities of fishes in the La Cloche Mountain lakes, 33-90 km away. Surviving rock bass (Ambloplites rupestris) responded to decreased abundance with increased growth rate. Variation in abundance among surviving populations could be monitored by means of individual growth rates and mean lake depth. Our findings suggest that growth rate of fishes, in conjunction with the morphoedaphic index, may serve as an indicator of environmental stress. (Katz)
W78-02736

ISOLATION OF TRICHODERMA HARZIANUM (RIFAI) GROWING ON FERRIC HYDROXIDE MUD IMPREGNATED WITH GAS OIL,
Societe Francais des Petroles BP, Paris. Div. of Microbiology.
C. Gudin, and K. W. A. Chater.
Environmental Pollution, Vol. 14, 1977, p 1-4. 5 ref.

Descriptors: *Fungi, *Oil, *Oil pollution, *Biodegradation, Bioassay, Biological treatment, Microbiology, Water pollution, Water pollution effects, Waste disposal, *Fuel oil, Gas-oil, *Ferric hydroxide mud, Fungal growth, *Trichoderma harzianum, Oil contaminated water, Fungal growth.

In northern France, gas oil-impregnated ferric hydroxide mud was found to support fungal growth. The fungus was identified by the Commonwealth Mycological Institute, Kew, with whom a reference culture has been registered. Experiments indicated that its growth resulted from the biodegradation of the gas oil. It is believed that, in this unusual situation, contaminating hydrocarbons may be removed from the environment by microbial activity. (Katz)
W78-02738

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-02739

ECOLOGICAL AND DISEASE STUDIES OF DEMERSAL FISHES IN PUGET SOUND NEAR METRO-OPERATED SEWAGE TREATMENT PLANTS AND IN THE DUWAMISH RIVER,
Washington Univ., Seattle. Fisheries Research Inst.
B. S. Miller, B. B. McCain, R. C. Wingert, S. F. Borton, and K. V. Pierce.
Puget Sound Interim Studies, Municipality of Metropolitan Seattle, Final Report No. CR2231, 1977. 164 p, 39 fig, 39 tab, 216 ref.

Descriptors: *Demersal fish, *Marine fish, *Distribution, *Effluents, *Municipal wastes, *Sampling, *Fish diseases, Ecosystems, Rivers, Water quality, Water pollution sources, Fish parasites, Biological communities, Baseline studies, Speciation, Population, Washington, *Duwamish River(Wash), *Puget Sound(Wash), *Flatfish, Tissue analysis, Bottom fish.

The effects of sewage effluent on demersal fish community structure and the relationship between sewage outfalls and disease incidence and parasite infestation levels were investigated. Baseline data for future sewage treatment procedures analysis on demersal fish was collected. A sampling program was designed to collect data on species composition, distribution, and abundance as well as disease and parasite incidences in the vicinity of two sewage outfalls and a control site. The Duwamish River study provided data on the spatial and temporal distribution of tumor-bearing and parasitized flatfishes- in particular starry flounder. Additional data were gathered on the distribution and abundance of all non-flatfish species. (Klein)
W78-02741

A SELECTED BIBLIOGRAPHY ON RAINBOW TROUT, SALMO GAIRDNERI RICHARDSON, WITH PARTICULAR REFERENCE TO STUDIES WITH AQUATIC TOXICANTS,
Environmental Protection Service, Halifax (Nova Scotia). Environmental Services Branch.
For primary bibliographic entry see Field 5C.
W78-02742

TOXICITY OF TNT WASTEWATER (PINK WATER) TO AQUATIC ORGANISMS,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-02743

DEVELOPMENT OF AN ON-LINE BIOLOGICAL DETECTOR,
Gulf South Research Inst., New Orleans, LA.
K. Ehrlich, E. Klein, and J. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 493, Price codes: A04 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington D.C., July 1976. 54 p, 1 tab, 16 fig, 27 ref.

Descriptors: *Public health, *Toxins, Methodology, Laboratory tests, Animal physiology, Laboratory equipment, Oxygen demand, Oxygen requirements, *Water supplies, *Domestic water, *Pollutant identification, *Toxicants, *Recycled water, *Cell culture, Oxygen utilization, Glucose utilization, Lactic acid excretion rate.

Mammalian cells are being grown in artificial capillary perfusion culture in an effort to develop a sensor for toxic components in recycled water intended for human consumption. Cultures of BHK or L929 cells can be established in capillary culture in one week or less by planting the units with a high seed population. Culture using either 1% or 10% calf-serum-containing medium allows the cells to reach a plateau in growth. Cultures can be maintained in either a once-through perfusion mode or a recirculation perfusion mode for prolonged periods at rates slow enough to allow rapid measurement of oxygen and glucose utilization and lactic acid excretion rate provided that (1) the flow rate is slow enough and (2) the toxin is in direct contact with the cells. (Katz)
W78-02746

THE TOXICITY OF URANIUM AND PLUTONIUM TO THE DEVELOPING EMBRYOS OF FISH,
Oak Ridge National Lab.
For primary bibliographic entry see Field 5C.
W78-02747

NATIONAL SURVEY OF PESTICIDES IN DRINKING WATER,
Stanford Research Inst., Menlo Park, CA.
E. M. McCarthy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 659, Price codes: A07 in paper copy, A01 in microfiche. Office of Water Supply. Environmental Protection Agency, Wash., D.C. Final Report No. PYU-4070, June 1976. 145 p, 3 tab, 91 fig.

Descriptors: Potable water, *Pollutant identification, *Public health, *Water supply, *Aldrin, *Dieldrin, *DDT, *Heptachlor, Analytical methods, Laboratory tests, *Chlorinated hydrocarbon pesticides, Monitoring, Gas chromatography, Spectroscopy, *Heptachlor epoxide, *Chlordane, Mass chromatography, Mass spectral analysis, *Anthracene, *Atrazine, Phthalate, *Chloronaphthalene, *Triphenyl phosphate.

More than 700 samples of raw and finished drinking water were analyzed for the presence of aldrin, dieldrin, DDT, and DDT metabolites. Thirty samples were also analyzed for the presence of heptachlor, heptachlor epoxide and chlordane. At the levels of detection, 107 water samples were found to contain dieldrin, 4 contained aldrin and dieldrin, 6 contained dieldrin and DDT, and 2 contained DDT. No samples were found to contain heptachlor, heptachlor epoxide or chlordane at or above the minimum levels of detection. (Katz)
W78-02750

MICROBIAL METABOLISM OF POLYCHLORINATED BIPHENYLS. STUDIES ON THE RELATIVE DEGRADABILITY OF POLYCHLORINATED BIPHENYL COMPONENTS BY ALKALIGENES SP.,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W78-02752

PESTICIDE RECOVERY STUDIES FOR EVALUATION OF PEST MANAGEMENT AND PESTICIDE MONITORING DIVISION WATER ANALYSIS METHODOLOGY, JUNE 1974-JUNE 1976,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
J. H. Vinopal, and J. F. Suprock.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 003, Price codes: A02 in paper copy, A01 in microfiche. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD, Entomological Special Study No 44-038-74/76, 1976, 18 p. 10 tab.

Descriptors: *Methodology, *Pesticides, Monitoring, *Laboratory tests, Water quality, Path of pollutants, *Analytical techniques, Insecticides, *DDD, Chlorinated hydrocarbon pesticides, *DDT, *DDE, *Dieldrin, *Heptachlor, Instrumentation, *BHC, Chloropyrifos, *Heptachlor epoxide, *Lindane, *Mirex, *Parathion, Recovery studies, *Instrumental sensitivity, Automatic integration.

This final report describes percent recovery studies carried out using 10 representative pesticides for the validation of the environmental surface water analysis method used in the Department of the Army Pesticide Monitoring Program. In addition, this report presents lower limits on nstrumental sensitivity for the 26 pesticides of the DA Pesticide Monitoring Program routine monitoring list. Thirdly, this report presents data comparing automatic integration (Auto Lab System IV Computing Integrator) and manual (peak height measurement) quantitation techniques. (Katz)
W78-02753

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED FOUNTAIN LAKE, COLORADO.
Army Engineers Waterways Experiment Station, Vicksburg, MS.
R. W. Hall, and D. L. Robey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 434, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper Y-77-4, July 1977. 61 p, 1 fig, 13 tab, 1 append, 17 ref.

Descriptors: *Reservoirs, *Water analysis, *Water quality, Colorado, Measurement, Pre-impoundment, Evaluation, Data collections, Nutrients, Bioassay, Pollutant identification, *Fountain Lake(Colo).

The proposed Fountain Lake would be formed by impoundment of Fountain Creek in southwestern Colorado immediately north of Pueblo. Authorized project purposes are flood control, fish and wildlife enhancement, and recreation. The purpose of the present study was to investigate possible water-quality problems that might occur in the proposed impoundment and evaluate the suitability of the project for general recreational and fish and wildlife purposes. The procedures used in this study included an evaluation of existing data and pervious studies on Fountain Creek and adjacent reservoirs, collection and evaluation of additional field data, determination of available and limiting nutrients through algal bioassays, and comparison of measured or predicted results with existing or proposed water-quality criteria. (WES)
W78-02755

SUMMARY REPORT, ARCADIA LAKE WATER-QUALITY REPORT STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. W. Hall, R. L. Eley, and D. L. Robey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 722, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper Y-77-3, July 1977. 27 p.

Descriptors: *Water quality standards, *Mathematical models, *Nutrients, Oklahoma, Bioassay, Pollutant identification, Water pollution sources, Lakes, *Arcadia Lake(Okla).

The water quality of the proposed Arcadia Lake, Oklahoma, was evaluated relative to water-quality criteria and standards appropriate for the project purposes. Study procedures included evaluation of existing data and previous studies of streams and lakes in the project area; collection and evaluation of additional field data; determination of available and limiting nutrients through algal bioassays; establishment of relationships between stream discharges and loadings of nutrients, metals, and pesticides based on stream concentrations and land-use patterns; application of various mathematical models; and comparison of predicted or measured results with existing or proposed water-quality criteria. A comparison of average values for 70 water-quality parameters with the most stringent standard or criterion revealed that ammonia, manganese, mercury, DDT, dieldrin, aldrin, chlordane, lindane, heptachlor, PCB, phenols, and recal coliforms equaled or exceeded permissible or recommended levels at least part of the time. Only coliform bacteria, ammonia, and manganese exceeded present Oklahoma standards applicable to proposed reservoir uses. Ammonia would not be expected to reach toxic concentrations in the hypolimnion of Arcadia Lake or interfere with project purposes. (WES)
W78-02756

WATER-QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
K. W. Thornton, D. E. Ford, R. W. Hall, Rex Eley, and D. L. Robey.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 003, Price codes: A04 in paper copy, A01 in microfiche. Technical Report Y-77-3, May 1977. 49 p, 28 fig, 1 tab, 5 ref.

Descriptors: *Water quality, *Reservoirs, Mathematical models, Oklahoma, Evaluation, Lakes, Arcadia Lake(Okla).

This study evaluated the water quality of the proposed Arcadia Lake at the lower pool elevation, 305 m msl, and supplemented the principal report, 'Arcadia Lake Water-Quality Evaluation,' conducted at pool elevation 311 m msl. The water quality of the proposed Arcadia Lake at the lower pool elevation was investigated using a version of the reservoir portion of the Water Quality for River-Reservoir Systems (WQRRS) ecological model. Although other water-quality constituents were simulated, the study concentrated on temperature, dissolved oxygen, algae, and coliform bacteria concentrations. Chemical and biological model coefficients and meteorological, streamflow, physical, chemical, and biological model updates for study years 1970 and 1973 were identical to those used in the principal study. (WES)
W78-02780

FORECAST OF THE CHANGE IN THE HYDROLOGIC BUDGET, LEVEL, AND MINERAL CONTENT OF LAKE BALKHASH IN THE NEXT TEN YEARS,
For primary bibliographic entry see Field 2H.
W78-02805

A TITRATION APPARATUS FOR THE DETERMINATION OF DISSOLVED OXYGEN IN SEAWATER,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy, C. C. Cunningham, C. D. W. Conrad, and J. D. Moffatt.
Journal of the Fisheries Research Board of Canada, Vol 34, No 11, p 2218-2220, November 1977. 1 fig, 2 ref.

Descriptors: *Dissolved oxygen, *Analytical techniques, *Water analysis, *Sea water, *Instrumentation, Oxygen, Water properties, Analysis, Chemistry, Chemical analysis, Testing, Testing procedures, Volumetric analysis, Oceanography, *Oxygen measurements.

A novel titration apparatus for the Carritt/Carpenter modification of the Winkler method for determining dissolved oxygen in seawater was described. Routine quantitative analyses for oxygen are made more reliable and more convenient by reducing the human factor. (Henley-ISWS)
W78-02815

LEACHATE TESTING TECHNIQUES SURVEYED,
Mitre Corp., McLean, VA. METREK Div.
W. Lowenbach, F. Ellerbusch, and J. A. King.
Water and Sewage Works, p 36-46, December 1977. 1 fig, 5 tab, 12 ref. EPA 68-02-1859.

Descriptors: *Leachate, *Landfills, *Waste disposal, *Pollutants, *Environmental sanitation, Infiltration, Leaching, Percolation, Runoff, Solubility, Solid wastes, Water quality, Water chemistry, Water properties, Model studies, Testing procedures, *Leachate testing, *Environmental assessment, Leachate transport.

A summary was presented of the laboratory and field techniques applicable to the assessment of leachate from solid waste disposal landfills. The impact on the ground surface water quality resulting from the leachate was discussed. (Henley-ISWS)
W78-02816

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II (CHEMICALS 1-20),
Stanford Research Inst., Menlo Park, CA.
S. L. Brown, F. Y. Chan, J. L. Jones, D. H. Liu, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 161, Price codes: A09 in paper copy, A01 in microfiche. Final Report, April 1975. 192 p, 20 fig, 20 tab, 23 ref. Report NSF-RA-E-75-190A. ECU-3386.

Descriptors: *Chemical analysis, *Chemical industry, *Chemicals, *Chemical wastes, *Chemical properties, Toxicity, Environmental effects, Hazards, Public health, Data collections, Industrial wastes, Pharmacology, Manufactured chemicals, Contaminants.

In Phase II of a two-phase effort, 80 chemicals having the greatest potential for environmental effects were studied. In this volume, chemicals 1-20 are discussed. Information was collected on the extent of the exposure of the environment to these chemicals (during manufacture and use) and on the possible environmental effects of this exposure (chemical, physical, and biological properties, persistence, and toxicity). A questionnaire survey of industry was conducted to determine the amount and types of losses in the manufacturing plants, and information from this survey is tabulated. Summary reports are given for each chemical, including a flow diagram showing industrial data on the amounts used for various applications, a one page assessment of the data gathered on toxicology and environmental persistence, a computer printout of a tabular summary of the important data gathered, and copies of the 25 most pertinent abstracts found in the area of toxicology. (Wares-IPA)
W78-02877

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS. PHASE II. (CHEMICAL 61-79),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-02878

AN AUTOMATED GAS CHROMATOGRAPHIC SYSTEM FOR PESTICIDE RESIDUE ANALYSIS,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
J. H. Johnson, E. E. Sturino, and S. Bourne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 690, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-905/4-77-001, January 1977. 9 p, 1 tab, 22 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *Automation, *Analytical techniques, Chemical analysis, *Pollutant identification, Monitoring, *Phthalates.

Gas chromatograms of pesticides and phthalate esters obtained by an automatic injection system are analyzed by a computerized gas chromatographic data system. The system provides for simultaneous injection onto two independent columns equipped with individual detectors. The gas chromatographic output is processed by the computer into a report for each column, listing the names and concentrations for compounds of interest. The system has sufficient reliability to allow detection of chlorinated pesticides at the picogram level and organophosphorus pesticides and phthalates at the nanogram level. This system can be readily incorporated into currently accepted methods for pesticide residue analysis, and once the system is calibrated, 42 samples can be analyzed for 45 parameters without operator intervention. Use of the semi-automatic pesticide analysis system will enable more effective use of available manpower in water monitoring programs. The system has been employed successfully to analyze drinking waters, surface waters, waste waters, biological (fish) extractions and sediment extractions. (Wares-IPA)
W78-02880

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME I. USERS MANUAL.
National Training and Operational Technology Center, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 224, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-430/1-76-011, September 1976. (Volume I of 4 volumes.) 89 p, 36 fig, 4 tab.

Descriptors: *Abstracts, Documentation, Bibliographies, Publications, Classifications, Data collections, Data processing, Data storage and retrieval, Information exchange, Information retrieval, Thesauri, Training, Education, *Indexing, Books, Cataloging, Information systems, Subject indexing, Technical reports, Water Quality Instructional Resources Information System(IRIS).

A users manual to assist in learning the basic philosphy and procedures used in the Water Quality Instructional Resources Information System (IRIS) is presented. IRIS contains approximately 2,000 references to materials available for use in education and training programs related to water quality, cataloged with library reference information and classification according to training applications. Materials can be selected based on subject area, educational level, type of training, and type of material, with each entry containing an abstract, source, and cost. The user manual gives instructions for defining IRIS; obtaining a complete reference for any IRIS item; obtaining references given combinations of relevent information, e.g., author's name and date; entering a reference into IRIS; determining whether an instructional resource is in IRIS similar to a proposed instructional material development project; filling out a selective bibliography search request form; naming the computer hardware required to service the system; and naming the software packages required to implement IRIS. (See also W78-02883 thru W78-02885) (Wares-IPA)
W78-02882

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME II. IRIS TABLES. THESAURUS, SOURCE CODE TABLE AND SOURCE NAME TABLE.
National Training and Operational Technology Center, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 225, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-430/1-76-012, September 1976. Volume II of 4 volumes. 88 p, 2 tab.

Descriptors: *Abstracts, Documentation, Bibliographies, Publications, Classifications, Data collections, Data processing, Data storage and retrieval, Information retrieval, Thesauri, Training, Education, *Indexing, Books, Cataloging, Information systems, Subject indexing, Technical reports, Water Quality Instructional Resources Information System(IRIS).

The thesaurus, source code table, and source name table for users of the Water Quality Instructional Resources Information System (IRIS) are presented. IRIS contains approximately 2,000 references to materials available for use in education and training programs related to water quality, cataloged with library reference information and classification according to training applications. Materials can be selected based on subject area, educational level, type of training, and type of material, with each entry containing an abstract, source, and cost. The thesaurus presents the IRIS vocabulary structure. The source code provides information about the publishing source for various materials, and the source name table provides an alphabetic listing of publishing sources names. (See also W78-02882) (Wares-IPA)
W78-02883

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME III. IDENTIFICATION NUMBER MASTER REPORT.
National Training and Operational Technology Center, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 226, Price codes: A21 in paper copy, A01 in microfiche. Report No. EPA-430/1-76-013, September 1976. Volume III of 4 volumes. 488 p.

Descriptors: *Abstracts, Documentation, Bibliographies, Publications, Classifications, Data collections, Data processing, Data storage and retrieval, Information exchange, Information retrieval, Thesauri, Training, Education, *Indexing, Books, Cataloging, Information systems, Subject indexing, Technical reports, Water Quality Instructional Resources Information System(IRIS).

The identification number master report for users of the Water Quality Instructional Resources Information System (IRIS) is presented. IRIS contains approximately 2,000 references to materials available for use in education and training programs related to water quality, cataloged with library reference information and classification according to training applications. Materials can be selected based on subject area, educational level, type of training, and type of material, with each entry containing an abstract, source, and cost. The identification number master report presents information for each reference on EPA identification number, copyright code, title, publication date, author, media type, water quality category, educational level, orginating source, cost, purchase/rent code, thesaurus subjects, special characteristics, and abstracts. (See also W78-02882) (Wares-IPA)
W78-02884

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME IV. SUBJECT INDEX.
National Training and Operational Technology Center, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 227, Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-430/1-76-014, September 1976. Volume IV of 4 volumes. 425 p.

Descriptors: *Abstracts, Documentation, Bibliographies, Publications, Classifications, Data collections, Data processing, Data storage and retrieval, Information exchange, Information retrieval, Thesauri, Training, Education, *Indexing, Books, Cataloging, Information systems, Subject indexing, Technicalreports, Water Quality Instructional Resources Information System(IRIS).

The subject index for users of the Water Quality Instructional Resources Information System (IRIS) is presented. IRIS contains approximately 2,000 references to materials available for use in education and training programs related to water quality, cataloged with library reference information and classification according to training applications. Materials can be selected based on subject area, educational level, type of training, and type of material, with each entry containing an abstract, source, and cost. The subject index provides controlled subject access to training materials retained in IRIS by categorizing each item by as many as 16 subjects; all of these are selected from a controlled thesaurus which supports the system. (See also W78-02882) (Wares-IPA)
W78-02885

PRECIPITATION SCAVENGING (1974).
Department of Energy, Oak Ridge, TN. Technical Information Center.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-741003, Price codes: A99 in paper copy, A01 in microfiche. Proceeding of symposium held, Oc, 14-18, 1974, Champaign, IL, Report ERDA Symposium Series 41, CONF-741003, 1977. 842 p, 274 fig, 82 tab, 1,087 ref. Cooridinators: R. G. Semonin and R. W. Beadle.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Aerosols, *Snowfall, *Storms, Meteorology, Chemistry, Biology, Geology, Oceanography, Pollutants, Pollutant identification, Analytical techniques, Rates, Estimating equations, Sulfur compounds, Basic data collections, On-site data collections, *Precipitation scavenging, *Pollutant distribution, Microphysics.

Papers on global aerosol production and rainfall research from an interdisciplinary group of scientists in the fields of chemistry, biology, geology, meteorology, and oceanography are presented. The general view of precipitation scavenging was given in an introductory paper focusing on problems associated with the collision efficiency for particles by drops, rain and snow scavenging, and scavenging in frontal and convective storms. It is suggested that major uncertainties about collision efficiency stem from the lack of appropriate laboratory data for submicron particles. A formula for collision efficiency for particles by drops is presented; it contain a revision of the contribution from interception. Because of uncertainties about the collection efficiency and raindrop size distributions, a gross approximation for the rain scavenging rate is suggested. Comparisons with field data lead to concern that simultaneous dry deposition may have seriously biased the data. A similar gross approximation is suggested for the snow scavenging rate. The formulas developed may be used to predict scavenging from plumes and clouds, taking into account other problems, such as modification of the pollutant in the atmosphere, precipitation within clouds, pollutant distribution, and pollutant trajectories. Finally, maximum scavenging rates to be used for safety analyses are proposed. Other papers presented concern scavenging ratio measurements, sulfur dioxide scavenging research, laboratory and theoretical microphysics, mesoscale field studies, regional studies, and scavenging modeling. A supplementary bibliography, list of symposium attendees, and an index to the symposium papers are also provided. (Wares-IPA)
W78-02886

PROCESS AND APPARATUS FOR ASCERTAINING THE CONCENTRATION OF MICROORGANISM IN A WATER SPECIMEN,
McDonnell Douglas Corp., St. Louis, MO. (Assignee).
J. W. Lanham, J. T. Holen, and N. L. Fadler.
U.S. Patent No. 4,018,652, 10 p, 10 fig, 3 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 957, No 3, p 1138, April 19, 1977.

Descriptors: *Pollutant identification, *Patents, Water quality, *Water analysis, Testing, *Sampling, Evaluation, Bioindicators, Microorganisms, Laboratory tests.

The concentration of microorganisms in a known volume of a water specimen is ascertained by introducing the water specimen into a number of wells or viewing containers which have known volume and contain a nutrient medium. The mixture of water specimen and nutrient medium is incubated and the wells are observed for a change in appearance which indicates metabolic activity, that is, the existence of microorganisms in the wells. If all the wells change appearance, then it is known that the concentration exceeds a certain limit, that is, at least one cell per specific well volume. On the other hand, if none of the wells change, then it is most likely the concentration is less than one cell per total volume of specimen in the wells. A change in appearance of some but not

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all of the wells indicates a concentration between the foregoing limits, and this concentration is estimated by statistical evaluation based on proven statistical computations. (Sinha-OEIS)
W78-02901

WEISER-LOWER PAYETTE WATER QUALITY SURVEYS,
Environmental Protection Agency, Seattle, WA. Region X.
D. R. Tangarone, and B. Bogue.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 075, Price codes: A09 in paper copy, A01 in microfiche. Working Paper No. EPA 910/8-76-098, 1975. 192 p, 53 fig, 8 tab, 5 append.

Descriptors: *Water quality, *Idaho, *Irrigation effects, *Water pollution, Baseline studies, Irrigation, Coliforms, Nutrients, Data collections, Monitoring, River basins, Watersheds(Basins), Agricultural runoff, Effluents, *Weiser River(ID), *Payette River(ID), Snake River Basin, Nonpoint pollution.

The Weiser and lower Payette Rivers, in the Middle Snake River Basin, (ID) were surveyed to determine effects of irrigation activities and point source discharges on water quality. Stream water quality and biological populations, as well as municipal, industrial, and agricultural pollution sources were monitored during 1975 in August, the irrigation season, and in December, the higher flow nonirrigation period. Extensive tables are given. Findings for the lower Payette included: (1) algal increases caused dissolved oxygen supersaturation in August; (2) 13-16% of NO2 + NO3 and total P in August was attributable to the B Lateral drain; (3) total and fecal coliform standards were violated in the lower 25 mi during both surveys; (4) during summer, nutrients, solids, conductivity, turbidity, and bacteria increased substantially from Black Canyon Dam to the mouth due to irrigation activities. For the Weiser River: (1) nutrients, solids, total organic C, conductivity, and turbidity increased dramatically below Crane Creek during the irrigation season; (2) Crane Creek was responsible for over 79% of suspended solids, nitrite and nitrate, and total P, and 56% of ammonia over the entire 100-mi reach of the river under study in August though no effects were detected in December; (3) total and fecal coliform standards were violated in much of the river during both surveys. Pesticide concentrations were low in both rivers. The biological diversity index showed a decline in water quality for the lower Payette and upper Weiser. (Lynch-Wisconsin)
W78-02994

MAN-MADE AIRBORNE ACIDITY AND ITS DETERMINATION,
Swedish Water and Air Pollution Lab., Gothenburg.
C. Brosset, and M. Ferm.
Technical Report B 341A, December 1976. 20 p, 9 fig, 8 tab, 11 ref.

Descriptors: *Acidity, *Air pollution, *Water pollution, Acids, Methodology, Precipitation(Atmospheric), Ions, Hydrogen ion concentration, Pollutants, *Pollutant identification, *Gran's titration method, Norway, Sweden, Titration.

A continuous increase in precipitation acidity has been noted in northwest Europe in recent decades, probably contributing to increasing water system acid levels observed in southern Norway and western Sweden. Drastic ecological changes have resulted, including fishkill. To identify and monitor acid emissions and aerial transport, it was concluded in this study that Gran's titration method was a significant improvement over pH tests. Man-made airborne acidity in most case is unneutralized part of hydrogen ion introduced into precipitation or particles as H2S04, HN03, or other strong acids. The neutralizng agent in air is usually NH3; or other strong acids. The neutralizing agent in air is usually NH3; some oxides present in particles may contribute to neutralization. Using Gran's plot and the associated extrapolation, the unneutralized part of hydrogen ions can be determined exactly, as long as the slope of the pseudolinear interval is due to the semiweak acid HS04(-) only. If the pseudolinear interval is considerably shorter, and its slope due to other sulphate concentration, Gran's plot cannot be used. Acid-base titration using Gran's method involves potentiometric measurement of the amount of hydrogen ions left in a sample after addition of known amounts of hydroxide ions. The measured amount of hydrogen ions is plotted in a diagram against the amount of hydroxide ion added. (Lynch-Wisconsin)
W78-02995

EVALUATION OF THE ALGAL ASSAY PROCEDURE,
North Carolina Univ. at Chapel Hill. School of Public Health.
C. M. Weiss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 226, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-064, June, 1976, NTIS PB-256 226, 57 p, 1 fig, 33 tab, 18 ref, 1 append. 1BA 031, R800399.

Descriptors: *Bioassay, *Algae, *Nutrients, Phosphorus, Nitrogen, Lakes, Rivers, Impoundments, Trophic levels, Eutrophication, Water quality, Filtration, Autoclaves, North Carolina, Biomass, Analytical techniques, Bottle test, Selenastrum capricornutum.

From 345 alagl assays of surface waters in 44 North Carolina lakes, impoundments, and rivers, it was concluded that pretreatment of water samples by autoclaving provides a good indication of total growth potential of a reseeded test alga, while membrane filtration pretreatment indicates ambient growth potential. Samples spiked with phosphorus and nitrogen established the growth-limiting nutrient, and reference to original nutrient levels indicated nitrogen; phosphorus ratio necessary for optimum support of the test alga, Selenastrum capricornutum. This method produces comparable results to the more complicated assay spiking procedure. For phosphorus-limited water with autoclaving pretreatment (104 assays), the control algal biomass had a mean concentration of 5.31 mg/l, whereas with filtration pretreatment (191 assays) the mean biomass was 1.37 mg/l. Nitrogen-limited water after autoclaving (132 assays) had a mean biomass of 12.15 mg/l, and after filtration 9.81 mg/l. While both phosphorus and nitrogen were limiting, following autoclaving (105 assays) mean biomass was 4.70 mg/l and after filtration 0.92 mg/l. The consistent pattern of soluble nitrogen and phosphorus to the indicated limitation of either one or both suggests this ratio is useful in defining which nutrient is limiting for that particular body of water. Water quality data for each water body is presented in tables.
W78-02996

SALMONELLA IN SURFACE WATERS OF CENTRAL NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 5C.
W78-03004

ESTIMATION OF NATURAL POLLUTION LOADS FROM STREAMFLOW MEASUREMENTS IN REMOTE CATCHMENTS,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 5B.
W78-03005

CHROMATOGRAPHIC INVESTIGATION OF INOSITOL PHOSPHATE ESTERS IN LAKE WATERS.
Wisconsin Univ.-Madison. Water Chemistry Lab., Water Chemistry Laboratory, University of Wisconsin, Madison.
Environmental Science and Technology, Vol. 11, No. 5, p 497-501, May, 1977. 4 fig, 2 tab, 20 ref.

Descriptors: *Phosphorus, *Phosphates, *Chromatography, *Lakes, Nutrients, Wisconsin, Methodology, Foaming, *Pollutant identification, *Inositol, *Lake Mendota(WI), Esters, Inositol phosphate esters, Hydroxyl groups.

The existence and concentrations of inositol phosphate esters in Lake Mendota (WI) were determined using alkaline bromation and gel permeation chromatography. Inositol phosphate (IP) esters result from replacement of one to six hydroxyl groups of inositol with orthophosphate anions. Wind-generated foam samples were collected in fall 1974 along the southern and eastern parts of the lake; water samples were collected in the 'deep hole' area in 1974 and 1975 with a pre-equilibrated plexiglas Van Dorn sampler. Percentages of total phosphorus present as inositol phosphate esters averaged 19% for lake foam and 26% for lake water. Estimated spring and summer IP concentrations in Lake Mendota were 3-15 micrograms P/l. The molecular-size distribution patterns of native or alkaline bromated samples were determined primarily on Sephadex G-25 in a 2.5 X 70 cm column operating in the ascending mode. The foam was greatly enriched in high-molecular-wt dissolved carbon, nitrogen and phosphorus, and dissolved organic phosphorus and was concluded to be of natural origin. Temperature and phosphorus measurements in the water column showed that the surface water was warmer, more highly colored, and had higher phosphorus concentrations than the lower strata. Results of this study indicate that the lower IP esters are the dominant forms in filtered and non-filtered foam samples, and in filtered, concentrated lake water. (Lynch-Wisconsin)
W78-03007

POLLUTION MONITORING WITH TOTAL ORGANIC CARBON ANALYSIS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineering.
R. L. Chandler, J. C. O'Shaughnessy, and F. Blanc.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2791-2803, December, 1976. 11 fig, 2 tab, 2 ref. 73-05.

Descriptors: *Carbon, *Water quality, *Biochemical oxygen demand, *Chemical oxygen demand, *Monitoring, Analytical techniques, Effluents, Sewage treatment, Waste water treatment, Automatic control, Rivers, Massachusetts, *Total organic carbon(TOC), Assabet River(MA).

Total organic carbon (TOC) may be used as an alternative to chemical or 5-day biochemical oxygen demand (BOD 5 and COD) tests once correlations have been determined. This paper evaluates the relationship of TOC to BOD5 and COD for six municipal wastewater treatment plants in eastern Massachusetts and for the Assabet River, which receives effluents from five of the plants. The sites included an extended aeration facility without primary clarification to a conventional activated sludge facility, three trickling filter plants, and an advanced plant employing a conventional activated sludge system followed by a nitrifying activated sludge system. Hourly samples of unchlorinated effluents were collected at each plant, and samples were taken at various locations along the river. The TOC analyzer oxidizes organic carbon to carbon dioxide, then reduces the CO2 to methane, is analyzed using a flame ionization detector. Results are given as direct mg C/l concentrations. It was concluded that: (1) a significant correlation exists between BOD5 and TOC

for domestic wastewater; (2) the correlation of BOD5 to TOC was stronger than for COD to TOC for a treated domestic secondary effluent; (3) TOC was useful for monitoring wastewater; (4) when all river samples were considered, BOD5 and TOC correlated significantly at the 0.01 level; and (5) with higher river flow, the BOD5 to TOC correlation decreased sharply. (Lynch-Wisconsin)
W78-03009

MACROPHYTE SUCCESSION IN SWEDISH LAKES CAUSED BY DEPOSITION OF AIRBORNE ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5C.
W78-03022

APPLICATION OF UNDERWATER LIGHT MEASUREMENTS IN NUTRIENT PRODUCTION STUDIES IN SHALLOW RIVERS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W78-03023

THERMALLY STRATIFIED ACID WATER IN LATE WINTER - A KEY FACTOR INDUCTING SELF-ACCELERATING PROCESSES WHICH INCREASE ACIDIFICATION,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5C.
W78-03028

ABYSSAL MEIOBENTHOS IN THE BAY OF BISCAY: I. CONSIDERATIONS ON QUANTITATIVE DATA, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
A. Dinet, and M-H. Vivier.
Cah Biol Mar 18, p 85-97, 1977.

Descriptors: *Bay of Biscay(France), Sampling, Meiobenthos, *Pollutant identification, *Organic matter, *Bacteria, Granulometry, *Sediments.

Reineck-box samples were taken in the Bay of Biscay (France) during 1972-1974. An analysis of the quantitative variations of meiobenthos was made, with particular reference to granulometry of sediments and organic matter data. These variations may be explained by the high diversity of substrata found within rather small areas. Population abundance cannot be directly correlated to the amount of organic material in sediment. It seems to be subordinate to an intermediate agent, probably bacteria, which allows utilization of the primary energetic level by meiofauna.--Copyright 1978, Biological Abstracts, Inc.
W78-03030

GREAT LAKES WATER QUALITY, FIFTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION.
International Joint Commission-United States and Canada. Great Lakes Water Quality Board.
For primary bibliographic entry see Field 5G.
W78-03041

CALCULATION METHODS IN THE HYGIENIC STANDARDIZATION OF CHEMICAL WATER CONTAMINATION, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (USSR). Dept. of General Hygiene.
S. A. Shigan.
Gig Sanit 11, p 15-20, 1976.

Descriptors: *Water quality standards, *Toxicity(Chronic), Methodology, Water pollution, *Chemical compounds, Forecasting, *Pollutant identification.

Data substantiating the calculation methods for forecasting the chronic toxicity of substances to accelerate their hygienic standardization in water is presented. More reliable results can be obtained by introducing the regression equation for chemically related groups of compounds and using toxicometric parameters. The conditions and the practical use of calculation equations are determined and the reliability of the suggested mathematical methods of forecasting is tested.--Copyright 1978, Biological Abstracts, Inc.
W78-03063

DIRECT MEASUREMENT OF DISSOLVED ORGANIC CARBON RELEASE BY PHYTOPLANKTON AND INCORPORATION BY MICROHETEROTROPHS,
Georgia Univ., Athens. Dept. of Microbiology.
W. J. Wiebe, and D. F. Smith.
Marine Biology, Vol. 42, No. 3, p. 213-223, 1977. 2 fig, 31 ref.

Descriptors: *Carbon, Algae, Phytoplankton, Eutrophication, Laboratory tests, Analytical techniques, Primary productivity, Isotope studies, Pollutant identification, *Kinetic tracer analysis, *Microheterotrophs, Australia, Dissolved organic carbon.

Techniques are described for measuring photosynthetically produced dissolved organic carbon (PDOC) through kinetic tracer analyses. Measurements were made in the laboratory on water samples taken from the South West Arm of the Port Hacking estuary in Australia. Measurements showed that the steady-state rate of PDOC production was 0.10 to 0.13 mg C.m-3.h-1. The rate of PDOC incorporation into microheterotroph particulate organic carbon was 0.10 to 0.12 mg C.m-3.h-1. The rate at which PDOC was respired to CO2 was 0.001 to 0.003 mg C.m-3.h-1. The PDOC makes up only about 0.1% of the total dissolved organic carbon. The size class of particles associated with PDOC producton differed from the size class responsible for uptake of PDOC. More than half of the PDOC production was associated with particles having a nominal diameter range of 20 to 63 micrometers, while this fraction was responsible for less than 10% of the incorporation. The studies are described as initial efforts but provide an insight into the roles of microheterotrophs. (Coyle-Wisconsin)
W78-03068

AUTOMATIC SORTING OF ZOOPLANKTON BY ISOPYCNIC SEDIMENTATION IN GRADIENTS OF SILICA: PERFORMANCE OF A 'RHO SPECTROMETER',
Rutgers - The State Univ., New Brunswick, NJ. Waksman Inst. of Microbiology.
C. A. Price, J. M. St. Onge-Burns, J. B. Colton, and J. E. Joyce, Jr.
Marine Biology, Vol. 42, No. 3, p. 225-231, 1977. 3 fig, 6 ref.

Descriptors: *Spectrometers, *Laboratory equipment, Fish eggs, Invertebrates, Zooplankton, Silica, Sedimentation, Pollutant identification, *Zooplankton sorting, Fish larvae.

Using a Rho Spectrometers apparatus, a system for analysis of large numbers of plankton samples offers a substantial decrease in the amount of manual sorting required. The apparatus consists of a 15.6-l cyclinder, a moveable piston for displacing the gradient from the top, and an ejector tube for collecting successive layers of the gradient. A gradient generator suitable for up to 30 Rho Spectrometers is also described. In a typical separation, about 100 ml of preserved zooplankton are layered over a 13-l gradient, which is 0-45% v/v in Ludox AM. After overnight sedimentation and equilibration, fish eggs are recovered from the top of the gradient, invertebrates from the central part, and fish larvae from the bottom of the gradient. In many cases 90% of the fish larvae are separated from 95% of the invertebrates. Absolute comparisons of the efficiency of sorting by Rho Spectrometry and hand sorting is difficult. But the use of density gradients of silica sol in the spectrometer makes possible semiautomatic sorting of fish eggs and fish larvae from the bulk of invertebrates for a majority of plankton samples of typical size and diversity. (Coyle-Wisconsin)
W78-03071

AERIAL INPUT OF HEAVY METALS INTO AN AQUATIC ECOSYSTEM,
Greenfield, Attaway and Tyler, Inc., San Rafael, CA.
For primary bibliographic entry see Field 5B.
W78-03074

THE DETERMINATION OF DIFFERENT FORMS OF METAL IONS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
P. N. Linnik, and B. I. Nabivanets.
Gidrobiol Zh 13(1), p 103-111, 1977.

Descriptors: *Pollutant identification, *Metal ions, Absorption, Manganese ions, *Path of pollutants, *Desna River(USSR), *Dnieper River(USSR), Electro dialysis, Gel chromatography, Membrane filtration, Migration, Rivers, Chemiluminescence.

Data on the forms of metal ion migration in natural waters are necessary for understanding metal assimilation by aquatic organisms, for preparing water for drinking and other purposes and for detecting commercial minerals. A technique based on chemiluminescence in combination with membrane filtration, electrodialysis, electromigration and gel chromatography was developed. Results of studies on concentrations of suspended, dissolved, complex-bound and unbound Mn in the Dnieper and Desna (USSR) Rivers are presented in illustration of the technique.-Copyright 1978, Biological Abstracts, Inc.
W78-03075

USE OF ARTHROPODS TO EVALUATE WATER QUALITY OF STREAMS,
Wisconsin Dept.of Natural Resources, Madison.
W. L. Hilsenhoff.
Technical Bulletin No. 100, 1977. 16 p, 1 fig, 9 tab, 11 ref, 1 append.

Descriptors: *Wisconsin, *Streams, *Water quality, *Insects, Water pollution, Sampling, Methodology, Data collections, *Bioindicators, Pollutant identification, *Arthropods, *Biotic index, Generic diversity, Diversity indexes, Water quality indexes.

A biotic index developed from insect sampling of 53 sites on 47 Wisconsin streams provides a sensitive and effective method for evaluating present water quality and past disruptions of all Wisconsin streams. To calculate the index, 29 sites undisturbed by human activities and 24 suspected of pollution were sampled. The index, modified from an earlier study, was computed by assigning a value of zero to genera known to be found only in the cleanest streams, five of genera inhabiting only extremely polluted waters, and intermediate values as appropriate. For a given unknown stream, the assigned value of genera is then multiplied by the number of individuals collected and an average is taken. A table presents the initial 53 sites ranked by biotic index which is compared with physical and chemical parameters. Basic oxygen demand, lowest dissolved oxygen, suspended solids, total nitrogen, total chlorides, and lowest maximum temperature all correlated significantly with the biotic index. The index tended to be higher when water temperatures were highest (June and September. A diversity index was judged unreliable for gauging water quality, at

least for small cold streams which typically have restricted fauna. The biotic index was applied to 41 additional sites on streams in the Dane-Jefferson Co. transect, Wood-Clark Co. transect, and Barron-Polk Co. transect, with an index value of < 1.75 rated excellent (6 sites, 1.75-2.25 good (14), 2.25-3.00 fair (14), 3.00-3.75 poor (6), and > 3.75 very poor (1). (Lynch-Wisconsin)
W78-03078

ENVIRONMENTAL BASELINE FOR MAUMEE BAY,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
A. P. Pinsak, and T. L. Meyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 007, Price codes: A08 in paper copy, A01 in microfiche. Great Lakes Basin Commission, Maumee River Basin Level B Study, MRB Series No. 9, August 1976. 165 p, 44 fig, 27 tab, 79 ref.

Descriptors: *Baseline studies, *Water resources, *Environmental effects, Lakes, Streams, Limnology, Erosion, Aquatic biology, Circulation, Land use, Resources development, Water quality, *Maumee Bay, *Lake Erie, Great Lakes Basin Commission.

A Maumee River Basin Level B Planning study was initiated in 1973 to consider and evaluate problems concerned with erosion and sediment transport and deposition, land use, flooding, water supply, recreation, and water quality in the basin and the relationship of the basin to Maumee Bay and Lake Erie. The objective of the study is the development of a basin-wide coordinated plan by affected local, regional State, and Federal agencies for optimum management of the water and land resources in the basin. This particular aspect of the comprehensive study, the environmental baseline for Maumee Bay, describes the limnology of the Bay, the distribution of significant variables in time and space, and the interrelationship between the Bay and the drainage basin on the one side and Lake Erie on the other. Problems indigenous to Maumee Bay, as defined by the users, are assessed and reduced to their significant elements. In addition, a numerical technique is applied to the simulation of water movement, and dispersion and disposition of particulate and some dissolved material being carried by the water. (Sinha-OEIS)
W78-03095

AN ESTIMATE OF THE INFLUENCE OF SEDIMENT CONCENTRATION AND TYPE ON REMOTE SENSING PENETRATION DEPTH FOR VARIOUS COASTAL WATERS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
C. H. Whitlock.
Available from the University of Microfilms. NASA Technical Memorandum No NASA TM X-73906, March 1976. 17 p, 3 fig, 2 tab, 10 ref.

Descriptors: *Remote sensing, *Coasts, *Sediment distribution, *Monitoring, Water quality, Light penetration, *Water pollution monitoring, Environmental quality, Absorption coefficient, US East coast, Gulf coast, Penetration depths.

Under the assumptions of collimated light, a homogeneous water column, zero molecular scattering, and constant ratio of volume scattering function to scattering coefficient, estimates of the remote sensing depth parameter, Z90, are made for various coastal waters at 540 nm. Calculations indicate that sediment concentration and type have a strong influence on remote sensing depth when concentrations are below 5 mg/l. Above 5 mg/l, the absorption coefficient of the sediments become large in comparison to that of water causing Z90 values to be less than 2 m with only small differences between various sediment types. (Sinha-OEIS)
W78-03102

OIL SPILL IDENTIFICATION BIBLIOGRAPHY,
Coast Guard Research and Development Center, Groton, CT.
A. P. Bentz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-029 126, Price codes: A02 in paper copy, A01 in microfiche. Office of Research and Development Report No. CG-D-41-76, March 1976. 10 p, 96 ref.

Descriptors: *Pollutant identification, *Oil spills, *Bibliographies, Environmental effects, Oil pollution, *Outer Continental Shelf.

The literature reviewed through March 1976 includes some of the latest state-of-the-art techniques, e.g. low temperature luminescence, field ionization mass spectrometry, double-beam fluorescence and simultaneous high resolution duel detection gas chromography. Some of the articles will provide more leading references as well as the names of current researchers in the field of oil identification. Two major sources of non-referenced papers are: the abstracts of the annual 'Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy'; and the biannual proceedings of the 'Joint Conference on Prevention and Control of Oil Pollution', sponsored by the U.S. Environmental Protection Agency, the U.S. Coast Guard and the American Petroleum Institute. (Sinha-OEIS)
W78-03105

BASIC REMOTE SENSING INVESTIGATION FOR BEACH RECONNAISSANCE,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W78-03107

AVAILABILITY AND CHEMICAL CHARACTERISTICS OF GROUND WATER IN CENTRAL LA PLATA COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03118

AVAILABILITY AND CHEMICAL QUALITY OF GROUND WATER IN THE CRYSTAL RIVER AND CATTLE CREEK DRAINAGE BASINS NEAR GLENWOOD SPRINGS, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03119

WATER QUALITY OF SELECTED STREAMS IN THE COAL AREA OF SOUTHEASTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03121

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1976.
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03122

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1976.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03123

WATER QUALITY OF TAMPA BAY, FLORIDA: WET-WEATHER CONDITIONS, OCTOBER 1971,
Geological Survey, Tampa, FL. Water Resources Div.; and Geological Survey, Lawrence, KS. Water Resources Div.
C. R. Goodwin, J. S. Rosenshein, and D. M. Michaelis.
Open-file report FL-75005, 1975. 88 p, 2 fig, 10 tab, 4 ref.

Descriptors: *Water quality, *Florida, *Bays, *Baseline studies, *Chemical analysis, Metals, Biological properties, Physical properties, Sampling, Sites, Data collections, Environmental effects, *Tampa Bay(Fla).

Water-quality data for Tampa Bay, Florida, during the period October 18 to 22, 1972, is presented in tabular form. The sampling followed a 12-week period of moderately excessive rainfall. These data provide a broad base of information to compare future sampling results for evaluating various changes in the bay. The water quality data also can be used in a digital simulation model of Tampa Bay. Water samples were collected at 95 sites and determinations were made for specific conductance, pH, temperature, dissolved oxygen, turbidity, nitrogen species, silica, phosphorus, carbon, metals, phenols, coliform bacteria, streptococci bacteria, biochemical oxygen demand and pesticides. Not all parameters were determined at each sampling site. (Woodard-USGS)
W78-03128

SELECTED AQUATIC PLANTS AS INDICATOR SPECIES FOR HEAVY METAL POLLUTION,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia); and Fisheries and Marine Service, Halifax (Nova Scotia). Dept. of Environment.
S. Ray, and W. White.
Journal of Environmental Science and Health - Environmental Science and Engineering, Vol. A11, No. 12, p 717-725, 1 fig, 2 tab, 12 ref. 1976.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, *Aquatic plants, Algae, Copper, Zinc, Lead, Cadmium, Water quality, *Bioindicators, Monitoring, *Pollutant identification, Canada, Pondweeds, Equipetum, Biological monitors, *Nepisiguit River(NB), Oscillatoria.

It is suggested that in order to evaluate aquatic plants as biological monitors of heavy metal pollution, the plants should be representative of the locality, abundant and easy to collect, and that they should have high tolerance of the heavy metals and a high concentration factor. Two vascular plants, Potamogeton and Equisetum, and a blue algae, Oscillatoria, from the Nepisiguit River were used in the present study. Analysis of copper, zinc, cadmium and lead in various tissues of these plants clearly established the usefulness of the three species as biological monitors to qualitatively reflect the long-term water quality of an area. (Chilton-ORNL)
W78-03141

CLADOCERA (CRUSTACEA) AS INDICATORS OF WATER POLLUTION, (IN RUSSIAN),
A. V. Makrushin.
Gidrobiol Zh 12(5), p 101-104, 1976.

Descriptors: *Crustaceans, Bioindicators, Water pollution, *Pollutant identification, Oligotrophy, Trophic level, *Saprobity(Cladocera).

The method of water pollution analysis by calculation of the number of saprophytic Cladocera in a given zone is described. Cladocera can be divided into 3 groups according to degree of saprobity in given conditions. The determination value of the

same species in different zones of their areal may be dissimilar. The 1st and most numerous group is comprised of species typical a oligo- and beta - meso-saprobic conditions and cannot serve as an indicator for other polluted zones. The 2nd, and very small group indicates only oligosaprobity, while the 3rd indicates the presence of a significant amount of easily disintegrated organic substances or a very high degree of trophy. Representative species of each group are listed.--Copyright 1978, Biological Abstracts, Inc.
W78-03144

GAS CHROMATOGRAPHIC DETERMINATION OF 2,4-D TRACE QUANTITIES, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
M. G. Mil'china, A. L. Pertsovskii, and Yu. A. Prismotrov.
Gig Sanit 8, p 72-75, 1976.

Descriptors: *Pollutant identification, *2-4-D, *Gas chromatography, Trace elements, Methodology, Analytical techniques, *Pesticide residues.

A modified Marquardt and Luce method is described based on transformation of 2,4-D into 2,4-dichlorphenol by fusing 2,4-D with pyridine hydrochloride and subsequent analysis on a gas chromatograph with electron detector. Steps to determine 2,4-D salts and derivatives, in water, soil and plant and animal tissue are explained. The method sensitivity is 0.01 mg/l, 0.01 mg/kg, and 0.05-0.1 mg/kg, respectively. Relative error is 10%.--Copyright 1978, Biological Abstracts, Inc.
W78-03146

TECHNIQUES FOR THE ISOLATION OF ENTEROPHAGES FOR THE HYGIENIC STUDY OF WATER, (IN ITALIAN),
Siena Univ. (Italy). Inst. of Hygiene.
M. Zanda.
Riv Ital Ig 36(1-3), p 33-42, 1976.

Descriptors: *Isolation, *Pollutant identification, *Enterophages, Public health, Analytical techniques, Tracers.

Basic techniques for isolation and count of enteric phages as surface water pollution tracers are reported.--Copyright 1978, Biological Abstracts, Inc.
W78-03149

AUTOMATIC MEASUREMENT OF TOTAL OXYGEN DEMAND APPLIED TO THE CONTROL OF WASTE WATERS (LA MESURE AUTOMATIQUE DE LA DEMANDE TOTALE EN OXYGENE APPLIQUEE AU CONTROLE DES EAUX RESIDUAIRES),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
J. L. Marty, and R. Ben Aim.
Techniques et Sciences Municipales-L'Eau, Vol. 71, No. 12, p 531-540, December, 1976. 14 fig, 1 tab, 13 ref.

Descriptors: *Analytical techniques, *Dissolved oxygen analyzers, *Dissolved oxygen, *Monitoring, Biochemical oxygen demand, Chemical oxygen demand, Automation, Automatic control, Industrial wastes, Food processing industry, Waste water treatment.

Analytic experiments were run to determine effective pollution parameters with a view towards using automatic instrumentation to control pollutants in urban and industrial waste waters. While BOD5 and COD are the parameters most used, TOD was often shown to be a more complete measurement. A description of the method and equipment used for measuring TOD is given. Suspended particles and the effects of dissolved oxygen can present problems in measuring TOD; nitrites, sulfates, metallic cations, and chlorides were also found to interfere in obtaining accurate measurements. Graphs depict the interference effects. Correlations between TOD and COD and between TOD and BOD5 were made. The correlations are expressed for urban wastes and for wastes from dyeing, distillery, and food industries. Results showed that a TOD meter can be used to measure total organic carbon and oxidizable matter; its use in rapid monitoring of on-site industrial wastes is being implemented. (Blits-FIRL)
W78-03169

SPECTROSCOPIC DETERMINATION OF METALS IN WASTEWATERS (PRIMENENIE METODA POLYAROGRAFII S NAKOPLENIEM (INVERSIONNOI VOL'TAMPEROMETRII) V ANALIZE MAKRO I MIKROOBEKTOV),
T. E. Morgulis, A. I. Kuznetsova, and I. D. Raikhbaum.
Zavodskaia Laboratoriia, Vol 43, No 4, p 429-432, 1977. 2 fig, 4 tab, 14 ref.

Descriptors: *Analytical techniques, *Metals, *Electrodes, *Spectroscopy, *Water analysis, Pollutant identification, Waste identification, Waste water treatment.

Spectral analysis of metals (Al, Fe, Ti, Ni, Co, Mn, Sn, Zn, Pb, Mo, Cr, V, Cu, Ba, Sr and Cd) in the dry residue of wastewater is described. The carbon electrode used was provided with an open hole to reduce heat dissipation. Stallwood's electrode used forced cooling to reduce interference due to high concentrations of calcium, and to improve the determination of volatile elements whose analytical lines are between 310 and 350 nm. The combination of these two electrodes was used for the high-sensitivity determination of Zn, Cu, and Cd. Comparison with atomic absorption analysis revealed that the coefficients of variation are 12-35%. (Takacs-FIRL)
W78-03177

SURFACE PROPERTIES OF PETROLEUM REFINERY WASTE OIL EMULSIONS,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Civil Engineering.
R. G. Luthy, R. E. Selleck, and T. R. Galloway.
Environmental Science and Technology, Vol 11, No 13, p 1211-1217, December, 1977. 10 fig, 3 tab, 19 ref.

Descriptors: *Emulsions, *Oil-water interfaces, *Oily water, *Analytical techniques, *Surfactants, Suspension, Oil wastes, Industrial wastes, Separation techniques, Physicochemical properties, Polyelectrolytes, Waste water treatment, Pollutant identification.

The surface of properties of refinery waste water oil emulsions were examined with respect to oil emulsion stability and ease of coagulation. Various organic coagulant aids which might be used to remove the waste oil from API separator effluents were compared. Electrokinetic properties of the oil emulsions, ranging in strength from 100 to 700 mg/liter, were similar, with positive charges on the droplets at low pH levels and negative charges occurring above a pH of 5.0, regardless of ionic strength. A decrease in electrokinetic mobility was observed with increases in the ionic strength of the suspension, verifying the suppression of the electrical double layer by the monovalent ions present in the solution. The data also verified the hypothesis that the surface charges are dependent upon surfactants contained in the oil phase and on H+ and OH- ions in the aqueous phase, regardless of the source of the oil or the ionic strength of the water. The presence of anionic surfactants in waste water produced marked differences in surface properties of crude oils and separator float oil emulsions. The relatively highly charged cationic polyelectrolytes, in particular a 75% charged PDADMA cationic polyelectrolyte, were much more effective as waste oil droplet coagulants than the anionic and nonionic polyelectrolytes. (Schulz-FIRL)
W78-03185

AVOIDANCE BY HERRING OF DISSOLVED COMPONENTS IN PULP MILL EFFLUENTS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W78-03194

5B. Sources Of Pollution

DISSOLVED ATMOSPHERIC GAS SUPERSATURATION OF WATER AND THE GAS BUBBLE DISEASE OF FISH,
Environmental Information Services, Inc., Mercer Island, WA.
For primary bibliographic entry see Field 5C.
W78-02707

COPPER, MANGANESE, AND CHROMIUM CONCENTRATIONS IN FIVE MACROPHYTES FROM THE DELTA OF RIVER TOCE (NORTHERN ITALY),
Istituto Italiano di Idrobiologia, Pallanza.
For primary bibliographic entry see Field 5C.
W78-02710

ECOLOGICAL BUFFER CAPACITY,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W78-02713

POLLUTION OF THE BALTIC BY CRUDE OIL PRODUCTS (ZANLECZYSZCZENIE BALTYKU SUBSTANCJAMI ROPOPOCHODNYMI),
For primary bibliographic entry see Field 5A.
W78-02716

FATE OF 2,4,-D IN FISH AND BLUE CRABS,
Syracuse Research Corp., NY.
For primary bibliographic entry see Field 5C.
W78-02728

INTERCALIBRATION OF GAS CHROMATOGRAPHIC ANALYSES FOR HYDROCARBONS IN TISSUES AND EXTRACTS OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5A.
W78-02729

COASTAL WATER RESEARCH PROJECT, ANNUAL REPORT 1975,
Southern California Coastal Water Research Project, El Segundo, CA.
For primary bibliographic entry see Field 2L.
W78-02740

THE POTENTIAL BIOLOGICAL EFFECTS OF DEPLETED URANIUM ON RANGE C-74 UPON THE ALGAL FLORA OF ROCKY CREEK ON EGLIN AIR FORCE BASE,
Alabama Univ., University. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-02748

PHOTODEGRADATION OF ORGANIC MATERIALS USED AS BIOMASS,
Naval Research Lab., Washington, DC.
R. A. Neihof, C. Patouillet, P. J. Hannan, and D. E. Klemme.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-028 347, Price codes: A02 in paper copy, A01 in microfiche. NRL Memorandum Report No. 3320, July 1976, 17 p. 12 ref, 2 fig, 5 tab.

Descriptors: *Pesticides, *Degradation(Decomposition), *Toxicity, *Bioassay, *Herbicides, *Algicides, *Water pollution sources, *Waste water, *Oil wastes, Deterioration, Algal control, Fouling, Corrosion, Laboratory tests, Light, Discharge(Water), Fuels, *Photodegradation, *Thiopyridine, *Photo-sensitive biocides.

In an effort to evaluate the possible environmental impact of discharging biocide-containing ballast or displacement water from shipboard fuel tanks, a study has been made of the effects of sunlight on the toxicity of three organic biocides to algae. A thiopyridine and a thiocyanate compound in solution in seawater lost more of their toxicity in less than 24 hours exposure to sunlight; a triazine compound was relatively unaffected. The results suggest that it may be possible to select a biocide which is active indefinitely against the microorganisms which infest ships' fuel tanks but becomes degraded so rapidly when discharged that no serious impact on the marine environment would result. (Katz)
W78-02751

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED FOUNTAIN LAKE, COLORADO.
Army Engineers Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02755

SUMMARY REPORT, ARCADIA LAKE WATER-QUALITY REPORT STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02756

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX A: INVESTIGATIONS OF THE HYDRAULIC REGIME AND THE PHYSICAL CHARACTERISTICS OF BOTTOM SEDIMENTATION,
Yale Univ., New Haven, CT. Dept.of Geology and Geophysics.
For primary bibliographic entry see Field 5E.
W78-02782

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX D: PREDISPOSAL BASELINE CONDITIONS OF DEMERSAL FISH ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02783

FORECAST OF THE CHANGE IN THE HYDROLOGIC BUDGET, LEVEL, AND MINERAL CONTENT OF LAKE BALKHASH IN THE NEXT TEN YEARS,
For primary bibliographic entry see Field 2H.
W78-02805

CHARACTERISTICS OF DREDGED BOTTOM SEDIMENTS,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
R. J. Krizek, D. K. Atmatzidis, and J. A. FitzPatrick.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW4, Proceedings Paper 13319, p 471-486, November 1977. 3 fig, 3 tab, 21 ref, 1 append. DACW 39-74-C-0090.

Descriptors: *Bottom sediments, *Correlation analysis, *United States, Dredging, Frequency, Gradation, Regression analysis, Water quality, Environmental effects, Water pollution, Metals, Chemicals, Particle size, *Dredged bottom sediments, *Chemical composition, Spoil.

Certain physical and bulk chemical characteristics of bottom sediments that are candidates for dredging were summarized for approximately 50 locations throughout the United States. According to empirical criteria that were used for the past several years, most of the sediments would be termed polluted. Based on the results of a bivariate regression analysis among the reported parameters, some plausible correlations were identified between different metals and between metals and certain fractions of organic material. None of the parameters was highly correlated with the mass of submicron particles in a dredged material. Additional site-specific data are needed to advance broader and more definitive conclusions regarding the water quality impact that might occur during dredging and disposal operations. (Roberts-ISWS)
W78-02813

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5G.
W78-02828

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II (CHEMICALS 1-20),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-02877

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS. PHASE II. (CHEMICAL 61-79),
Stanford Research Inst., Menlo Park, CA.
S. L. Brown, F. Y. Chan, J. L. Jones, D. H. Liu, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 164, Price codes: A09 in paper copy, A01 in microfiche. Final Report, April 1975. 193 p, 20 fig, 20 tab, 24 ref. Report NSF-RA-E-75-190D. ECU-3386.

Descriptors: *Chemical analysis, *Chemical industry, *Chemicals, *Chemical wastes, *Chemical properties, Toxicity, Environmental effects, Hazards, Public health, Data collections, Industrial wastes, Pharmacology, Manufactured chemicals.

Chemicals 61 through 79 (including 75a) of the 80 chemicals selected by experts on trace contaminants as having the greatest potential for environmental effects were studied. Information was collected on the extent of the exposure of the environment to these chemicals (during manufacture and use) and on the possible environmental effects of this exposure (chemical, physical, and biological properties, persistence, and toxicity). A questionnaire survey of industry was conducted to determine the amount and type of losses in the manufacturing plants, and information from this survey is tabulated. Summary reports are given for each chemical, including a flow diagram showing industrial data on the amounts used for various applications, a one page assessment of the data gathered on toxicology and environmental persistence, a computer printout of a tabular summary of the important data gathered, and copies of the 25 most pertinent abstracts found in the area of toxicology. (Wares-IPA)
W78-02878

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE CHAPTER 1, INTRODUCTION,
Radian Corp., Austin, TX.
I. A. Jefcoat, and P. W. Spaite.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 274, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-023a, January 1977. 13 p, 2 fig, 3 tab, Parsons, T., Editor. 1AB015;ROAP 21AFH-025, 68-02-1319, Task 34.

Descriptors: *Industrial production, *Operations research, *Environmental effects, Chemicals, Bibliographies, *Process analysis, Raw materials.

A catalog of industrial processes was developed to aid in defining the environmental impacts of industrial activity in the U.S. Entries for each industry are in consistent format and form separate chapters of the catalog; companies are classified as industries if they competitively produce similar products from the same types of raw materials. Chapter 1 presents an introduction to the catalog and identifies a number of expected uses for the information contained in the various chapters, the approach to catalog development is explained, and the basic catalog format outlined. Examples of typical information to be found in subsequent chapters, along with definitions for specific catalog nomenclature are provided. Future program plans for the assessment of industrial processes and their impact on the environment are presented. Environmentally significant processes were identified by considering the kinds of equipment and the nature of input and output materials for each processing step involved in conversion of raw materials into products. Each industry is described in terms of raw materials, products, companies, environmental impact, chemical (product) tree, process flowsheets, and process descriptions, and pertinent data are appended as lists to each description. (Wares-IPA)
W78-02881

NUTRIENT REGENERATION FROM AEROBIC DECOMPOSITION OF GREEN ALGAE,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-02992

WEISER-LOWER PAYETTE WATER QUALITY SURVEYS,
Environmental Protection Agency, Seattle, WA. Region X.
For primary bibliographic entry see Field 5A.
W78-02994

TEST OF REDFIELD'S MODEL FOR OXYGEN-NUTRIENT RELATIONSHIPS USING REGRESSION ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Statistics.
For primary bibliographic entry see Field 5C.
W78-02997

DISTRIBUTION OF ARSENIC, CADMIUM, LEAD, ZINC, COPPER, MANGANESE, AND IRON CONTAINED IN THE BOTTOM SEDIMENT OF LAKE BIWA,
Kyoto Univ., Otsu (Japan). Otsu Hydrobiological Station.
J. Kobayashi, S. M. Fuji Morii, H. T. Nakashima, and S. Horie.
Ber Ohara Inst Landwirtsch Biol Okayama Univ 16(4), p 147-163, 1976.

Descriptors: *Path of pollutants, Water pollution sources, Lead, Zinc, Cadmium, Iron, Manganese, Copper, Arsenic, Bottom sediments, Lakes, *Lake Biwa(Japan), *Lake sediments, Metals, Heavy metals.

From the sediment of Lake Biwa (Japan), a total of 76 samples were collected and analyzed for As, Cd, Pb, Zn, Cu, Mn and Fe by atomic absorption spectrophotometry. As concerns the horizontal distribution of trace metals in the surface sediment

deposited in modern ages, a remarkable accumulation of As (126-450 ppm) and Mn (8300-17,300 ppm) was observed at several points near the center of the northern main part of the lake basin, where pollution had not been expected. In the southern part of the lake, the surface sediment near the Seta River which flows out of the lake was polluted by Cd and other metals (Cd 26 ppm, Pb 259 ppm, Zn 736 ppm). At other points investigated, the content of trace metals in the bottom surface sediment was much the same as that in the vertical core samples from below the level polluted by man. The high concentration of trace metals detected in the surface sediment indicated that the natural process of accumulation of trace metals has begun to be distrupted by recent human activity. Copyright 1978, Biological Abstracts, Inc.
W78-02999

DYNAMICS OF WATER-SOLUBLE ORGANIC MATTER AND BIOGENIC ELEMENTS IN BOTTOM SEDIMENTS OF THE TSYBUL'NIK BAY IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
I. K. Palamarchuk', and A. I. Denisova.
Gidrobiol Zh 12(6), p 16-23, 1976.

Descriptors: *Organic matter, Reservoirs, Bays, Bottom sediments, *Biogenic elements, Chemical compounds, Zooplankton, Zoobenthos, Organic compounds, Nitrogen, Kremenchug Reservoir(USSR).

Stationary observations of annual dynamics for water-soluble organic matter and biogenic elements (zooplankton, zoobenthos) in the water and bottom sediments of Tsybul'nik Bay (Ukrainian SSR, USSR) made it possible to determine the amount of chemical elements migrating from the sediment to water active hydrological conditions. In heavy weather the concentration of water-soluble chemical compounds in the grounds decreases sharply, which is explained by their intensified migration to water: 1 m2 of bottom yields for 24 h 200-500 mg of organic carbon, 18-62 mg of organic nitrogen, 1.0-8.7 mg of organic phosphorus and 11-21 mg of ammonium nitrogen. Copyright 1978, Biological Abstracts, Inc.
W78-03001

STUDIES ON DEGRADATION OF ADENOSINE-5' PHOSPHOSULPHATE ADENOSINE-3'-PHOSPHATE-5'-PHOSPHOSULPHATE (PAPS) IN EXTRACTS OF ANABAENA CYLINDRICA,
Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
For primary bibliographic entry see Field 5C.
W78-03002

ESTIMATION OF NATURAL POLLUTION LOADS FROM STREAMFLOW MEASUREMENTS IN REMOTE CATCHMENTS,
Northern Forest Research Center, Edmonton (Alberta).
T. Singh, and Y. P. Kalra.
Water, Air, and Soil Pollution, Vol. 7, No. 1, p. 111-116, 1977. 1 fig, 3 tab, 11 ref.

Descriptors: *Estimating equations, Streams, Streamflow, *Dissolved solids, *Solutes, *Erosion, Water pollution, *Canada, Rocky Mountain Region, Water quality, Measurement, Equations, *Marmot Creek Basin(Canada), Chemical erosion, Alberta(Canada), Pollution loads, Catchments.

A study in the Marmot Creek Basin Experimental Watershed in the Rocky Mountains of Alberta, Canada resulted in the development of equations for obtaining gross estimates of the total inorganic solutes dislodged monthly and annually from three catchments, as indicators of chemical weathering and baseline water quality levels. The equations are suitable for in-situ estimation of pollution loads directly from streamflow measurements, and are especially useful in measuring remote catchments. Water samples were collected monthly in the Cabin, Middle, and Twin creek subbasins. The following formula was used: Total solids=Na + K + Si + Cl + SO4 + F + 0.6 (total alkalinity) + NO3 + NO2 + 0.393 Ca + 0.243 (total hardness), where 0.6 is the ratio CO3:CaCO3. The flow (l/sec) at the time of sampling and the solute concentration (mg/l) showed a highly significant relationship which could be used for estimating concentration. Concentrations were combined with flow to obtain solute yields (kg/day). Prediction equations were derived by the least-squares method. Equations were for a linear model of the form: Solute yield=M(Streamflow) + B + e, where M and B are model coefficients from the data and e is error. Highest solute yield occurred in June; maximum chemical erosion occurred from May to August. High solute yields were due to high rock solubility and vegetation influence. (Lynch-Wisconsin)
W78-03005

REAL TIME SIMULATION OF NITROGEN CYCLE IN AN ESTUARY,
Resource Analysis, Inc., Cambridge, MA.
T. O. Najarian, and D. R. F. Harleman.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 523-538, August, 1977. 10 fig, 1 tab, 13 ref.

Descriptors: *Nitrogen cycle, *Estuaries, *Model studies, *Water quality control, Mathematical models, Waste treatment, Advection, Effluents, Mixing, Biochemistry, Real time, Through-flow models.

Biogeochemical engineering models as applied to water quality control in rivers and estuaries are discussed. Hydrodynamic aspects of an estuary are the transport processes—including the advection, mixing, and dispersion of specific constituents in waste effluents, which are in turn subject to various transformation or reaction processes. Using an idealized estuary, the coupling of transport processes in an advective system with the biochemical nitrogen transformation processes is investigated. It is shown that the predicted concentrations of the nitrogen storage variables are highly sensitive to the representation of the real time (i.e., intratidal cycle) tidal motion and dispersive mixing processes within the estuary. The estuary is assumed to have uniform depth length and width and Manning roughness of 0.018. A constant freshwater inflow rate of 28 cu m/sec enters the head of the estuary, and two waste treatment plants are located on the estuary. It is demonstrated that there is a high degree of coupling between intratidal cycle transport and mixing and biochemical transfer processes in estuaries. Use of nontidal or through-flow water quality models, which grossly simplify the transport, leads to large differences in predicted nutrient concentrations, even though identical biochemical components and rate constants are used in both these and real-time models.
W78-03010

CONSEQUENCES OF DETERGENT POLLUTION OF THE SEA: EFFECTS ON REGENERATING SPONGE CUBES OF GEODIA CYDONIUM,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5C.
W78-03025

INVESTIGATIONS OF ENERGY FLOW IN SEDIMENTS OF KIEL BAY (BALTIC SEA), (IN GERMAN),
Akademiya Nauk URSR, Kiev. Inst. Zoologii.
For primary bibliographic entry see Field 2L.
W78-03029

THE TOXIC ACTION OF ENDRIN ON AQUATIC INVERTEBRATES, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W78-03034

TRACE ORGANIC EMISSIONS FROM LEAD MINING-MILLING OPERATIONS,
Syracuse Univ., NY. Dept. of Civil Engineering.
J. C. Jennett, and A. J. Callier.
Journal Water Pollution Control Federation, Vol. 49, No. 3, p. 469-488, March 1977. 8 fig, 8 tab, 38 ref. NSF T-900121-03 and 04.

Descriptors: *Organic compounds, *Mine wastes, Water pollution sources, Lead, Zinc, *New Lead Belt(MO), Trace organic emissions.

Two lead mine operations in the New Belt of southeastern Missouri were studied to determine refractory organic levels in the discharged effluent of a treated industrial waste and the concomitant increase of trace organics in the receiving body of water. These organics, which are toxic, are used as chemical reagents in the milling process which separates lead and zinc sulfides. Both mine-mill treatment systems discharged more trace organics than the background levels found in the receiving streams. Organics extracted from the samples taken at Bee Fork Creek, a control stream, and from the two mine treatment systems, were generally chloroform-soluble and were recovered in largest amounts when extractions were performed at levels of pH 7 and 3. Data strongly implied that rainfall and runoff diluted trace organics recovered from the control stream as well as the two treatment systems. A correlation between the physical and chemical data and the level of trace organics recovered from a sample could not be found. Final discharge from one mine-mill treatment system contained more trace organics than the final effluent of the other. Of the two wastes from the first, the mill waste contained a higher concentration of ogranics than the excess mine water. (Coyle-Wisconsin)
W78-03036

A QUANTITATIVE STUDY OF THE STRUCTURE AND DYNAMICS OF BENTHIC SUBTIDAL ALGAL VEGETATION IN GHANA (TROPHICAL WEST AFRICA),
Ghana Univ., Legon. Dept. of Botany.
D. M. John, D. Lieberman, and M. Lieberman.
Journal of Ecology, Vol. 65, No. 2, p 497-521, July 1977. 10 fig, 4 tab, 51 ref, 1 append.

Descriptors: *Scuba diving, Aquatic life, Sampling, Depth, Data collections, Benthic fauna, Marine algae, Littoral, *Ghana(Africa), Species composition, Species diversity.

Subtidal benthic algal vegetation off Tema, Ghana at depths of eight to 30 m was surveyed by means of scuba diving. Over a seven year period an accumulation of presence-absence records was supplemented at the end of the April, 1975 growing season by the collection of material from quadrats. Over one hundred species were identified from 62 plotless dives and 57 quadrats. On the plotless samples, groupings obtained reflect depth and sampling intensity. Both stands and species were ordinated using reciprocal averaging. Results are not in conflict with those of the classifications but reveal the importance of substratum as well as depth. Species-composition based on presence-absence data showed a 10.8 percent turnover during a five year interval. There was no net gain or loss in the total number of species. The turnover is interpreted as representing local shifts in abundance rather than true immigration and extinction. Species diversity was estimated on the basis of biomass data from the quadrat samples. For purposes of comparison the samples from shallower quadrats were treated separately from those taken from deeper quadrats. Shallower sites have more species, deeper sites have greater evenness. (Coyle-Wisconsin)
W78-03037

CHNSED: SIMULATION OF SEDIMENT AND TRACE CONTAMINATION TRANSPORT WITH SEDIMENT/CONTAMINANT INTERACTION,
Oak Ridge National Lab., TN.
D. E. Fields.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NSF/EATC-19, Price codes: A10 in paper copy, A01 in microfiche. Report No. ORNL/NSF/EATC-19, March, 1976, 204 p. 18 fig, 9 tab, 264 ref, 6 append. W7405-eng-26.

Descriptors: *Model studied, *Sediment transport, Sediment-water interfaces, Pollutants, Water pollution, Equation, Ion exchange, Rio Grande River, Watersheds(Basins), Path of pollutants, *CHNSED, *Trace contaminant transport, Unified Transport Model(UTM), Wisconsin Hydrologic Transport Model(WHTM), SEDTRN.

CHNSED is a composite of a newly designed model of sediment transport in a rectangular stream channel system (SEDTRN), and the Wisconsin Hydrologic Transport Model (WHTM), which are components of the Unified Transport Model (UTM) under development with support from the National Science Foundation. The UTM simulates transport of a trace contaminant through a watershed ecosystem from injection into the atmosphere through deposition. In CHNSED, as in the WHTM, particulate mobilizaton (sheet erosion and overland transport) and dissolved contaminant transport associated with runoff, interflow, and base flow inputs to the channel system are considered. An ion-exchange submodel simulates the soil-contaminant-water interaction at the land surface. Following entry into the channel system, dissolved contaminant support is derived from the flow routing of the WHTM. Routing of the adsorbed fraction is controlled by sediment transport dynamics, which are governed by bedload and suspended load transport. SEDTRN is an extension of the sediment transport formulation described by R. A. Bagnold, but includes Manning's equation to determine flow rate and modifications to Stokes' law allowing calculation of particulate fall velocity in both the viscous and inertial particle settling regions. Detailed instructions are given for application of CHNSED, with an example. The sediment transport portion is also applied to the Rio Grande River. (Lynch-Wisconsin)
W78-03057

COMBUSTION EXPERIMENTS USING PENTACHLOROPHENOL ON A PILOT SCALE AND FULL-SCALE,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5E.
W78-03058

ENERGY FLOW MODEL OF AN OXYGEN-DEFICIENT ESTUARY ON THE SWEDISH WEST COAST,
Swedish Water and Air Pollution Research Lab., Gothenberg.
For primary bibliographic entry see Field 5C.
W78-03067

TRANSPORT OF TRACE METALS BY SUSPENDED PARTICULATES ON MIXING WITH SEAWATER,
University of Southern California, Los Angeles. Environmental Engineering Program.
N. Rohatgi, and K. Y. Chen.
Journal Water Pollution Control Federation, Vol. 47, No. 9, p. 2298-2316, September 1975. 10 fig, 6 tab, 9 ref.

Descriptors: *Path of pollutants, *Seawater, *Suspended solids, *Sediments, *Trace elements, Oxidation, California, Water pollution sources, Hyperion Treatment plant(Los Angeles, CA).

A study was made of trace metals such as cadmium, chromium, copper, iron, manganese, nickel, lead and zinc in the wastewater effluents of the Hyperion Treatment plant, Los Angeles, California. Objectives were to determine whether the metals are released from waste effluent particularates after discharge into a saline environment (the Pacific Ocean and, if so, to what extent they are released and what the mechanisms are for their mobilization from particularates which can enhance the long distance transport. Particular interest was given to digested sludge, primary effluent and a mixture of primary and secondary effluent. Dry weather flow from the Los Angeles River was also selected because of the past practice of discharging industrial wastes into the river. It was found that under aerobic conditions with seawater salinity, trace metals were observed to be released from suspended particulates. Release occurred in two stages, an initial rapid release, followed by a slower, long-term release. Release of trace metals may be attributed to oxidation of organic matter or metal sulfides, desorption from suspended solids which depend mostly on dilution ratio and pH of seawater, and formation of metal chloride as well as organo-metallic complexes. (Coyle-Wisconsin)
W78-03069

AERIAL INPUT OF HEAVY METALS INTO AN AQUATIC ECOSYSTEM,
Greenfield, Attaway and Tyler, Inc., San Rafael, CA.
T. Peyton, A. McIntosh, V. Anderson, and K. Yost.
Water, Air, and Soil Pollution, Vol. 5, No. 4, p 443-451, June, 1976. 3 fig, 4 tab, 12 ref. NSF-RANN GI-35106; NIEHS 5TOLRL00064.

Descriptors: *Heavy metals, *Water pollution sources, *Highway effects, *Industrial wastes, *Fallout, *Borrow pits, Indiana, Trace elements, Winds, Water pollution, *Air pollution effects, Steel, Lead, Cadmium, Iron, Zinc, Ponds, Artificial lakes, Gary(IN), Shidler Pond(IN), Automotive exhaust, Aerial input.

Monitoring of a rural pond and a water-filled 'borrow pit' (a place from which highway construction materials were dug) showed that aerial deposit of zinc, cadmium, lead, and iron was significantly greater in the urban pit than at the rural site. Shidler Pond in west-central Indiana, was chosen as an uncontaminated rural site. The borrow pit in an industrialized part of Gary (IN), filled with water soon after is was created in 1954; it has a surface area of 7.8 acres and a center depth of 8.5 m. It is located 1.5-3.5 km southeast of a major steel processing complex, and 40 m south of the Indiana Toll Road. Two floating fallout collectors were placed at northern and southern positions on the water surface. Soil samples were collected in August-September 1973 at Zone A, the southern shore of the pit representing background regional air polluton fallout; Zone B on the northwestern shore receiving regional fallout plus local automotive input; and Zonc C on the northeastern shore, subject to regional fallout, local automotive input, and direct toll road drainage from six drains emptying 10-20 m for the pit's northern shore. In Zone B and C high metal levels, especially lead, were noted near the road, decreasing further from the highway. High levels around the drains indicated likely runoff contamination of the pit. Automotive exhaust impact occurs mainly on land near the road, not on the water surface. Of total sediment deposits in the pit, aerial sources accounted for 69% of cadmium, 48% of zinc, 36% of lead, and 18% of iron. (Lynch-Wisconsin)
W78-03074

THE DETERMINATION OF DIFFERENT FORMS OF METAL IONS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5A.
W78-03075

A BIBLIOGRAPHY ON OCEAN WASTE DISPOSAL, SECOND EDITION,
Interstate Electronics Corp., Anaheim, CA. Environmental Engineering Div.
For primary bibliographic entry see Field 5E.
W78-03087

WATER RESOURCES RESEARCH PROGRAM. TRANSPORT AND DISPERSION OF OIL-REFINERY WASTES IN THE COASTAL WATERS OF SOUTHWESTERN LAKE MICHIGAN (EXPERIMENTAL DESIGN--SINKING-PLUME CONDITION),
Argonne National Lab., IL. Energy and Environmental Systems Div.
D. L. McCown, W. Harrison, and W. Orvosh.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL WR 76-4, Price codes: A04 in paper copy, A01 in microfiche. Report No. ANL/WR-76-4, prepared for U.S. Energy Research and Development Administration, July 1976. 51 p, 8 fig, 3 tab, 9 ref, append. EPA-D6-E681.

Descriptors: *Oil wastes, *Lake Michigan, *Coasts, *Water pollution control, *Transport, Mathematical models, Dispersion, Methodology, Oil refinery wastes, Sinking plumes.

The field phase of the experimental design was implemented on February 14-16, 1976, and consisted of (1) tagging 170 l of simulated refinery waste with 1.4 kg of a 50% acid solution of dysprosium acetate and spreading the tagged waste on the water surface at the entrance to the Indiana Harbor Canal (IHC); (2) tagging 3600 sq. m of water at the IHC mouth with 13.6 kg of samarium complexed with DTPA; (3) sampling the surface and subsurface waters of the lake downflow for 10 km using three boats with submersible pumping systems; and (4) sampling raw-water from the shore and Dunne Crib intakes at Chicago's South Water Filtration Plant (SWFP). The laboratory portion of the experimental design involved neutron activation analysis of the samples after evaporation of the water phase. Reactors and low-energy, photon spectrometers at Argonne and Ames, Iowa were used for sample irradiation and counting. Results indicate that the methodology, with appropriate changes, can be used successfully to study the transport and dispersion of simulated refinery waste injected into the IHC's sinking plume. Deficiencies in the original experimental design are discussed, and recommendations are given for their remedy. More-frequent sampling at the SWFP, and the use of an underway water-sampling system that will permit sampling coverage farther offshore, are the principal improvements required for the 1976/1977, full-scale, sinking-plume study. (Sinha-OEIS)
W78-03092

IMPLICATIONS OF THE U.S. COAST GUARD SEGREGATED BALLAST RETROFIT RULING ON IMPORT ALTERNATIVES AND POLLUTION OF THE MARINE ENVIRONMENT,
Operations Research, Inc., Silver Spring, MD.
For primary bibliographic entry see Field 5G.
W78-03099

PROBABILISTIC TRAJECTORY ASSESSMENTS FOR OFFSHORE OIL SPILLS IMPACTING LONG ISLAND,
Massachusetts Inst. of Tech., Cambridge.
R. J. Stewart, and J. W. Devanney, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 013, Price codes: A03 in paper copy, A01 in microfiche. Report to Nassau-Suffolk Planning Board, New York, Regional Marine Resources Council, November 15, 1974. 36 p, 9 fig.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Winds, *Ocean currents, New England, New York, Beaches, Coasts, Seasonal, Ocean circulation, Environmental effects, Outer Continental Shelf, Long Island, Nantucket Shoals, Wind fields, Trajectories.

Under the presumed current and wind fields, this study has shown that it is reasonable for Long Island to anticipate that some spills from the Nantucket Shoals region will beach upon her shores given a sufficient number of such events. In particular, it appears that the probability of a spill beaching on Long Island given that it originated on Nantucket Shoals is on the order of .05 in the summer and perhaps .01 or less in the winter. The times to shore for spills from this area appear to be in the thirty- to forty-day range on the average, and the minimum is around twenty days. These predictions are somewhat at variance with previous results, but this can be explained by the differences in the wind field specifications. (Sinha-OEIS)
W78-03100

AN ESTIMATE OF THE INFLUENCE OF SEDIMENT CONCENTRATION AND TYPE ON REMOTE SENSING PENETRATION DEPTH FOR VARIOUS COASTAL WATERS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-03102

A COMPUTER ANALYSIS OF THE SPREAD OF POLLUTION ON LONG ISLAND BEACHES,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
A. G. Tingle.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-50651, Price codes: A02 in paper copy, A01 in microfiche. Report No BNL 50651, Environmental Control Technology and Earth Sciences Report No TID-4500 to Energy Research and Development Administration, July 1976. 21 p, 7 fig, 3 tab. ERDA-EY-76-C-02-0016.

Descriptors: *Water pollution sources, *Winds, *Waste disposal, Garbage dumps, Sewage disposal, New York, *Outer Continental Shelf, *Ocean dumping, New York Bight Apex, Long Island.

In June 1976 large quantities of garbage and sewage-type debris were washed ashore on most southern Long Island beaches. The flotable debris, of unknown source, threatened industry and public health. In an effort to trace the source, the trajectories of floatables from a variety of hypothetical release points in the New York Bight were simulated using a one-layer ocean model that computes currents, given the bottom topography and the observed winds. It was then assumed that the surface material moves as the vector sum of the currents and 3% of the wind. It was found that the initial beaching was probably due to debris floating in the Bight Apex, and that material from as far south as Atlantic City could have washed ashore during late June. An examination of historical wind records indicated that the persistent southwest winds observed during this period could recur about each three years. (Sinha-OEIS)
W78-03103

BASELINE STUDY PROGRAM, NORTH PUGET SOUND. BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL I - TEXT,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 5C.
W78-03104

OIL SPILL IDENTIFICATION BIBLIOGRAPHY,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-03105

MOVEMENT OF SPILLED OIL OVER THE BEAUFORT SEA SHELF - A FORECAST,
Coast Guard Research and Development Center, Groton, CT.
G. L. Hufford, I. M. Lissauer, and J. P. Welsh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 580, Price codes: A05 in paper copy, A01 in microfiche. Coast Guard Research and Development Center Report No. CG-D-101-76, June 1976. 90 p, 49 fig, 14 tab, 36 ref, append. Also prepared for and sponsored by the Bureau of Land Management.

Descriptors: *Alaska, *Oil spills, *Water quality control, *Water pollution, Forecasting, Meteorology, Path of pollutants, *Outer Continental Shelf, *Beaufort Sea, Environmental conditions, Environmental impact.

Projections of the movement of oil slicks and their impact location along the north Alaskan coast are determined from fifteen potential oil drilling sites. Two approaches are implemented to determine impact locations. The first is a description of the environment with emphasis on the meteorology and water movement in the area. The second considers the interactions of the environmental processes in forecasting the potential paths of spilled oil and their impact location on the shoreline. (Sinha-OEIS)
W78-03108

A NUMERICAL OIL TRAJECTORY FORECAST MODEL USED TO ASSESS THE HAZARD TO LONG ISLAND BEACHES FROM OIL ENTERING THE NEW YORK BIGHT APEX FROM FEBRUARY 11-24, 1977,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
A. G. Tingle, and D. A. Dieterle.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL 50649, Price codes: A03 in paper copy, A01 in microfiche. Report No. BNL 50649 and Environmental Control Technology and Earth Sciences Report No. TID-4500, March 1977. 26 p, 13 fig. ERDA- EY-76-C-03-0016.

Descriptors: *Oil spills, *Hazards, *Water pollution effects, Forecasting, Oil pollution, *Outer Continental Shelf, *New York Bight, Long Island.

Oil spilling into the Hudson River from a grounded barge (carrying 400,000 gallons) was observed entering the N.Y. Bight Apex on 11 February 1977. A computer model was used to forecast the subsequent trajectory of this oil and to assess the hazard to Long Island beaches. Oil was forecast to wash ashore on the 13th on Rockaway or Long Beach, depending upon the initial position of the oil in the Bight. Oil was observed on Rockaway Beach on the 13th. Additional daily forecasts indicated no further hazard to Long Island, also in accordance with observations, and the forecasts were terminated on the 16th. The model was used also to assess a beaching event that occurred a week later. The complete calculations are available on microfiche in graphics format. (Sinha-OEIS)
W78-03109

ANALYSIS OF OIL SPILL TRENDS,
GKY and Associates, Alexandria, VA.
G. K. Young, D. Evans, and R. U. Jettmar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 917, Price codes: A03 in paper copy, A01 in microfiche. Report to Counciloon Environmental Quality, Washington, DC, and Environmental Protection Agency, Washington, DC, August 15, 1976. 50 p, 8 fig, 6 tab, 18 ref, 3 append. EQ6AC014.

Descriptors: *Oil spills, *Water pollution, *Statistics, Resources development, Transportation, *Outer Continental Shelf.

An analysis is given of national data on oil spills and cleanup to derive trends from incidents recorded from 1972 through 1975 in the Pollution Incident Reporting System (PIRS) file of the U.S. Coast Guard and the Spill Prevention, Control, and Countermeasure (SPCC) file of the Environmental Protection Agency. Indications are that some improvement trends appear to be present. Future analyses should add credibility to the estimates as information is accumulated in the data files in later years. Future analysis will be greatly benefited by the ability to merge and analyze both the SPCC and PIRS files, as is done in this report. (Sinha-OEIS)
W78-03112

WATER QUALITY OF SELECTED STREAMS IN THE COAL AREA OF SOUTHEASTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
J. R. Knapton, and P. W. McKinley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 028, Price codes: A08 in paper copy, A01 in microfiche. Water-Resources Investigations 77-80, September 1977. 145 p, 53 fig, 1 tab, 13 ref.

Descriptors: *Water quality, *Streams, *Montana, *Coal mines, *Chemical analysis, Anions, Cations, Dissolved solids, Specific conductivity, Trace elements, Sediment transport, Water temperature, Path of pollutants, Water utilization, Irrigation, Cattle, Water analysis, Evaluation, Southeastern Montana.

This report summarizes and evaluates water-quality data collected at 35 stream sites the the coal region of southeastern Montana. Sarpy Creek, Armells Creek, and Rosebud Creek sometimes have dissolved-solids concentrations that cause water to be marginal for agricultural purposes. At times of rainfall and snowmelt, the runoff water mixes with the base-flow component to improve the overall quality. Water in the Tongue River generally showed a downstream degradation in which some changes were related to lithology of the aquifers contributing water to streamflow. Water from Pumpkin Creek and Mizpah Creek is used mostly for cattle watering. To some extent water is used for irrigation although the salinity hazard was often high. The chemical quality of the Powder River changed little during flow downstream. High sediment loads of the river acted as transporting agents for many of the plant nutrients and trace-element constituents. (Woodard-USGS)
W78-03121

HYDROLOGIC MONITORING OF A WASTE-INJECTION WELL NEAR MILTON, FLORIDA, JUNE 1975 - DECEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. A. Pascale, and J. B. Martin.
Open-file report 77-368, April 1977. 46 p, 9 fig, 4 tab, 16 ref.

Descriptors: *Waste disposal wells, *Injection wells, *Industrial wastes, *Path of pollutants, *Chemical analysis, Sampling, Monitoring, Data collections, Florida, Evaluation, Santa Rosa County(Fla).

Hydraulic and chemical data were collected through a monitoring program conducted by the U.S. Geological Survey at an industrial liquid-

waste injection site 6 mi southwest of Milton, Fla., in Santa Rosa County. The injection system is described. Data include injection rates, volumes, and pressures; water-level data at three monitor wells and a standby injection well, and field and laboratory analyses of water samples from four wells. Hydraulic and geochemical effects of the waste-injection system at the plant as of December 31, 1976, have been detected only in the injection zone, the lower limestone of the Floridan aquifer. Increased pressures are evident at the three wells used to monitor the injection zone. Geochemical changes have been noted only at the deep-test monitor well closest to the injection well. (Woodard-USGS)
W78-03126

PRELIMINARY STUDY OF SOURCES AND PROCESSES OF ENRICHMENT OF MANGANESE IN WATER FROM UNIVERSITY OF RHODE ISLAND SUPPLY WELLS,
Geological Survey, Boston, MA. Water Resources Div.; and Geological Survey, Providence, RI. Water Resources Div.
W. D. Silvey, and H. E. Johnston.
Open-file report 77-561, May 1977. 33 p, 12 fig, 4 tab, 10 ref.

Descriptors: *Manganese, *Water pollution sources, *Groundwater, *Water wells, Ponds, Bottom sediments, Organic matter, Seepage, Iron, Path of pollutants, Groundwater movement, Chemical reactions.

Concentrations of dissolved manganese have increased from 0.0 to as much as 3.3 mg/liter over a period of years in closely spaced University of Rhode Island supply wells. The wells tap stratified glacial deposits and derive part of their water from infiltration from a nearby river-pond system. The principal sources of the manganese seem to be coatings of oxides and other forms of manganese on granular aquifer materials and organic-rich sediments on the bottom of the pond and river. Chemical analyses of water from an observation well screened from 3 to 5 feet below the pond bottom indicate that infiltration of water through organic-rich sediments on the pond bottom is the likely cause of manganese enrichment in the well supplies. After passing through the organic layer, the water contains concentrations of manganese as high as 1.2 mg/liter. Manganese in water in concentrations that do not cause unpleasant taste is not regarded to be toxicologically significant. However, concentrations in excess of a few tenths of a milligram per liter are undesirable in public supplies and in many industrial supplies. Brown and others (21970) note that waters containing manganese in concentrations less than 0.1 mg/liter seldom prove troublesome, but that those containing more than 0.5 mg/liter may form objectionable deposits on cooked food, laundry, and plumbing fixtures. The U.S. Public health Service (1962) recommends that the concentrations of manganese in drinking and culinary water not exceed 0.05 mg/liter. (Woodard-USGS)
W78-03127

TIME OF TRAVEL OF SOLUTES IN THE TUSCARAWAS RIVER BASIN, OHIO, AUGUST AND SEPTEMBER, 1974,
Geological Survey, Columbus, OH. Water Resources Div.
A. O. Westfall, and E. E. Webber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 187, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 77-23, March 1977. 7 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Streamflow, *Flow characteristics, *Dye releases, *Travel time, *Pollutants, Ohio, Tracking techniques, Fluorescent dye, Flow rates, Discharge measurement, Data collections, Sampling, Maps, Hydrographs, *Path of pollutants, *Tuscarawas River basin(Ohio).

A time-of-travel study was made on a 106-mile reach of the Tuscarawas River in Ohio to determine average velocity and dispersion characteristics between selected points. The reach was divided into five subreaches, and a fluorescent dye was used as the tracer material. At about the 50-percent flow-duration level, time of travel of the peak concentrations was 137 hours. (Woodard-USGS)
W78-03131

TIME OF TRAVEL OF SOLUTES IN SELECTED REACHES OF THE SANDUSKY RIVER BASIN, OHIO, 1972 AND 1973,
Geological Survey, Columbus, OH. Water Resources Div.
A. O. Westfall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 109, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-50, October 1976. 64 p, 47 fig, 4 tab, 8 ref.

Descriptors: *Streamflow, *Flow characteristics, *Dye releases, *Travel time, *Pollutants, Ohio, Tracking techniques, Fluorescent dye, Reservoir releases, Flow rates, Discharge measurement, Data collections, Sampling, Maps, Hydrographs, *Sandusky River basin(Ohio).

A time-of-travel study in Ohio of a 106-mile reach of the Sandusky River and a 39-mile reach of Tymochtee Creek was made to determine the time required for water released from Killdeer Reservoir on Tymochtee Creek to reach selected downstream points. Two dye sample runs were made through each subreach to define the time-discharge relation for approximating travel times at selected discharges within the measured range. Time-discharge graphs are presented for 38 subreaches. Graphs of dye dispersion and variation in relation to time are given for three sampling sites. For estimating travel time and velocities between points in the study reach, tables for selected flow durations are given. Duration curves of daily discharge for four index stations are presented to indicate the low-flow characteristics and for use in shaping downward extensions of the time-discharge curves. (Woodard-USGS)
W78-03132

TRACE METALS IN FINFISH FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Milford Lab.
R. A. Greig, and D. R. Wenzloff.
Marine Pollution Bulletin, Vol 8, No 9, p 198-200, 1 fig, 1 tab, 7 ref. Sept. 1977.

Descriptors: Environmental effects, *Water pollution sources, *Metals, Fish, *New York Bight, *Long Island Sound, Silver, Cadmium, Chromium, Copper, Mercury, Manganese, Nickel, Lead, Zinc, Toxicity, *Trace elements, Trace metals.

Silver, cadmium, chromium, copper, mercury, manganese, nickel, lead and zinc concentrations were determined in five species of finfish (red hake, smooth dogfish, white hake, winter flounder, and yellowtail flounder). Tissue concentrations of the metals were found to be similar in the various species except that zinc in the liver of smooth dogfish was about 10% lower than in red hake or winter flounder and mercury level in a single dogfish liver was 2.0 ppm compared to less than 0.2 ppm in livers of other fish. Metal concentrations were also found to be similar for a single species when comparing catch locations. Comparison of the present data to those of other investigators is made. (Chilton-ORNL)
W78-03139

REGIONAL GEOCHEMICAL DATA IN RELATION TO SEASONAL VARIATIONS IN WATER QUALITY,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
S. R. Arston, and I. Thornton.
The Science of the Total Environment, Vol. 7, No. 3, p 247-260, 2 fig, 8 tab, 5 ref. 1977.

Descriptors: *Water pollution sources, Water quality, *Geochemistry, *Seasonal, Iron, Manganese, Copper, Lead, Zinc, Cadmium, Sediments, *Metals, *Trace elements, Path of pollutants, *England(Cornwall), Regional analysis, Data collections.

During the period March, 1973 to March, 1974 the concentration of iron, manganese, copper, lead, zinc and cadmium were determined in the waters and sediments of eight tributaries in four Cornish catchments. Considerable variation in the concentrations of all the trace elements occurred on a temporal basis. The greatest range of concentration variations occurred in the mineralized/mined tributaries. The data suggests that the average composition of sediment is useful for the prediction of areas where concentrations of potentially toxic elements in waters may exceed recommended limits. (Chilton-ORNL)
W78-03140

UPTAKE AND ACCUMULATION OF THE NICKEL ION BY MYTILUS EDULIS,
San Francisco Univ., CA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-03142

LEAD IN DRINKING WATER IN SOFT WATER AREAS -- HEALTH HAZARDS,
Glasgow Univ., Glasgow (Scotland). Dept. of Materia Medica.
M. R. Moore.
The Science of the Total Environment, Vol 7, No 2, p 109-115, 2 fig, 2 tab, 20 ref. 1977.

Descriptors: Environmental effects, *Water pollution effects, Plumbing, *Potable water, Toxicity, *Lead, *Public health, Absorption.

The paper reports upon the uptake of lead into domestic water and the association of blood lead concentrations found in persons resident in houses supplied with such water. In situations where a lead-lined storage tank supplied water to a house through lead piping, the initial sample showed a concentration of 2.88 microM which dropped to 0.50 microM when flushed for 5 min at a rate of 10 l/min. In a house plumbed with copper joined with lead soldered joints, the initial figure was 0.51 microM and fell rapidly to 0.12 microM on flushing. Significant regressions were found between water lead and blood lead concentrations of persons resident in these houses. It is suggested that the amount of lead in drinking water can be reduced by removing lead from plumbing systems and a short term solution (already initiated in Glasgow) is to treat the water supply in holding reservoirs with calcium salts as lime at the rate of 2-4 ppm. (Chilton-ORNL)
W78-03143

ASPECTS OF THE VIRAL CONTAMINATION OF SEA WATER: PRELIMINARY RESULTS, (IN ITALIAN),
Messina Univ. (Italy). Inst. of Hygiene.
R. De Blasi, L. Squeri, W. Farina, and I. Picerno.
Riv Ital Ig 36(1-3), p 26-32, 1976.

Descriptors: *Viruses, Sea water, *Water pollution sources, Isolation, Cytological studies, Adenoviruses, Infection, *Messina coast(Italy), Picornaviruses, Polioviruses, Sewage(Untreated).

Sea water samples collected along the Messina (Italy) coast were studied to accertain the degree of viral contamination due to untreated sewage of the city and the villages. The results of cytopathic agents isolated in June, just before the swimming period, are reported. From 82 sea water samples collected, 20 viruses were isolated; 4 of them were polioviruses type I, 1 poliovirus type 3, 8 adenoviruses and 6 not identified. The danger of sea water as a vehicle of infection and necessity of a sewage treatment are discussed. –Copyright 1978, Biological Abstracts, Inc.
W78-03147

TUNICATE SPECIES AS MARINE POLLUTION INDICATORS,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
C. Papadopoulou, and G. D. Kanias.
Marine Pollution Bulletin, Vol 8, No 10, October 1977, p 229-231, 3 tab, 21 ref.

Descriptors: Environmental effects, *Water pollution sources, *Bioindicators, Aquatic life, Iron, Selenium, Chromium, Zinc, Cobalt, *Tunicates, Microcosmus sulcatus, Ciona intestinalis.

Cobalt, zinc, chromium, caesium, silver, iron, rubidium, selenium, scadium and antimony concentrations were determined in two tunicates, Microcosmus sulcatus (Pyuridae) and Ciona intestinalis (Cionidae). High K values found for the elements selenium, chromium, zinc and cobalt in Microcosmus and of iron in Ciona indicate the usefulness of these two species as indicator organisms to detect or measure the specific pollutants in the environment. (chilton-ORNL)
W78-03148

5C. Effects Of Pollution

THE UPTAKE OF THE MOLLUSCICIDE, 4'-CHLORONICOTINANILIDE INTO BIOMPHALARIA GLABRATA (SAY) IN A FLOWING WATER SYSTEM,
Centre for Overseas Pest Research, London (England).
J. Duncan, N. Brown, and R. W. Dunlap.
Pesticide Science, Vol 8, p 345-353, 1977. 7 fig, 1 tab, 9 ref.

Descriptors: *Pesticides, *Chlorinated hydrocarbon pesticides, *Mollusks, *Methodology, *Design, *Snails, *Flow system, Research and development, Metabolism, Toxicity, Absorption, Analytical techniques, Aquaria, Organic compounds, Bioassay, Methodology, Biomphalaria glabrata, 4'-chloronicotinanilide, Bioaccumulation.

A system was described for the exposure of freshwater snails to pesticides in flowing water. The method allowed groups of seven snails to be confined in about 20 ml of water under constant conditions of pesticide concentration, oxygen tension and temperature for up to 5 days. The uptake rate of 4'-chloronicotinanilide into the planorbid snail, Biomphalaria glabrata (Say) was measured using this method with liquid scintillation counting techniques. The necessity for an acclimatisation period prior to exposure and the possible influence of activity on uptake was demonstrated. The advantages of the flowing system over exposure in static solutions were discussed and the use of the apparatus in deciding whether relative uptake rates can account for interspecific differences in susceptibility or contribute to the improvement of molluscicide specificity was indicated. (Klein)
W78-02702

TOXICITY EVALUATION OF A COMPLEX METAL MIXTURE TO THE SOFTSHELL CLAM MYA ARENARIA,
Environmental Research Lab., Narragansett, RI.
R. Eisler.
Marine Biology, 43, p 265-276, (1977), 7 tab, 7 fig, 20 ref.

Descriptors: *Clams, *Bioassay, Mortality, *Metals, Water pollution effects, *Manganese, *Zinc, *Lead, *Nickel, *Copper, *Cadmium, Rhode Island, Molluscs, Benthos, Methodology, Dredging, Seawater, Softshell clam, Mya arenaria, Salt mixture, Tissue concentration, Bioaccumulation, Narragansett Bay, Metal mixture.

Adults of the softshell clam Mya arenaria were continuously subjected to a flowing raw seawater solution containing a mixture of salts of manganese, zinc, lead, nickel, copper, and cadmium. Final calculated concentrations, in microg 1-1, of the toxicant solution were 7200 Mn, 2500 Zn, 70 Pb, 50 Ni, 50 Cu and 1 Cd. M. arenaria were also subjected to a 20% solution, i.e., 1440 Mn, 500 Zn, 14 Pb, 10 Ni, 10 Cu, and 0.2 microg 1-1 Cd. In the winter study, all clams exposed to a 100% solution died between the 4th and 10th week; soft parts of survivors at 6 weeks contained about 19 times more Pb, 15 x more Zn, 12 x more Cu, 10 x more Mn, 3 x more Ni and 0.1 x more Cd than controls; relatively minor changes in whole body elemental content of Ca, Cr, Fe, K, Mg, Na, Sr, and V were observed. Clams exposed to a 20% solution during winter survived the 112 day study; at that time these contained about 5 x more Cu, 4 x more Mn, 3 x more Zn, and about 2 x more Pb than controls; comparatively minor changes were observed in other elements examined 6 and 14 days; survivors from this group at 7 days contained about 25 x more Pb, 13 x more Cu, 11 x more Zn, 7 x more Mn, and 3 x more Ni than controls; other changes in elemental content were not as pronounced. Mortality in the 20% group during summer was slightly higher than controls during the 16 day study; at 14 days survivors from this group contained about 12 x more Mn, 7 x more Pb, 7 x more Zn, 4 x more Cu, and 3 x more Ni than controls. (Katz)
W78-02703

EFFECTS OF OIL ON BEHAVIORAL RESPONSES TO LIGHT, PRESSURE AND GRAVITY IN LARVAE OF THE ROCK CRAB CANCER IRRORATUS,
Environmental Research Lab., Narragansett, RI.
T. E. Bigford.
Marine Biology, Vol 43, 1977, p 137-148. 1 fig, 8 tab, 26 ref.

Descriptors: *Oil, *Oil pollution, Water pollution effects, *Bioassay, Methodology, Laboratory tests, *Crabs, Crustaceans, *Zooplankton, Animal behavior, Larvae, Gravity, Light, Pressure, *Rock crab, Cancer, No. 2 Fuel Oil, Water accomodated fractions, Larval behavior.

Cancer irroratus larvae were cultured and studied in 0.0, 0.1, 1.0 ppm concentrations of water-accomodated fractions of No. 2 fuel oil under static conditions. Behavioral changes were monitored in terms of water column responses to various conditions of light, pressure, and gravity. Results showed significant effects of this oil fraction on larval behavior, with the specific response to oil depending upon the concentration, larval stage, and the combination of light, pressure and gravity tested. Responses at 0.1 ppm differed from those at 1.0 ppm. Geonegative upward movements in the water column were typically depressed in early-stage larvae and enhanced in late-stage larvae after subjection to oils, showing gravity responses to be greatly affected. Phototactic behaviors were significantly changed by the oil and pressure responses were slightly affected. (Katz)
W78-02704

AVOIDANCE OF LOW PH IN SELECTION OF SPAWNING SITES BY BROOK TROUT (SALVELINUS FONTINALIS),
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
D. W. Johnson, and D. A. Webster.
Journal of the Fisheries Research Board of Canada, 34, 1977, p 2215-2218. 2 tab, 11 ref.

Descriptors: *Brook trout, *Behavior, *Acidity, *Hydrogen ion concentration, *Spawning, Aquiculture, Fish physiology, Fish eggs, *Fish reproduction, Acidic water, Acidity, Adirondacks, Spawning sites, pH discrimination.

Brook trout (Salvelinus fontinalis) show a strong preference for upwelling water in selection of precise spawning sites. Advantage was taken of this behavior in observing discrimination of pH by 48 breeding females. When artificial aquifers delivered ambient (6.7), alkaline (8.0), and acid water (varied at pH 4.0, 4.5, and 5.0 in three trials), females clearly avoided upwellings of pH 4.0 and 4.5 in preference to alkaline and ambient upwelling. Discrimination was not evident at pH 5.0. As natural springs in the Adirondack area are likely to be alkaline, the strong preference of brook trout for alkaline upwelling water for breeking sites assures a satisfactory environment through egg and larval stages for at least this environmental condition. (Katz)
W78-02705

CHLORINATED HYDROCARBONS IN DOVER SOLE MICROSTOMUS PACIFICUS: LOCAL MIGRATIONS AND FIN EROSION,
Southern California Coastal Water Research Project, Avila, CA. Lockheed Center for Marine Research.
D. J. McDermott-Ehrlich.
Fishery Bulletin, Vol 75, No 3, p 513-517, 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Organic compounds, *Effluents, *Wastes, *DDT, Marine fish, Discharge(Water), Waste water(Pollution), Demersal fish, Polychlorinated biphenyls, Water quality, Path of pollutants, Fish physiology, Metabolism, Analytical techniques, Environmental effects, Distribution, California, Fish behavior, Water pollution sources, Bioaccumulation, Tissue analysis, Dover sole, Bottom fish, Microstomus pacificus.

Dover sole, Microstomus pacificus, with and without fin erosion collected from the municipal wastewater discharge sites of Los Angeles and Orange counties. While there was a significant difference between the total DDT levels in muscle tissue of the unaffected fish from the two regions, there was no significant regional differences between the muscle DDT levels in the diseased fish. This was consistent with the proposed hypothesis that the Orange County diseased fish had originated at the Los Angeles County discharge site. Comparisons of chlorinated hydrocarbon levels in diseased and unaffected Dover sole from the Palos Verdes discharge site of Los Angeles County indicated (1) DDT levels were significantly higher (P less than 0.05) in Dover sole with fin erosion, and (2) polychlorinated biphenyl levels were higher at the 90% confidence level (P less than 0.10) in diseased Dover sole. (Klein)
W78-02706

DISSOLVED ATMOSPHERIC GAS SUPERSATURATION OF WATER AND THE GAS BUBBLE DISEASE OF FISH,
Environmental Information Services, Inc., Mercer Island, WA.
D. E. Weitkamp, and M. Katz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 122, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, October 1977. 107 p, 1 tab, 195 ref. OWRT W-224(No. 6263)(1).

Descriptors: Supersaturation, *Dissolved gases, *Water pollution effects, *Nitrogen supersaturation, Thermal pollution, Water temperature, Gases, *Literature reviews, Dissolved gas analysis, Post-impoundment, *Columbia River, *Snake River.

The world literature regarding the effects of supersaturated dissolved gases and the related gas bubble disease on fish has been critically reviewed. Interest in this topic has been simulated by the supersaturation of river waters caused by the dams on the Columbia and Snake Rivers and the supersaturation observed in some thermal effluents. A series of episodes of air supersaturated waters and the resulting gas bubble disease in fish hatcheries and other special situations were reported. The external signs of gas bubble disease syndrome in fish larvae and juvenile stages are described. The internal lesions of the disease are also described. Gas bubble disease is related to total dissolved atmospheric gas levels (nitrogen, oxygen, carbon dioxide, argon) and not to nitrogen alone. A critical level of 110% saturation has been proposed for fish confined to waters of one meter or less depth. Studies have shown that at 115% total gas pressures (TGP), in shallow water, mortalities are usually first observed. Fish permitted access to deeper waters, 2.5 meters or greater, can survive supersaturations of 120% TGP for extended periods of time. An increase in water temperature has the effect of decreasing the solubility of dissolved gases, thus resulting in a higher level of supersaturation. Water becomes supersatured with atmospheric gases because of air injection in faulty pumping mechanisms, by spilling at hydroelectric projects, by increases in water temperature of cooling waters at electrical generating facilities and by natural causes particularly those occuring in spring and well waters, geothermal heating, photosynthesis, or warming by solar radiation. Techniques for nitrogen determination and dissolved gas analysis are reviewed.
W78-02707

RESPONSES OF ALGAE AND BACTERIA TO NUTRIENT ADDITIONS IN BOTTLED LAKE WATER,
Tokyo Metropolitan Univ., Tokyo (Japan). Dept. of Biology.
Y. Tezuka, and H. Hayashi.
The Japanese Journal of Limnology, Vol 36, No 4, p 131-138, 1975. 6 fig, 2 tab, 23 ref.

Descriptors: *Algae, *Lakes, *Nutrients, *Water quality, *Bacteria, *Primary productivity, Surface waters, Eutrophication, Organic compounds, Growth rates, Productivity, Limiting factors, Environmental effects, Population, Aquatic life, Ecosystems, Physiochemical properties, Metabolism, Nitrogen compounds, Glucose, Nutrient enrichment.

Surface water of lake Yunoko, a small eutrophic lake in central Japan, was bottled, enriched with glucose and/or mineral nutrients, and incubated for five days at the surface layer of that lake. Bacteria reacted promptly to the addition of glucose. When, however, an ample amount of glucose was added to the lake water, certain mineral nutrients, possibly nitrogen, became secondarily limiting to the growth of bacteria. Although mineral nutrients alone stimulated the growth of algae, the stimulatory effect was far greater when both glucose and mineral nutrients were enriched. (Klein)
W78-02708

ON THE BENTHIC COMMUNITY OF YOKKAICHI HARBOR,
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
T. Iwaki, T. Niihata, M. Naka, and T. Kawahara.
Bulletin of the Faculty of Fisheries of Mie University, No. 3, p 29-40, 1976. 5 fig, 2 tab, 12 ref.

Descriptors: *Benthos, *Benthic fauna, *Sediments, *Harbors, Worms, Gastropods, Nematodes, Water quality, Ecosystems, Biological communities, Speciation, Distribution, Water pollution, Sampling, Mollusks, Ecological distribution, Dominant organisms, *Yokkaichi Harbor(Japan), Nemerteans, Polychaetes.

Benthic animals and bottom sediments were sampled in october, 1975 at 56 stations selected inside and outside Yokkaichi Harbor. Animals collected were nemerteans, nematodes, gastropods, pelecypods, and polychaetes, and the last were dominant. Dominant species of polychaetes was Paraprionospio pinnata, which was living almost everywhere inside and outside the harbor. The second species in dominance was Lumbrineris longifolia which surpassed P. pinnata in dominancy at some area outside the harbor. The third species was Sigambra tentaculata and the fourth Cossura longocirrata. Organic pollution had advanced at the stagnant corner and in the deeps inside the harbor. Southwest corner of the berth had become abiotic where the sediments (mud) contained more than 5 mg S/g dry mud in total sulfide, 35 mg 02/g dry mud in COD, 25 mg C/g dry mud in organic carbon and 12% ignition loss, with four exceptions which did not reach these levels of conditions in two items and one exception in four items. (Klein)
W78-02709

COPPER, MANGANESE, AND CHROMIUM CONCENTRATIONS IN FIVE MACROPHYTES FROM THE DELTA OF RIVER TOCE (NORTHERN ITALY),
Istituto Italiano di Idrobiologia, Pallanza.
R. Baudo, and P. G. Varini.
Memorie dell'Instituto Italiano di Idrobiologia, Vol 33, p 305-324, 1976. 2 fig, 8 tab, 49 ref.

Descriptors: *Metals, *Copper, *Chromium, *Manganese, *Aquatic plants, *Heavy metals, Plant morphology, Plant physiology, Analytical techniques, Sampling, Seeds, Vascular tissues, Plant tissues, Physiochemical properties, Tissue analysis, *Macrophytes, Phragmites communis, Potamogeton crispus, Trapa natans, Lagarosiphon major, Elode canadensis, River Toce delta(Italy).

Five freshwater macrophytes were collected from March, 1974, to February, 1975 in eight sampling stations of the Toce delta, and were analysed for manganese, copper, and chromium. In Phragmites communis seeds showed the highest concentrations of copper and chromium, while manganese was particularly abundant in leaves. Among the submergent macrophytes, Elodea canadensis had a maximum content of heavy metals; Potamogeton crispus showed the minimum concentration of manganese and chromium and Lagarosiphon major was the less rish in copper. Finally, in Trapa natans manganese and chromium were highly concentrated in stems and copper in fruits. (Klein)
W78-02710

CHEMICAL CONTROL OF ZOOTHAMNIUM SP. ON LARVAL MACROBRACHIUM ACANTHURUS,
Texas Parks and Wildlife Dept., Ingram. Heart of Hills Fisheries Research Station.
For primary bibliographic entry see Field 5G.
W78-02711

TEMPERATURE EFFECTS ON PERIODICITY AND EMBRYOLOGY, WITH OBSERVATIONS ON THE POPULATION GENETICS, OF THE AQUACULTURAL ECHINOID HELIOCIDARIS TUBERCULATA,
Sydney Univ. (Australia). School of Biologic Sciences.
C. O'Connor, and J. C. Mulley.
Aquatulture, Vol 12, 1977, p 99-114. 4 tab, 8 fig, 137 ref.

Descriptors: *Aquiculture, *Invertebrates, *Benthos, Reproduction, Water temperature, Thermal pollution, *Thermal stress, Thermal water, *Growth rates, Geographical regions, Commercial shellfish, Water pollution effects, *Sea urchins, *Heliocidaris, Sea urchin roe, Echinoids, *Population genetics, Geographical variations.

The fertilization and development of H. tuberculata, a species producing over 60 g of roe per individual, were studied seasonally at different temperatures. The optimum temperature for both fertilization and development varied from month to month as adult reproductive periodicity, fertility and larval developmental success were related to the seasonal ocean temperature. Observations on the population genetics of H. tuberculata revealed that populations were genetically undifferentiated with no evidence for separate sympatric or allopatric races, subspecies or species which may have been morphologically indistinguishable had they existed. Consequently, geographical variations in reproductive behaviour observed between locations were probably caused, not by genetic differences, but by localized non-genetic adaptation to prevailing temperatures. (Katz)
W78-02712

ECOLOGICAL BUFFER CAPACITY,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen, and H. Mejer.
Ecological Modelling, Vol 3, p 39-61, 1977. 6 fig, 10 tab, 20 ref.

Descriptors: *Model studies, *Ecosystems, Theoretical analysis, *Stability, Behavior, Habitats, Research and development, Mass transfer, Environmental effects, Sediments, Phosphate, Detritus, Phytoplankton, Zooplankton, *Buffer capacity, Complexity, Diversity, Energy, Mass flows, Driving functions, *Ecological buffer capacity.

A situation where models of increasing complexity were calibrated to give equal levels of phytoplankton, detritus, and zooplankton was considered. The buffer capacity of the models was found to increase with increasing capacity. It appeared necessary to have a model of a certain complexity to adequately describe a response to changes. The inclusion of the essential mass flows was determined to be important. In shallow lakes when phosphate was considered, the sediments played an essential role. Diversity was considered less suitably related to the buffer capacity than energy. (Klein)
W78-02713

THE RAPID ALGAE TEST - A CONTRIBUTION TO THE MEASUREMENT OF TOXICITY (DER ALGENSCHNELL TEST - EIN BEITRAG ZUR TOXIZITATMESSUNG),
Landesanstalt fuer Wasser und Abfall Nordrhein-Westfalen, Duesseldorf (West Germany).
For primary bibliographic entry see Field 5A.
W78-02714

TOXICITY TOLERANCE STUDIES UTILIZING PERIPHYTON (TOXITOLERANZVERUCHE AN WASSERMOOSEN),
Duisburg Univ. (West Germany). Dept. of Biology.
J. P. Frahm.
Gewasser und Abwasser, No 57/58, p 59-66, 1975. 1 tab, 6 ref.

Descriptors: *Pollutant identification, *Algae, *Phytoplankton, *Bioassay, *Toxicity, Lethal limit, Metals, Iron, Nutrients, Potassium phosphate, *Sulfates, Calcium, *Sodium chloride, Water quality, *Periphyton, *Lethal threshold, Lepodictyum, Leskea, Fissidens, Schistidium, Fontinalis.

A laboratory study was made of the tolerance of five typical species of fresh water phytoplankton to substances found in some waste waters. The species were Leptodictyum riparium, Leskea polycarpa, Fissidens crassipes, Schistidium alpicola, and Fontinalis antipyretica. The test substances were NaCl, Ammonium sulfate, potassium sulfate, calcium phosphate, and ferric sulfate. The toxicity thresholds of these five species to the various ions were determined. (Katz)
W78-02715

HISTOPATHOLOGICAL CHANGES IN FISH ON INTOXICATION WITH HERBICIDES CONTAINING 2-METHYL-4-CHLORPHENOXYACETIC ACID (HISTOPATOLOGICKE ZMENY U RYB PO INTOXIKACI HERBICIDY S OBSAHEM KYSELINY 2-METYL-4-CHLORFENOXYOCTOVE),
Vysoka Skola Veterinarni, Brno (Czechoslovakia).
L. Groch, and Z. Svobodova.
Bulletin VUR11 Vodnany, Vol 13, No 1, January-March 1977, p 26-30. 4 fig, 13 ref. (English summary).

Descriptors: *Freshwater fish, *Herbicides, Fish diseases, *Animal pathology, Toxicity, Bioassay, Fish physiology, *Water pollution effects, Path of pollutants, Rainbo trout, Carp, *Histopathology, 2-methyl-4-chlorophenoxyacetic acid, Kenopur, Bandex, Dikogren, Circulation disorders, *Hematology.

The organs and tissues of fish intoxicated with combined herbicidal preparations (Keropur, Bandex, Dikogren) containing 2-methyl-4-chlorphenoxyacetic acid were subject to histopathological examination. Carp exhibits circulation disorders manifesting themselves as vasodilatation, congestion, and displacement of erythrocytes from the vascular system. In rainbow trout the histopathological changes are mainly related with the disorders if the circulation system. (Katz)
W78-02717

THE POLLUTION OF THE RHINE ZOOCENOSIS BY MERCURY AND BY ORGANOCHLORINE COMPOUNDS (LA POLLUTION DE LA ZOOCENOSE RHENANE PAR LE MERCURE ET LES PRODUITS ORGANOCHLORES),
Institut de Botanique, Strasbourg (France). Lab. de Ecologie Vegetale.
For primary bibliographic entry see Field 5A.
W78-02718

EXPERIMENTAL STUDIES ON THE EFFECTS OF SUBLETHAL CONCENTRATIONS OF IONOGENIC DETERGENTS ON THE ACTIVITIES OF EMBRYOS, LARVAE AND FRY OF RIVULUS CYLINDRACEUS (CYPRINIDONTIDAE, RIVULINAE) (EXPERIMENTELLE UNTERSUCHUNGEN AN RIVULUS CYLINDRACEUS (CYPRINIDONTIDAE, RIVULINAE) ZUM EINFLUB SUBLETALER KONZENTRATIONEN IONOGENER DETERGENTIEN AUF EMBRYONON, LARVEN UND JUNGFISCHE),
Hamburg Univ. (West Germany). Inst. fuer Hydrobiologie und Fischereiwissenschaft.
R. Weinberg.
Internationale Revue gesamten Hydrobiologie, Vol 62, No 3, p 371-383, 1977. 5 fig, 5 tab, 19 ref.

Descriptors: *Mortality, *Organic compounds, *Alkylbenzene sulfonates, *Sulfonates, *Detergents, *Toxicity, Environmental effects, Lethal limit, Growth stages, Fish physiology, Fish behavior, Embryonig growth stage, Fry, Freshwater fish, *Rivulus cylindraceus, Bioaccumulation.

Embryos, larvae, and fry of the cyprinidontid Rivulus cylindraceus, subjected to sublethal concentrations of the branched alkyl benzene sulfonate TBS, were investigated with respect to mortality rates, deformities, hatching and activity (frequency of heart pulsation, pectoral fin beating and body movements of the embryos, swimming behavior and activity of larvae and fry. Under optimal environmental conditions, sublethal concentrations seemed to have no effect on an entire larval or young fish stock. Under stressing environmental factors of natural or human origin, such as lack of nutrients, effects on a stock were noted at low sublethal concentrations. (Klein)
W78-02719

EFFECT OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. GENERAL CONCLUSIONS,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
Z. Kajak.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 555-561, 1976. 3 tab, 6 ref.

Descriptors: *Thermal pollution, *Heated water, *Water temperature, *Water quality, *Effluents, Productivity, Actinomycetes, Bacteria, Sampling, Diatoms, Phytoplankton, E coli, Diptera, Environmental effects, Rivers, Path of pollutants, Biomass, Density, Distribution, Cyanophyta, Aquatic algae, Periphyton, Worms, Speication, Decomposing organic matter, Water pollution, *Narew River(Poland).

The cumulative effect of heating (by 2C) and pollution in a lowland river resulted in a growth of biomass and share of blue-green algae in the phytoplankton with a drop in diatoms, growth in Actinomycetes and Coli index, decline in the number of benthic Chironomidae species, greater fluctuation in Tubificidae number, and increased destructive processes. Heating, itself, possible to observe only on stationary communities, caused a drop in the number of benthic Chironomidae species, an increase in the share of sexually mature Tubificidae and increased fluctuation in their number in time and a slight growth in number of mesoaprobic species in the periphyton. (See W78-02721 thru W78-02726) (Klein)
W78-02720

EFFECTS OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. MACROBENTHOS,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
K. Dusoge, and R. J. Wisniewski.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 539-554, 1976. 1 fig, 7 tab, 28 ref.

Descriptors: *Thermal pollution, *Heated water, *Effluents, *Water temperature, *Benthos, *Benthic fauna, *Population, Diptera, *Powerplants, Biological communities, Environmental effects, Aquatic life, Distribution, Sewage, Speciation, Water pollution sources, Rivers, Toxicity, Water quality, Density, Productivity, Sampling, Chironomidae, *Narew River(Poland).

The effect of a power station effluent on species composition, dynamics of the density of benthos was investigated in the lowland Narew River. A slight rise of water temperature, not higher than by 2C in summer, was observed in the river downstream the power station. This gave in effect a decrease in the number of various species (especially Chironomidae) in the benthos, an increase of the share of predatory forms in the benthos and increased fluctuations in the numbers of benthic organisms. These changes indicate unfavourable decrease of the stability of benthic communities. Especially marked changes were observed in the sectors of the river under a combined effect of a higher water temperature and contamination of the waters with sewage and industrial effluents. (Klein)
W78-02721

EFFECT OF HEATED WATERS ON A BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. OLIGOCHAETA,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
R. J. Wisniewski.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 527-538, 1976. 4 fig, 4 tab, 15 ref.

Descriptors: *Thermal pollution, *Heated water, *Water temperature, *Oligochaetes, *Invertebrates, *Worms, Powerplants, Environmental effects, Water quality, Sampling, Water pollution, Biological communities, Population, Benthos, Distribution, Seasonal, Reproduction, Rivers, *Narew River(Poland).

The effects of a power station effluent on the benthic oligochaetes communities were studied in the slightly polluted lowland Narew River. During a slight rise of water temperature in the stream of the river below the power station, not exceeding 2C in the summer time, the periods of an intensive sexual reproduction were accelerated by a few weeks, the ratio of the mature individuals has increased and the rhythm of the recurrence of young individuals in the population was changed. In effect of these changes, large fluctuations in the numbers of Oligochaetes were observed in the heated sector of the river. (Klein)
W78-02722

EFFECT OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. PERIPHYTON,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
I. Andrzejczak-Czechowska, and R. J. Wisniewski.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 519-526, 1976. 2 fig, 1 tab, 11 ref.

Descriptors: *Thermal pollution, Effluents, *Heated water, *Water temperature, *Biomass, *Algae, *Periphyton, *Diatoms, Aquatic algae, Primary productivity, Population, Water quality, Environmental effects, Powerplants, Water pollution sources, Sampling, Seasonal, Bioindicators, Rivers, *Narew River(Poland).

The effect of heated waters discharged from the power station on the periphyton algae communities was studied in the slightly polluted lowland Narew River. The discharge of heated water caused a rise of temperature in the river waters by about 2C in summer, after mixing up of the discharge waters with the river waters. In the most strongly heated sector of the river a decrease in the density of periphyton algae and in the number of diatoms species was observed as well as an increase in the ratio of the indicator-forms of alpha-mesosaprobity, especially in warm seasons of the year. The decrease in the number of diatoms species and the increase in the ratio of the forms indicating alpha-mesosaprobity were also observed in the summer and autumn in the most strongly polluted sector of the river, downstream below the discharge of the wastes from the sewage treatment plant at Ostroleka. (Klein)
W78-02723

EFFECT OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. PHYTOPLANKTON,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
J. Turczynska, and R. J. Wisniewski.
Polskie Archiwum Hydrobiologia, Vol 23, No 4, p 507-518, 1976. 3 fig, 3 tab, 15 ref.

Descriptors: *Thermal pollution, *Phytoplankton, *Productivity, *Primary productivity, *Biomass, *Heated water, *Water temperature, Chlorophyll, Power plants, Distribution, Population, Speciation, Sampling, Seasonal, Cyanophyta, Chlorophyta, Nannoplankton, Rivers, Environmental effects, Water quality, Water pollution, Narew River(Poland).

The effects of a power station on phytoplankton were investigated in the moderately polluted lowland the Narew River. The rise of water temperature did not cause any changes in the species composition, composition of dominants, density and biomass of phytoplankton and pheopigments chlorophyll a ratio. Only in the case of the intake of more than 30% of the river rate of flow for cooling purposes an increase in the ratio of blue-green algae in the total number and biomass of the

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phytoplankton was observed in the waters directly below the discharge of the cooling waters. An increase in the number and biomass of blue-green algae was also observed in the sector of the river remaining under combined of heating and pollution, especially at the time of the low water flow rate in the river in summer and autumn of 1973, an increase in the number and biomass of green algae was also observed as well as a strong development of nonnoplanktonic forms in summer 1973. (Klein)
W78-02724

EFFECT OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. MICROBIOLOGICAL CHARACTERISTICS,
Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
W. A. Godlewska-Lipowa.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 499-506, 1976. 7 fig, 12 ref.

Descriptors: *Thermal pollution, *Biomass, *Productivity, *Heated water, *Water temperature, *Bacteria, *Actinomyces, *Density, Bioassay, Sampling, Population, Powerplants, Wastes, Bioindicators, Water quality, Water pollution, Water pollution sources, Environmental effects, Microbiology, Humic wastes, Decomposing organic matter, *Cellulolytic bacteria, Fecal pollution, *Narew River(Poland).

Studies on the density and biomass of bacteria, cellulolytic bacteria, and actinomyces were carried out in the 133-km-long sector of the Narew River from Ostroleka down to the Zergrzynski Dam Reservoir. Heterotrophic activity of microflora on cellulose and index of fecal pollution were determined. The number and biomass of bacteria in the Narew River remained, before (1973) and after the setting in motion of the Power-Plant-B at Ostroleka (1973), at a stable level with only very slight oscillations. In 1973 the values of the index of faecal pollution and of actinomyces were slightly higher than in 1972. This refers also to the number and activity of cellulolytic bacteria. The values of the organic matter destruction in 1973 were many times higher than in 1972. It seems that this comes in result of a cumulative effect of a slightly higher water temperature and simultaneous water contamination. (See also W78-02720) (Klein)
W78-02725

EFFECT OF HEATED WATERS ON BIOCENOSIS OF THE MODERATELY POLLUTED NAREW RIVER. PHYSICO-CHEMICAL CONDITIONS,
Institute of Meteorology and Water Economy, Warsaw (Poland). Dept. of Biology and Water Chemistry.
J. R. Dojlido.
Polskie Archiwum Hydrobiologii, Vol 23, No 4, p 487-498, 1976. 5 fig, 3 tab, 6 ref.

Descriptors: *Heated water, *Water temperature, *Effluents, *Water quality, *Power plants, Dissolved oxygen, Physiochemical properties, Water pollution sources, Rivers, *Nitrites, Environmental effects, *Thermal pollution, Waste water(Pollution), Water pollution, Chemical oxygen demand, Biocenosis, *Narew River(Poland).

The effect of heated water discharge from a power plant on the quality of water in the moderately polluted Narew River was investigated. Utilization of the river water for the cooling system requirements ranged up to 40 per cent of the river flow. The rise of temperature of the river water (1.5 km downstress of the power plant) ranged up to 2C. The maximum temperature of the river water was 28.5C. The heated waters did not cause any negative changes in the quality of water. Only a slight decrease in the concentration of dissolved oxygen and biochemical oxygen demand was observed, as well as, a slight increase in the concentration of nitrites. (See also W78-02720) (Klein)
W78-02726

INVESTIGATIONS ON THE UPTAKE OF MERCURY IONS BY CHLORELLA FUSCA AND CHLAMYDOMONAS REINHARDI (UNTERSUCHUNGEN UBER DIE AUFNAHME VON QUECKSILBERIONEN BEI CHLORELLA FUSCA UND CHLAMYDOMONAS REINHARDI),
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Vienna.
W. Eisenreich, H. Wihlidal, G. Stehlik, and R. Biebl.
Report SGAE BER. NO. 2456, 13L-139/75, p 1-19, 1975. 18 fig, 1 tab, 22 ref.

Descriptors: *Metals, *Mercury, *Mode of action, *Algae, *Chlorophyta, Chlorella, Chlamydomonas, Radioisotopes, Absorption, Membranes, Transfer, Plant physiology, Path of pollutants, Translocation, Ions, Chlorella fusca, Chlamydomonas reinhardi, Tissue analysis, Bioaccumulation.

The uptake of labelled mercury ions (taken as 203Hg-acetate) was investigated on two different unicellular algae, Chlorella fusca and Chlamydomonas reinhardi. During the first hours of the experiments both organisms, cultivated asynchronously, showed comparatively quick and strong uptakes of mercury ions, being independent of any supply of energy (light, heat). Uptake-tests applied to synchronous algae cell cultures further demonstrated rather independence of the cells' physiological condition. The results suggest a passive transport of mercury ions at Chlorella fusca and Chlamydomonas reinhardi or a strong binding to the cell wall. (Klein)
W78-02727

FATE OF 2,4,-D IN FISH AND BLUE CRABS,
Syracuse Research Corp., NY.
H. C. Sikka.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 678, Price codes: A02 in paper copy, A01 in microfiche. Submitted to Office of Chief of Engineers, U.S. Army, Wash., D.C.. Contract Report A-77-2. May 1977. 18 p, 8 ref, 5 tab.

Descriptors: *Path of pollutants, *Pesticide residues, *Absorption, *2,4-D, *Channel catfish, *Crabs, *Sunfishes, *Herbicides, *Laboratory tests, Aquatic plants, Public health, Metabolism, Shellfish, Crustacean, Pesticides, Chlorinated hydrocarbon pesticides, Commercial shellfish, Bioaccumulation, St. Johns River(Florida).

The uptake and accumulation of the dimethylamine (DMA) salt of 2,4-D by fish and blue crabs was studied in the process of registering the use of this herbicide in slow moving waters for aquatic plant control. Bluegills and channel catfish were exposed to 2,4-D in an environment in which microbial degradation of the herbicide was minimal for assessment of uptake and metabolism. To determine residues of 2,4-D in crab meat, blue crabs were collected from four locations along the St. Johns River in Florida, following treatment of water hyacinths with the 2,4-D DMA. The results of this study demonstrated that the herbicide did not bioaccumulate in fish and did not exceed the established tolerance limit of 1.0 ppm in blue crab flesh. (Katz)
W78-02728

IMPACTS OF POWER PLANT INTAKE VELOCITIES ON FISH,
National Power Plant Team, Ann Arbor, MI.
J. Boreman.
Fish and Wildlife Service, Biological Services Program No. FWS/OBS-76/20.1, March 1977. 10 p. 13 ref, 2 fig, 2 tab.

Descriptors: *Powerplants, *Fishkill, *Intakes, *Entrainment, *Larvae, *Velocity, *Cooling water, Environmental effects, Mortality, Spatial distribution, Design, *Intake velocity, *Powerplant design.

This report outlines biological problems associated with power plant intake velocities. Information needed to assess impacts of intake velocities on fishery resources and a list of technical references containing more detailed analyses of the problems and mitigation alternatives are included. Reduction of entrainment losses can be accomplished by several methods, including use of skimmer walls, velocity caps, and submerged weirs, relocation of the intake in areas of less critical habitat or construction of a closed-cycle cooling system to reduce the volume of water withdrawal. Reduction of impingement can be accomplished by use of methods such as travelling screens, fish bypass systems, louvers, and relocation of the intake. (Katz)
W78-02731

SOME ASPECTS OF BENTHIC PRODUCTION IN A SALMONID REARING CHANNEL,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
D. D. Williams, J. H. Mundie, and D. E. Mounce.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2133-2141. 13 fig, 22 ref.

Descriptors: *Salmon, *Fish hatchery, *Benthic flora, *Benthic fauna, Benthos, Fish diets, Fish establishment, Fish farming, *Aquiculture, Fish population, Invertebrates, Biomass, *Water pollution effects, *Benthic production, *Salmonid rearing channel, Substrate recolonization, *Fish production wastes, Benthic standing crop.

Experiments on optimizing the use of benthos in a salmonid rearing channel are described. The cropping potential of invertebrates for use as fish food was measured by substrate recolonization which showed that 80,000 animals, weighing approximately 0.62 g (dry weight) could be liberated from 1 m2 of clean gravel substrate to a depth of 15 cm every 15 days. Recolonization curves expressed in terms of number of taxa, total numbers, and biomass gave the following patterns: asymptotic regression curve, logistic growth curve, and a straight line, respectively. Individual curves of the major taxa showed a variety of patterns. Small accumulations of fish production wastes (up to 9 1/m2 of food pellets and up to 4.5 1/m2 of fish feces) increased benthic standing crop by as much as 3 times, but larger accumulations resulted in a decline together with a decrease in benthos diversity. We suggest that invertebrates ameliorate these potential pollutants through their feeding and living habits. (Katz)
W78-02733

LONG-TERM TOXIC EFFECTS OF DDT FOOD AND WATER EXPOSURE ON FATHEAD MINNOWS (PIMEPHALES PROMELAS),
Environmental Research Lab., Duluth, MN.
A. W. Jarvinen, M. J. Hoffman, and T. W. Thorslund.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2089-2103. 9 tab, 4 fig, 53 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, Insecticides, Minnows, *Fish food, Water quality, *Water pollution effects, Bioassay, *Food chain, *Pesticides, Clams, Freshwater fish, Methodology, *Fathead minnows, Pimephales, *Maximum acceptable toxicant concentration.

Fathead minnows were exposed during a partial chronic toxicity test to two DDT concentrations in the water, one in the diet, and combinations of water and diet for 266 days through a reproductive period of their life cycle. The fish were fed a diet of clams that had accumulated 14C-DDT when ex-

posed at a DDT water concentration similar to that in the high fish exposure. Higher total DDT tissue residues were accumulated from the water than diet. Residues contributed by dietary DDT were additive to those from the water. Mean concentrations factors were 1.2 for the diet and 100,000 for the water. Fish exposed to DDT in both water and diet had higher mortality rates than those exposed to only one or the other of these sources. DDT in the diet significantly reduced the probability of survival of the test fish (P=0.025). Estimated maximum acceptable toxicant concentrations for DDT are 9 microg/liter for fish exposed to DDT in both water and diet. Embryo residue levels and larval mortality rates were about twice as great for those from parent fish that had been exposed to DDT in both the water and diet as for those from parent fish exposed to only DDT in the water. (Katz)
W78-02734

MASS STRANDING OF THE LONG-FINNED PILOT WHALE, GLOBICEPHALA MELAENA, ON SABLE ISLAND, NOVA SCOTIA,
Ontario Veterinary Coll., Guelph.
J. R. Geraci, and D. J. St. Aubin.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2196-2199. 3 fig, 10 ref.

Descriptors: *Oil, *Oil pollution, *Water pollution effects, *Mammals, Animal pathology, Wildlife, *Mortalities, Atlantic Ocean, *Massachusetts, Canada, *Mass stranding, *Long-finned pilot whales, Canadian Atlantic, *Oil tankers, *Argo Merchant, Globicephala, *Sable Island(NS).

On December 23, 1976, a herd of over 130 long-finned pilot whales, Globicephala melaena, became stranded on Sable Island, Nova Scotia (43 deg 58'N:59 deg 48'W). Data on sex, length, and maximum girth, as well as skin, and blubber samples for eventual hydrocarbon analysis were collected on January 15 and 16 from up to 116 carcasses. The possible reasons for the stranding are discussed. In particular, implications in the news media that the stranding was precipitated by the December 15 breakup of the oil tanker Argo Merchant off the Massachusetts coast are discounted. (Katz)
W78-02735

GROWTH OF ROCK BASS, AMBLOPLITES RUPESTRIS, IN RELATION TO THE MORPHOEDAPHIC INDEX AS AN INDICATOR OF AN ENVIRONMENTAL STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-02736

BIOELECTRIC ACTION POTENTIALS OF PROCAMBARUS ACUTUS ACUTUS (GIRRARD) IN SERIALLY DILUTED SOLUTIONS OF SELECTED C6 HYDROCARBONS IN WATER,
Marine Biological Lab., Woods Hole, MA.
B. Idoniboye-Obu.
Environmental Pollution, Vol. 14, 1977, p 5-24. 2 tab, 6 fig, 62 ref.

Descriptors: *Oil, *Oil pollution, *Bioassay, Mortality, Laboratory tests, *Methodology, Crustaceans, *Crayfish, Animal physiology, Electric fields, Electrodes, Monitoring, Water pollution effects, Laboratory equipment, Bioelectric action potentials, *Procambarus, *C6 hydrocarbons, *Water soluble fractions, Muscle action potentials, Electrophysiology, Threshold concentrations, Hexane, Hexene, Cyclohexene, Benzene.

Gross muscle action potentials and spontaneous nerve action potentials from moving animals inside experimental chambers or aquaria containing a sufficient depth of water can be recorded by means of remote electrodes. The principle of recording the complex action potentials from both neurogenic and myogenic sources by remote electrodes in water is explored in a bioassay assessing the external concentrations of selected water-soluble petroleum hydrocarbons. These petroleum hydrocarbons could bring about the ultimate cessation of impulse generation and propagation in short term exposures. Long before the harsh threshold of the 'death response' itself is reached, a progressive diminution or irregularity of the biopotentials can indicate proximity to the 'point of no return'. This is particularly so in the locomotor system, which begins to function less and less effectively in decapod Crustacea, commonly known as very active animals. It is suggested that lethal thresholds of water pollution can be established in a systematic manner using test organisms, especially those of commercial importance, by such electrophysiological methods, with minimum destruction of experimental animals. The technique can be adapted or refined for use in regulatory laboratories and similar establishments. (Katz)
W78-02737

ISOLATION OF TRICHODERMA HARZIANUM (RIFAI) GROWING ON FERRIC HYDROXIDE MUD IMPREGNATED WITH GAS OIL,
Societe Francais des Petroles BP, Paris. Div. of Microbiology.
For primary bibliographic entry see Field 5A.
W78-02738

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology.
V. V. Ernst, and J. M. Neff.
Environmental Pollution, Vol. 14, 1977, p 25-35. 2 tab, 8 fig, 14 ref.

Descriptors: *Oil, *Oil pollution, *Toxicity, Mortality, *Bioassay, Laboratory tests, *Pathology, Juvenile fish, Estuarine environment, *Water pollution effects, *Estuarine fish, Fundulus grandis, *No 2 fuel oil, *Water soluble fractions, Petroleum hydrocarbons, *Naphalenes, *Methylnaphthalenes, *Histological examination, Pathological effects.

Embryos of Fundulus grandis were exposed continuously to 12.5, 25, and 50% dilutions of the water-soluble fraction (W SF) of No. 2 fuel oil, corresponding to aqueous petroleum hydrocarbon concentrations of 1.1, 2.2, and 4.4 ppm, respectively, and aqueous naphthalenes concentrations of 0.56, 1.07, and 1.26 ppm, respectively. At different times during development, embryos were examined histologically and compared with unexposed controls. Embryos exposed to 12.5% WSF generally hatched earlier than the controls and most were normal. Some of those exposed to 25% WSF had pathological liver, kidney, lens, and epithelial tissue while others appeared normal. None of the embryos exposed to 50% WSF hatched and all had pathological tissues. (Katz)
W78-02739

COASTAL WATER RESEARCH PROJECT, ANNUAL REPORT 1975,
Southern California Coastal Water Research Project, El Segundo, CA.
For primary bibliographic entry see Field 2L.
W78-02740

ECOLOGICAL AND DISEASE STUDIES OF DEMERSAL FISHES IN PUGET SOUND NEAR METRO-OPERATED SEWAGE TREATMENT PLANTS AND IN THE DUWAMISH RIVER,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5A.
W78-02741

A SELECTED BIBLIOGRAPHY ON RAINBOW TROUT, SALMO GAIRDNERI RICHARDSON, WITH PARTICULAR REFERENCE TO STUDIES WITH AQUATIC TOXICANTS,
Environmental Protection Service, Halifax (Nova Scotia). Environmental Services Branch.
P. Wells.
Economic and Technical Review Report No. EPS-3-AR-77-1. April 1977. 109 p, 599 ref.

Descriptors: *Rainbow trout, *Bibliographies, *Toxins, *Information retrieval, *Bioassay, *Fish diseases, *Fish physiology, *Water pollution effects, Trout, Salmonids, Reviews, Laboratory tests, Toxicity, Pesticides, Metals, Environmental effects, Indexes, *Sublethal effects, *Toxicants.

An indexed and selected bibliography on rainbow trout, Salmo gairdneri Richardson, is presented. It contains 599 references from the primary and technical scientific literature. These references are of particular interest and use to aquatic toxicity laboratories studying the responses of rainbow trout in toxicity bioassays. The references are presented in three sections - holding and disease, physiology and effects of toxicants - and two indexes (author and keyword) are compiled to allow their rapid access. (Katz)
W78-02742

TOXICITY OF TNT WASTEWATER (PINK WATER) TO AQUATIC ORGANISMS,
Stanford Research Inst., Menlo Park, CA.
D. H. W. Liu, R. J. Spanggord, and H. C. Bailey.
Available from the National Technical Information Service Springfield, VA 22161 as ADA-031 067, Price codes: A03 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D. C., January 1976. 31 p, 8 tab, 9 ref.

Descriptors: Bioassay, *Toxicity, Mortality, *Freshwater fish, Crustaceans, *Daphnia, Hydrogen ion concentration, Industrial wastes, Irradiation, Laboratory tests, Laboratory animals, Acute toxicity, *Alpha-TNT, 2,4-DNT, *TNT wastewater, *Fathead minnow, Pimephales, Static bioassays, Ultraviolet irradiation, Red water, *Benzene.

The acute toxicity was determined of aqueous solutions of alpha-TNT and 2,4-DNT and three types of TNT wastewater from the Joliet Army Ammunition Plant to the fathead minnow (Pimephales promelas) and the aquatic invertebrate Daphnia magna. The toxicity tests were conducted on materials that had been adjusted to pH 5, 7, and 9.4 and exposed to ultraviolet light. All tests were conducted under static conditions without aeration. The pH of the material during irradiation had little effect on its toxicity. Ultraviolet irradiation of LAP and condensate wastewater and of alpha-TNT and 2,4-DNT, the respective major constituents of the two wastewaters, reduced their toxicity; however, this effect was not statistically significant. The acute toxicity of benzene and aqueous fractions of nonirradiated wastewater and of 50% photolyzed aqueous solutions of alpha-TNT and 2,4-DNT was also determined. The benzene fractions were more toxic than the aqueous fractions. Evidence was obtained suggesting that alpha-TNT is probably the most toxic ingredient of LAP wastewater. The minnow and Daphnia magna were equally sensitive to 2,4-DNT, but the latter was more tolerant of alpha-TNT. (Katz)
W78-02743

BIBLIOGRAPHY OF STRIP MINE ECOLOGY,
Iowa State Univ., Ames. Energy and Mineral Resources Research Inst.
For primary bibliographic entry see Field 5G.
W78-02744

SUBMODELS: COPEPOD POPULATION PARAMETERS AS FUNCTION OF ENVIRONMENTAL FACTORS,
Oak Ridge National Lab., TN.
L. A. Maguire, S. R. Blum, C. W. Gehrs, and W. Van Winkle.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNLTM-4978, Price codes: A04 in paper copy, A01 in microfiche. Oak Ridge National Laboratory, Environmental Sciences Division, Publication No. 853, ORNL/TM 4978, July 1976. 58 p, 6 fig, 24 ref.

Descriptors: *Copepods, Zooplankton, *Environmental effects, Water pollution effects, *Model studies, Animal populations, Mortality, *Statistical methods, Statistical models, Water temperature, Analytical methods, *Methodology, Calanoid copepods, *Diaptomus, Population parameters, Environmental factors, *Submodels.

This report describes a set of function submodels that have been developed to calculate copepod population parameters (e.g., clutch size, mortality) as functions of environmental factors (e.g., water temperature, food). Since little is known about how environmental conditions influence copepod population parameters, a variety of functional forms that can be used to relate any population parameter to any environmental factor have been constructed. A brief review of the literature on the calanoid copepod Diaptomus clavipes Schacht and related species suggests functions that may be appropriate for specific biological relationships. (Katz)
W78-02745

DEVELOPMENT OF AN ON-LINE BIOLOGICAL DETECTOR,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W78-02746

THE TOXICITY OF URANIUM AND PLUTONIUM TO THE DEVELOPING EMBRYOS OF FISH,
Oak Ridge National Lab.
J. E. Till, S. V. Kaye, and J. R. Trabalka.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-5160, Price codes:A10 in paper copy, A01 in microfiche. Oak Ridge National Laboratory, Report No. ORNL-5160, UC-41 Health and Safety, July 1976. 189 p, 16 tab, 43 fig, 144 ref.

Descriptors: Carp, *Freshwater fish, *Bioassays, Toxicity, Mortality, Laboratory tests, *Fish eggs, Fish reproduction, Metals, *Radioactivity, *Uranium radioisotopes, Fish physiology, Juvenile fish, Animal pathology, *Plutonium, *Uranium, Carp eggs, Pimephales promelas, Egg hatchability.

The radiological and chemical toxicity of plutonium and uranium to the developing embryos of fish was investigated using eggs from carp, Cyprinus carpio, and fathead minnows, Pimephales promelas. Freshly fertilized eggs were developed in solutions containing high specific activity 238Pu or 232U or low specific activity 244Pu, 235U, or 238U. Quantitative tests to determine the penetration of these elements through the chorion indicated that plutonium accumulated in the contents of carp eggs reaching a maximum concentration factor of approximately 3.0 at hatching. Autoradiographs of egg sections showed that plutonium was uniformly distributed in the egg volume. Uranium localized in the yolk material, and the concentration factor in the yolk sac remained constant during development at approximately 3.3. Doses of 238Pu which affected hatchability of the eggs were estimated to be 1.6 x 10 to the 4th rads and 9.7 x 10 to the 3rd rads for c. carpio and P. promelas, respectively; doses from 232U were 1.3 x 10 to the 4th power rads to carp and 5.7 x 10 to the 2nd power rads to fathead minnows; 3.2 x 10 to the 3rd power rads to carp and 2.7 x 10 to the 2nd power rads were estimated from 232U. Eggs that were incubated in 20 ppm 244Pu did not hatch. This mortality may have been the result of chemical toxicity of plutonium. (Katz)
W78-02747

THE POTENTIAL BIOLOGICAL EFFECTS OF DEPLETED URANIUM ON RANGE C-74 UPON THE ALGAL FLORA OF ROCKY CREEK ON EGLIN AIR FORCE BASE,
Alabama Univ., University. Dept. of Biology.
J. C. O'Kelley.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 809, Price codes: A02 in paper copy, A01 in microfiche. Air Force Armament Laboratory, Armament Development and Test Center, Eglin A.F.B., Fla. August 1976. 52 p. 20 ref, 29 tab, 1 fig. AFATL-TR-76-98.

Descriptors: *Toxicity, *Water pollution sources, *Algae, *Uranium radioisotopes, *Environmental effects, *Growth rates, *Streams, Laboratory tests, On-site investigations, Water pollution effects, Dissolved oxygen, Florida, *Rocky Creek(Florida), *Depleted uranium, *Chlorococcum, U308, Eglin Air Force Base.

Stream samples were collected at five time periods between November 1974 and April, 1976, from selected sites on Rocky and Turkey Creeks, Eglin Air Force Base, Florida. Rocky Creek is in a drainage area for some depleted uranium while Turkey Creek is not. The physical parameters of pH, temperatures and dissolved oxygen were measured as the water samples were taken. The algae present in the samples were identified and the algal populations in Rocky Creek were compared to those in Turkey Creek. There is no evidence from this study that there has been any ecological damage done as yet to Rocky Creek by depleted uranium. However, species isolated from this stream have been shown to be sensitive to uranium as U308 and as UO2 and also to uranyl nitrate. These species and presumably others from the stream can be expected to show damage from depleted uranium on the range should its level become sufficiently high to give a concentration in the water of the stream approaching 5 x 10 to the -5th power M. (Katz)
W78-02748

EFFECTS OF WASTEWATER AND COOLING WATER CHLORINATION ON AQUATIC LIFE,
Environmental Research Lab., Duluth, MN.
W. D. Brungs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 700, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series, Report No. EPA 600/3-76-098, August 1976. 45 p, 154 ref.

Descriptors: Aquatic animals, Aquatic plants, *Bioassay, *Chlorine, *Chlorination, *Bromine, *Bromides, Condensors, Cooling water, *Fishes, *Reviews, *Toxicity, Standards, Aquatic environment, Cooling towers, *Bromination, *Bromine halides, *Chlorinated organic compounds, *Dechlorination, Disinfection, *Wastewater chlorination, *Criteria, Application factors.

The literature since 1972 pertaining to wastewater and cooling water chlorination is discussed under the following headings: review papers, chlorinated municipal wastewaters, continuously chlorinated water, intermittently chlorinated water, dechlorination, avoidance, formation of chlorinated organic compounds, aquatic life criteria and application factors, and regulations. Field and laboratory research results support a single criterion of 0.003 mg/l for continuous exposure of freshwater organisms. The former distinction between warmwater and coldwater systems is no longer appropriate; recent data indicate that several freshwater fish species are as sensitive as trout and salmon. (Katz)
W78-02749

PHOTODEGRADATION OF ORGANIC MATERIALS USED AS BIOMASS,
Naval Research Lab., Washington, DC.
For primary bibliographic entry see Field 5B.
W78-02751

MICROBIAL METABOLISM OF POLYCHLORINATED BIPHENYLS. STUDIES ON THE RELATIVE DEGRADABILITY OF POLYCHLORINATED BIPHENYL COMPONENTS BY ALKALIGENES SP.,
Wisconsin Univ.-Madison. Dept. of Entomology.
K. Furukawa, and F. Matsumura.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 510, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. WIS-SG-76-363,7 p. Reprinted from Journal of Agricultural and Food Chemistry, Vol. 24, p 251-256, March-April 1976. 8 fig, 2 tab, 7 ref.

Descriptors: *Bacteria, *Lakes, Sediments, *Aroclor, *Polychlorinated biphenyl, *Chlorinated hydrocarbon pesticides, Biochemistry, Physiology, Water pollution effects, Microorganisms, Microbial degradation, Environmental effects, *Bacteria, *Alkaligenes, *PCB compounds.

A bacterial strain belonging to the genus Alkaligenes was isolated from a lake sediment by using biphenyl as a sole carbon source. Metabolic degradation of various polychlorinated biphenyls (PCB) by this organism was studied. The bacterium was capable of metabolizing various PCB components, including a highly chlorinated one through an oxidative route. The organism appears to preferentially degrade the less chlorinated (ring II) of the two rings. Degradation takes place in two major steps. The first step produces metabolic intermediates which are considered to be chlorinated derivatives of 2-hydroxy-6-oxo-6-phenylhexa-2,4-dienoic acid, which often has a yellow color with an absorption around 400 nm. In the second step these colored metabolic intermediates are degraded to corresponding chlorobenzoic acids. Generally speaking, degradation of PCBs becomes increasingly difficult as the degree of chlorination increases. (Katz)
W78-02752

PESTICIDE RECOVERY STUDIES FOR EVALUATION OF PEST MANAGEMENT AND PESTICIDE MONITORING DIVISION WATER ANALYSIS METHODOLOGY, JUNE 1974-JUNE 1976,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-02753

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX E: PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02784

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX F: PREDISPOSAL BASELINE CONDITIONS OF PHYTOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
For primary bibliographic entry see Field 5E.
W78-02785

FEEDING AND GROWTH OF PLANT-EATING FISH IN PONDS OF THE CHITA STATE REGIONAL ELECTRIC POWER PLANT,
L. A. Gurova.
Zap Zabaikal Fil Geogr O-Va SSSR. 62, p 74-84, 1972. Translated from Ref Zh Biol, 1972, No. 10I259.

Descriptors: *Carp, Cyanophyta, Algae, Aristichthys-nobilis, Bladderwort, Bulrushes, Charophyta, Chita, Ctenopharyngodon-idella, Diatoms, Electric powerplants, Euglena, Feeding, Fish, Grass, Growth, Milfoil, Oats, Peas, Phytoplankton, Ponds, Pondweed, Reeds, Russian-SFSR, USSR, Willow.

Year-old grass carp (Ctenopharyngodon idella) and 'speckled carp' (Aristichthys nobilis) (22,500 specimens) were reared from June 7 in the embankment-enclosed part of Malyi Kenon bay, Russian SFSR, USSR. After a month there was no natural food in the pond for the grass carp and the fishes were fed the green mass of oat and pea. The daily ration of a grass carp weighing 30 g was 30%, the index of fullness (weight of food as permillage of body weight) was 600% and the role of artificial feed increased with fish size. The preferences of the grass carp for various plants were established experimentally. Well-edible plants were: Charophyta and waterlilies; edible plants: reeds and bulrushes; poorly edible plants: common bladderwort; unedible plants: spiked milfoil (old), curly pondweed and willowgrass. The food of the speckled carp included all species of phytoplankton found in the pond, but diatoms, green algae and Euglena predominated. Blue-green algae were least significant with respect to frequency of occurrence. At the start of June the grass carp had an average length of 11.9 cm and an average weight of 19.9 g and by mid-Sept. reached 15.7 cm and 43.7 g. During this same time the length of the speckled carp increased from 15.7-18 cm and the weight from 34.6-60.0 g.--Copyright 1974, Biological Abstracts, Inc.
W78-02837

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II (CHEMICALS 1-20),
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-02877

BIOECOLOGICAL CONSEQUENCES OF AN ACCIDENTAL OIL SPILL ON ROCKY SHORES OF THE NORMANDY COAST: RESULTS ONE YEAR AFTER OIL POLLUTION ON NOVEMBER 26TH 1974, (IN FRENCH),
Laboratoire de Biologie Anim.-Endocrinol. Saint Aignan (France).
J. C. Peltier, W. Dupont, and J. P. Dupont.
C R Seances Soc Biol Fil 170(2), p 442-448, 1976.

Descriptors: Water pollution effects, Clean-Up(Oil spills), Detergents, Mussels, *Oil spills, *Normandy Beach(France), *Oil pollution.

Along shores where detergents were not used, mussels have progressively excreted the hydrocarbons accumulated in their bodies; the other fixed animals show no change. Along the shores where the detergents were used, their spread and noxious demoecological and synecological consequences with modification of the fixed species colonizing the rocks. The use of detergents to clean polluted shores is not harmless.--Copyright 1978, Biological Abstracts, Inc.
W78-02897

PHOTOSYNTHESIS IN THE AQUATIC MACROPHYTE EGERIA DENSA. I. 14CO2 FIXATION AT NATURAL CO2 CONCENTRATIONS,
Auckland Univ. (New Zealand). Dept. of Botany.
J. A. Browse, F. I. Dromgoole, and J. M. A. Brown.
Australian Journal of Plant Physiology, Vol. 4, No. 2, p. 169-176, April 1977. 2 fig, 23 ref.

Descriptors: *Carbon dioxide, *Photosynthesis, Carbon, Biochemistry, Submerged plants, *Macrophytes, *Calvin cycle, *Carboxylation mechanism, Malate, Egeria densa.

A preliminary study suggested that the four-carbon acids malate and aspartate were important initial products of photosynthesis in the submerged aquatic plants Egeria densa Planch. and Lagarosiphon major. Results of this follow-up study indicate that the Calvin cycle is the major photosynthesis pathway in Egeria densa and that malate is a minor product of fixation under conditions prevailing in the natural habitat. At a high rate under conditions closely approximating those of plants in the field, carbon distribution into 3-phosphoglyceric acid, sugar phosphates and sucrose indicates that the Calvin cycle is the primary carboxylation mechanism and responsible for over 90 percent of the carbon initially incorporated. Malate accounts for only five percent of the initial carbon dioxide fixation and is not actively further metabolized. It is suggested that the predominant carbon fixation into malic acid, noted in previous reports on Hydrocharitacean species, may be due to very low experimental carbon dioxide concentrations and a consequent suppression of the Calvin cycle activity. (Coyle-Wisconsin)
W78-02986

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH). I. THE PHYTOPLANKTON COMMUNITY AND ITS ENVIRONMENT,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
R. I. Jones.
The Journal of Ecology, Vol. 65, No. 2, p. 547-559, July 1977. 5 fig, 1 tab, 4 ref.

Descriptors: *Seasonal, *Succession, *Primary productivity, Eutrophication, Algae, Nutrients, Phytoplankton, Growth rates, Diatoms, Cyanophyta, *Kinnego Bay, Lough Neagh(Northern Ireland).

Two years of seasonal variations of phytoplankton and some physical and chemical conditions are described for Kinnego Bay, a shallow, highly-eutrophic part of Lough Neagh in Northern Ireland. The shallow water column was well-mixed throughout the study period and vertical heterogeneity with respect to temperature and oxygen saturation was slight. Annual loading of algal nutrients was very great, but concentrations could below as a result of depletion by the large algal growths. Diatoms were dominant in the phytoplankton community during spring and autumn, but blue-green algae predominated during summer. Peak crops of both chlorophyll and algal volume were extremely high. Apparent changes in the algal standing crop were found to be highly dependent on the form in which the algal biomass was expressed. It is suggested, in view of the high loading of nutrients into the bay, that the annual succession of phytoplankton species was not entirely attributable to the nutritional considerations but was at least partly a response to changing physical conditions. It is noted that while Kennego Bay represents one of the most eutrophic lakes yet studied, it is still not possible to separate completely the influence of chemical and physical variables on growth of phytoplankton in the bay. (See also W78-02988 and W78-02989) (Coyle-Wisconsin)
W78-02987

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION, AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH) II. PHYTOPLANKTON PRODUCTION AND ITS CHIEF DETERMINANTS,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
R. I. Jones.
Journal of Ecology, Vol. 65, No. 2, p. 561-577, July 1977. 8 fig, 1 tab, 39 ref.

Descriptors: *Photosynthesis, *Respiration, *Primary productivity, Light, Temperature, Phytoplankton, Nutrients, Eutrophication, Lakes, *Kinnego Bay(Northern Ireland).

Photosynthesis and respiration of phytoplankton in Kinnego Bay (Northern Ireland) were studied over a two-year period using the oxygen light and dark bottle technique. Hourly areal phytosysthesis was high and was largely independent of irradiance, being closely related to biomass and phytosynthetic capacity. However, daily areal photosynthesis was strongly dependent on a function of radiation which incorporated day length. Since daily radiation is also a determinant of water temperature is exerted a further influence through the photosynthetic capacity, which was strongly correlated with temperature. The values of the annual gross photosynthesis in the bay seem to be some of the highest recorded from a temperate lake and are considered more remarkable in view of the high percentage of incident radiation that is removed by non-algal material in the water column. Such high photosynthetic values are a function of the dense phyoplankton crops maintained throughout the year, which results from an abundance of nutrients at most times that allows the algae to adapt towards maximum photosynthetic efficiency. (See also W78-02987 and W78-02989) (Coyle-Wisconsin)
W78-02988

FACTORS CONTROLLING PHYTOPLANKTON PRODUCTION AND SUCCESSION IN A HIGHLY EUTROPHIC LAKE (KINNEGO BAY, LOUGH NEAGH) III. INTERSPECIFIC COMPETITION IN RELATION TO IRRADIANCE AND TEMPERATURE,
New Univ. of Ulster, Coleraine (Northern Ireland). School of Biological and Environmental Studies.
R. I. Jones.
Journal of Ecology, Vol. 65, No. 2, p. 579-586, July 1977. 3 fig, 21 ref.

Descriptors: *Respiration, *Temperature, *Succession, *Light intensity, *Competition, *Primary productivity, Phytoplankton, Cycles, Model studies, Eutrophication, Lakes, *Kinnego Bay(Northern Ireland), Growth prediction, Light attenuation, Physiological limits.

Respiration rates appropriate to a diatom and a blue-green alga have been deduced from measurements made with natural phytoplankton populations in Kinnego Bay, dominated at different times by these two species. The diatom and alga had different rates of respiration and also different responses of respiratory rates under varying conditions of irradiance and temperature has been applied to a simple model for predicting growth; the model facilitates analysis of factor interaction in determining the competitive ability of each species during the annual phytoplankton cycle. The success of the two species at different times in the Bay appeared largely to be determined by differences in light attenuation properties of their cells, and by relative advantages conferred at different temperatures by their dissimilar respiration responses. While it may be possible to define physiological limits to growth for a particular species when all factors are optimized under laboratory conditions, these limits may not be good indications of the limits to ecological success for that species under natural conditions. (See also W78-02987 and W78-02988) (Coyle-Wisconsin)
W78-02989

THE RECOVERY OF DAMAGED STREAMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5G.
W78-02990

LIMNOLOGICAL COMPARISON OF CULTURALLY EUTROPHIC SHAGAWA LAKE AND ADJACENT OLIGOTROPHIC BURNTSIDE LAKE, MINNESOTA,
Pacific Northwest Environmental Research Laboratory, Corvallis, OR.
D. W. Schults, K. W. Malueg, and P. D. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 256, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-76-019. Reprinted from The American Midland Naturalist, Vol. 96, No. 1, p 160-178, July 1976. 1BA1031.

Descriptors: *Eutrophication, *Oligotrophy, *Limnology, Minnesota, Trophic levels, Algae, Lakes, Nutrients, Benthos, Wastewater treatment, Tertiary treatment, Phosphorus, *Shagawa Lake(MN), *Burntside Lake(MN).

Eutrophic Shagawa Lake and nearly oligotrophic Burntside Lake near Ely in northeastern Minnesota were compared for 1971-72, just prior to a lake restoration project initiated in January 1973 involving 99% phosphorus removal from municipal wastewater effluent into Shagawa Lake. Both lakes are characterized by steep shorelines, irregular bottoms, and many islands; mean and maximum depths are 5.7 and 13.7 m for Shagawa Lake, and 15.2 and 48.8 m for Burntside Lake. Typical of Shagawa Lake were extensive summer blue-green algal blooms (Anabaena and Aphanizomenon), anaerobic hypolimnion and large, rapid fluctuations in chemical constituents. Burntside Lake had little algae (predominantly diatoms and green algae), aerobic hypolimnion, and small changes in chemical constituents. Chlorophyll a concentrations in Shagawa Lake reached 50-60 micrograms/l, compared with a maximum in Burntside Lake of 6 micrograms/l. Benthic fauna in Lake was predominantly Chaoborus (up to 28,000 organisms/sq m), while amphipoda predominated in Burntside Lake during the summer (maximum 1,300 organisms/sq m). Inorganic nitrogen was undetectable in the epilimnion in summer in both Shagawa and Burntside Lakes. Epilimnion orthophosphate phosphorus was detectable in Burntside Lake in the summer, but undetectable in Shagawa Lake. In Burntside Lake the thermocline was stable, while in Shagawa Lake the algal biomass was sustained in part by an unstable thermocline which allowed nutrient-rich hypolimnetic water to mix with nutrient-poor epilimnetic water. (Lynch-Wisconsin)
W78-02991

NUTRIENT REGENERATION FROM AEROBIC DECOMPOSITION OF GREEN ALGAE,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
J. V. DePinto, and F. H. Verhoff.
Environmental Science and Technology, Vol. 11, No. 4, p 371-377, April, 1977. 7 fig, 2 tab, 21 ref. EPA 7-801245.

Descriptors: *Nutrients, *Algae, *Bacteria, *Decomposing organic matter, Chlorophyta, Aerobic conditions, Phosphorus, Nitrogen, Eutrophication, Aquatic weed control, Nutrient regeneration, Chlorella vulgaris, Selenastrum capricornutum.

Aerobic bacterial decomposition of algal cultures was studied under laboratory conditions to determine the rate and extent of phosphorus and nitrogen regeneration. Results provided indirect proof that bacteria can also attack algal cells and terminate algal blooms, as bacteria-free cultures remain viable after 70 days in the dark, while cultures inoculated with bacteria decayed rapidly. Axenic unialgal cultures of the green algae Chlorella vulgaris and Selenastrum capricornutum were grown in 5-gal Pyrex bottles in the NAAM medium, which is designed so that phosphorus is the growth-limiting nutrient. All eight cultures (six Chlorella and two Selenastrum) were moved into a dark room after four-nine days, and six were inoculated with bacteria from eutrophic Stone Lake, Cassopolis, MI. Initial nutrient concentrations in the medium were 80 or 186 micrograms P/l (as PO4), and 1600 or 4200 micrograms N/l (as NO3). Vessels were monitored during the dark incubation period for changes in phosphorus, nitrogen, chemical oxygen demand (COD), suspended solids, and algal and bacterial densities. Phosphorus regeneration in the bacteria-inoculated cultures ranged from 31-94% (mean 74%) with higher release associated with excess initial cellular phosphorus. Conversion of particulate organic nitrogen to NH3 ranged from 51-94% (mean 74%). No net phosphorus regeneration occurred in bacteria-free cultures. Decay rate was highly dependent on the size of the bacterial population. Active bacterial decomposition was far more important than endogenous respiration by the algal cells. (Lynch-Wisconsin)
W78-02992

EFFECTS OF INTERMITTENT CHLORINATION ON AQUATIC ORGANISMS AND COMMUNITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
K. L. Dickson, J. Cairns, Jr., B. C. Gregg, D. I. Messenger, and J. L. Plafkin.
Journal Water Pollution Control Federation, p 35-44, January, 1977. 8 fig, 7 tab, 23 ref.

Descriptors: *Chlorination, *Fish, *Protozoa, *Water treatment, Chlorine, Toxicity, Water pollution effects, Fishkill, Carrasius auratus, Goldfish, Intermittent chlorination.

Because of widespread use of chlorine to prevent biological slime build-up in industrial cooling systems, aquatic organisms are subject to intermittent exposures of the chemical. In this study of effects of such intermittent exposure, laboratory tests of exposure, frequency concentration, forms of chlorine, and duration of exposure were related to goldfish (Carasius auratus) mortality and changes in protozoan community structure. Data for goldfish showed that as frequency and duration of exposure increased, mortality also increased, but the mortality rate of change decreased with increasing frequency and duration. Frequency increases were somewhatmore lethal than duration increases. Water temperature and fish size did not affect mortality. Combined chlorine was slightly more toxic than free chlorine, which contradicts most freshwater studies. A chlorination procedure of two-three exposures of 15-30 minutes per day with a total residual chlorine concentration of 0.5-0.75 mg/l would not result in acute lethality to species similar in reaction to goldfish. In each of seven protozoa experiments exposure to chlorine substantially reduced the total number of individuals; the most frequent exposures caused the greatest decrease. Species diversity was not greatly affected at concentrations under 1.45 mg/l given three times in a 2-hour period, but at greater frequencies diversity decreased. Eleven species were judged relatively tolerant to chlorine. (Lynch-Wisconsin)
W78-02993

EVALUATION OF THE ALGAL ASSAY PROCEDURE,
North Carolina Univ. at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 5A.
W78-02996

TEST OF REDFIELD'S MODEL FOR OXYGEN-NUTRIENT RELATIONSHIPS USING REGRESSION ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Statistics.
D. Guthrie, S. Alvarez-Borrego, Ch. H. Culbertson, and P. K. Park.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 154, Price codes: A02 in paper copy, A01 in microfiche. Limnology and Oceanography, Vol 20, No 5, p. 795-805, September 1975. 13 fig, 4 tab, 10 ref. NR 083-102, GX-28167, GA-12113, N00014-67-A-0369-007.

Descriptors: *Oxygen, *Nutrients, *Model studies, *Phosphates, *Regression analysis, Nitrates, Dissolved oxygen, Carbon dioxide, Atlantic Ocean, Pacific Ocean, Equations, *Redfield's model.

Hydrographic data from stations in the Atlantic and Pacific Oceans was used to test Redfield's model for a relationship among the concentrations of dissolved oxygen, carbon dioxide, nitrate, and phosphate in seawater based on the average chemical composition of plankton. This relationship predicts that the ratio of oxygen consumption to nutrient production by biological oxidation is constant and can be expressed by an equation given in this paper. Redfield's model of the 02-P04 and 02-N03 relationships was tested by applying multiple regression analysis to oxygen, phosphate, and nitrate field data. The 95% confidence intervals for delta 02:delta P04 and delta 02:delta N03 ratios were consistent with -values predicted by Redfield's model. The variation of 02-P04 and 02-N03 slopes with depth, latitudes, and time is due to mixing between different water types with different preformed portions of oxygen, phosphate, and nitrate. Diagrams of 02 residuals after regression of 02 on potential temperature (theta) and P04 on theta or N03 can be used to detect water types, some of which are not clearly shown by theta-salinity diagrams. Qualitative studies on the proportions of water types at different stations can also be done using the 01 residuals versus theta diagrams. (Lynch-Wisconsin)
W78-02997

FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE: GOOD AGRICULTURAL PRACTICE OF A HEALTH HAZARD,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 5G.
W78-03000

DYNAMICS OF WATER-SOLUBLE ORGANIC MATTER AND BIOGENIC ELEMENTS IN BOTTOM SEDIMENTS OF THE TSYBUL'NIK BAY IN THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-03001

STUDIES ON DEGRADATION OF ADENOSINE-5' PHOSPHOSULPHATE ADENOSINE-3'-PHOSPHATE-5'-PHOSPHOSULPHATE (PAPS) IN EXTRACTS OF ANABAENA CYLINDRICA,
Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
S. K. Sawhney, and D. J. D. Nicholas.
Plant Science Letters, Vol. 6, No. 2, p. 103-110, February 1976. 4 fig, 3 tab, 23 ref.

Descriptors: *Cyanophyta, *Laboratory tests, Eutrophication, Cytological studies, *Anabaena cylindrica, Sulphate metabolism, Cell free extracts, Hydrolytic enzymes.

Research indicates that cell-free extracts of Anabaena cylindrica contain enzymes which hydrolyse adenosine-5' phosphosulphate (APS)

and adensine-3' phosphate-5' phosphosulphate (PAPS) fairly rapidly. The occurrence of such hydrolytic enzymes has been reported in extracts of various organisms. No attempt has been made to characterize the enzymes which degrade these nucleotides. However, the protective effect of sodium fluoride and sodium sulphite indicates that part of PAPS was sulphatases (19). The accumulation of (35S)APS during the degradation of (35S)PAPS is the presence of unlabelled APS suggests that PAPS was also attacked, presumably by 3'-nucleotidase, to form APS. The experiments emphasize the problem of interference from hydrolytic enzymes when using unpurified extracts for investigating synthesis and metabolism of these sulphur by elimination of the hydrolytic enzymes by their removal on purification of extracts or by supplementing the incubation mixture with various compounds. In this context, the addition of 5'adenine nucleotides protects PAPS and APS against hydrolytic enzymes in cell extracts. (Coyle-Wisconsin)
W78-03002

EFFECT OF SULFATE ON CARBON AND ELECTRON FLOW DURING MICROBIAL METHANOGENESIS IN FRESHWATER SEDIMENTS,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
M. R. Winfrey, and J. G. Zeikus.
Applied and Environmental Microbiology, Vol. 33, No. 2, p. 275-281, February 1977. 7 fig, 1 tab, 23 ref. NSF DEB 73-01511-A01.

Descriptors: *Sulfates, *Methane production, Wisconsin, Sedimentation, Lakes, *Lake Mendota(WI), *Sediment chemistry, *Methanogenesis, Acetate.

The effect of sulfate on methane production in the sediments of Lake Mendota, Wisconsin was investigated to clarify the mechanism of sulfate inhibition of methanogenesis. Methanogenesis was inhibited by the addition of as little as 0.2 mM sulfate. Sulfate inhibition was reversed by addition of either H2 or acetate. Methane evolved when inhibition was reversed by H2 addition derived from CO2. Conversely, when acetate was added to overcome sulfate inhibition, the evolved methane was derived from acetate. A competition for available H2 and acetate is proposed as the mechanism by which sulfate inhibited methanogensis. Acetate was metabolized even in the absence of methanogenic activity. In the presence of sulfate, the methyl position of acetate was converted to CO2. The addition of sulfate to sediments did not result in the accumulation of significant amounts of sulfide in the pore water. Results indicate that carbon and electron flow are altered when sulfate is added to sediments. Sulfate-reducing organism appear to assume the role of methanogenic bacteria in sulfate-containing sediments by utilizing methanogenic precursors. (Coyle-Wisconsin)
W78-03003

SALMONELLA IN SURFACE WATERS OF CENTRAL NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
N. C. Dondero, C. T. Thomas, M. Khare, J. F. Tomoney, and G. M. Fukui.
Applied and Environmental Microbiology, Vol. 33, No. 4, p 791-801, April, 1977. 4 fig, 2 tab, 40 ref.

Descriptors: *Salmonella, *Bacteria, *Feed lots, *Water pollution sources, *Public health, New York, Tributaries, Watersheds(Basins), Pathogenic bacteria, Water pollution effects, Pollutants, Urban runoff, Agricultural runoff, Lakes, Streams, Human pathology, Botulism, *Cayuga Lake(NY), Salmonella typhimurium, Nonpoint pollution, Taughannock Creek(NY).

Although salmonellosis is usually associated with contaminated foods and feeds, salmonellae have frequently been found in streams receiving sewage effluents and industrial wastes. Southern Cayuga Lake and six tributaries (Taughannock, Fall, Sixmile, Trumansburg, and Cascadilla creeks, and Renwick Brook) in central New York state were sampled for Salmonella using swabs; 39% of 322 swabs yielded Salmonellae. Tests performed on white mice showed that the virulence of 144 Salmonella isolates was low or nonexistent. Fatal at one million cells per mouse were S. agona, S. enteritidis, a few S. typhimurium isolates, and S. saint-paul. Human salmonellosis was low in the area, consistent with low Salmonella concentrations and virulence in the waters. Of 28 distinguishable types from all locations, S. typhimurium was by far the most common (60%), and was absent only from Renwick Brook and Trumansburg Creek. In all streams 57% of samples were positive at high stream levels after snow melt or rain, compared with only 24% during dry weather flow. A cattle feedlot on a Taughannock Creek tributary was the only definitely identified Salmonella source, and yielded only S. typhimurium. Of swabs from just below the feedlot, 86% were positive. Urban runoff was a likely source and has been known to contain Salmonella. Rural dwellings and sewage treatment plants could also have been point sources. (Lynch-Wisconsin)
W78-03004

EFFECTS OF DESTRATIFICATION AND AERATION OF A LAKE ON THE DISTRIBUTION OF PLANKTONIC CRUSTACEA, YELLOW PERCH, AND TROUT,
Wisconsin Dept. of Natural Resources, Madison.
O. M. Brynildson, and S. L. Serns.
Technical Bulletin, No. 99, p 1-22, 1977. 11 fig, 4 tab, 26 ref.

Descriptors: *Aeration, *Destratification, *Wisconsin, *Lakes, *Crustacea, *Yellow perch, Plankton, Distribution, Eutrophication, Brook trout, Rainbow trout, Brown trout, *Trout, *Mirror Lake(WI), *Larson Lake(WI), Bosmina, Diaphanosoma, *Destratification, Calanoid copepod, Cyclopoid copepod.

Aeration equipment was installed and its use monitored in Mirror and Larson lakes, Wisconsin, to study problems associated with eutrophication. In the Mirror Lake study the main objective was to observe what effects the September 1973-74 vertical mixing had on the depth distribution of yellow perch and trout and their planktonic prey, with emphasis of Daphnia. Studies at Larson Lake were limited to observations on the distribution of planktonic crustacea during hypolimnetic aeration and on assessment of the food of perch and trout after a natural destratification (the fall overturn). While before the destratification the Mirror Lake fish and their prey occupied mainly the upper half of the lake, they spread throughout the water after September 1974. Although the 1973 destratification had little effect on Daphnia numbers, they increased four-fold after the 1974 change. Densities of calanoid and cyclopoid copepods (but not of the cladocerans Bosmina and diaphanosoma) increased during both years after destratification. Total aeration of Mirror Lake in the spring hastened the Daphnia pulicaria spring population pulse and increased their living space as well as that of their predators. Total aeration into late fall 1973-74 helped to maintain higher dissolved oxygen levels and carried over trout into winter. Total aeration in spring and fall is the most efficient way to expand living space for trout and yellow perch in lakes with uniform water density. Prolonged total aeration in spring augmented by intermittent hypolimnetic aeration during summer is the most efficient means of increasing trout and yellod perch in darkstained bog lakes such as Larson Lake. (Spaeth-Wisconsin)
W78-03006

CHROMATOGRAPHIC INVESTIGATION OF INOSITOL PHOSPHATE ESTERS IN LAKE WATERS.
Wisconsin Univ.-Madison. Water Chemistry Lab., Water Chemistry Laboratory, University of Wisconsin, Madison.
For primary bibliographic entry see Field 5A.
W78-03007

PHOSPHORUS MODELS FOR EUTROPHIC LAKES,
Michigan Univ., Ann Arbor.
W. S. Lung, R. P. Canale, and P. L. Freedman.
Water Research, Vol. 10, p. 1101-1114, 1976. 13 fig, 2 tab, 25 ref. EPA G-00-5104.

Descriptors: *Phosphorus, *Model studies, *Eutrophication, *Lakes, Michigan, Sediments, Sediment-water interfaces, Sedimentation, Nutrients, Dissolved oxygen, Dissolved solids, Water quality, *White Lake(MI), Particulates.

A multi-component dynamic phosphorus model was developed for highly eutrophic White Lake in southwest Michigan and was calibrated and verified by extensive field data. Two layers in the water and 38 1-cm layers of the sediment were incorporated in the model, and both particulate and dissolved phosphorus were considered. White Lake, which has an outlet into Lake Michigan, has a surface area of 10.4 million sq m and a mean depth of 7.9 m. White River is the only major tributary, and has a drainage area of 1000 sq km. Sediment regeneration of dissolved phosphorus was found to be important in White Lake, especially during summer anaerobic periods; the main mechanism was diffusion across the sediment-water interface. In the model the space coordinate system was designed to move with the interface as sedimentation and compaction cause it to move upward, so that sediment properties are always observed relative to the interface. Processes involved in particulate-dissolved phosphorus transformation include oxidation and breakdown of sedimented organic material, oxidation and reduction of associated inorganic species, physiochemical adsorption and precipitation, and solution of phosphorus to and from mineral forms. Vertical eddy diffusion in the water was also analyzed. (Lynch-Wisconsin)
W78-03008

REAL TIME SIMULATION OF NITROGEN CYCLE IN AN ESTUARY,
Resource Analysis, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5B.
W78-03010

THE MINERAL NUTRIENTS LEVELS IN THREE NORFOLK BROADS DIFFERING IN TROPHIC STATUS, AND AN ANNUAL MINERAL CONTENT BUDGET FOR ONE OF THEM,
University of East Anglia, Norwich (England). Schools of Biological; and University of East Anglia, Norwich (England). Environmental Sciences.
G. L. Phillips.
Journal of Ecology, Vol. 65, No. 2, p 447-474, July 1977. 13 fig, 8 tab, 14 ref.

Descriptors: *Bogs, *Nutrients, *Eutrophication, *Lakes, Phosphorus, Nitrogen, Silica, Manganese, Cyanophyta, Trophic level, Sediments, *Norfolk Broads(England), Nutrient budget.

The seasonal range and variation of phosphorus, nitrogen, silica and manganese were studied in three Norfolk Broads, Alderfen Broad, Barton Broad and Upton Broad. The Norfolk Broads are a series of shallow, flooded peat diggings created in medieval times and now extremely important as recreation areas of great ecological interest. At all the sites nitrate-nitrogen was maximal during the winter, usually undetectable in the summer. At Alderfen and Barton Broads a large increase of solu-

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ble reactive phosphorus occurred during the summer. At Alderfen Broad this was accompanied by an increase of ammonium nitrogen, manganese and soluble reactive silica. A nutrient budget was calculated for Alderfen Broad and this showed that the increase of these nutrients could not be accounted for by the input stream. It is suggested that the sediment was an important source of these nutrients during the summer. It is suggested that these three broads are typical of the range of conditions present in the Norfolk Broads as a whole, with Barton Broad highly enriched, Alderfen Broad less enriched, and Upton Broad typical of a broad as yet unaffected by increased enrichment. (Coyle-Wisconsin)
W78-03011

CORRESPONDENCE OF AMMONIA CONTENT AND ACETYLENE REDUCTION ACTIVITY IN SLUDGE SAMPLES OF LAKE HARKORT (RUHR VALLEY), (IN GERMAN),
Staatliches Amt Wasser-und Abfallwirtsch. Hagen (West Germany).
D. Jaeger, and D. Werner.
Arch Hydrobiol 79(2), p 233-246, 1977.

Descriptors: *Ammonia, *Acetylene reduction, *Sludge, Sampling, Lakes, *Metabolism, Microorganisms, Nitrogen, *Lake Harkort(West Germany)

Studies on microbiological N-metabolism in lake Harkort (part of the Ruhr river system) revealed a linear relationship between ammonia content of the sediments (84-265 mg/kg sludge) and their acetylene reduction activity (83-314 nmol C2H4/h x kg sludge). Compared to the annual ammonium-N content of the water of the Ruhr river, the Nz-fixation in the sediments of the small lake Harkort is 0.444%. N2-fixation in the sludge was increased by ammonia up to concentrations of 80 mmol/kg and inhibited by higher concentrations added to samples.--Copyright 1978, Biological Abstracts, Inc.
W78-03012

DISTRIBUTION, ABUNDANCE, AND RESOURCE UTILIZATION OF LITTORAL ZONE FISHES IN RESPONSE TO A NUTRIENT/PRODUCTION GRADIENT IN LAKE MEMPHREMAGOG,
McGill Univ., Montreal (Quebec). Dept. of Biology.
D. Gascon, and W. C. Leggett.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 8, p 1105-1117, August 1977. 3 fig, 2 tab, 61 ref.

Descriptors: *Nutrients, *Fish diets, Fish, Larvae, Food abundance, Competition, Vermont, Lakes, Littoral, Distribution, Biomass, Primary productivity, Secondary productivity, Rivers, Minnows, Darters, Canada, *Lake Memphremagog(Quebec-Vermont), Quebec, Notropis volucellus, Hybognathus nuchalis, Pimephales notatus, Notemigonus crysoleacas, Fundulus diaphanus, Etheostoma nigraum.

The investigation used the presence of a strong nutrient production gradient in a single lake ecosystem (Lake Memphremagog) to study the relationship between fish community composition and patterns of resource utilization by littoral zone fishes at different levels of primary and secondary production. The study concludes that the differences in the levels of primary and secondary production (food availability) along the axis of Lake Memphremagog, resulting from the presence of a pronounced nutrient gradient, are the principal causes of observed changes in the species diversity, community composition, relative biomass, and patterns of resource utilization in the littoral zone fish community of the lake. Species diversity, relative abundance, and biomass were highest in the more productive southern area of the lake similar to that observed in stream ecosystems. And much greater overlap was observed in the diets of species inhabiting the southern areas, and species feeding exclusively on organic detritus were largely restricted to Newport Bay and the south basin. Composition of the littoral zone fish community and the pattern of utilization of available lake resources also appear to be strongly influenced by differences in food availability along the length of the lake. (Coyle-Wisconsin)
W78-03013

ANALYSIS OF ZOOPLANKTON POPULATION FLUCTUATIONS IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
G. A. Gardner.
Journal of Fisheries Research Board Canada, Vol. 34, No. 8, p 1196-1206, 1977. 5 fig, 6 tab, 25 ref.

Descriptors: *Copepods, *Analytical techniques, *Aquatic populations, *Straits, Hydrologic data, Distribution patterns, Temperature, Salinity, Canada, *Strait of Georgia(British Columbia).

To examine relationships between zooplankton species within a community and the interaction between species groups and the physical environment in the Strait of Georgia, data from a series of vertical and horizontal tows have been analyzed by a variety of statistical techniques. Association of deep-water temperatures with population levels of two important copepod species, and the demonstration of parallel long-term temperal trends in the hydrographic and biological regimes, suggest that the strait is in a state of flux. Whether this is a transient shift that will eventually change directions or part of a longer term trend that may accelerate in future cannot be resolved with currently available data. But the former possibility may be more probable. However it is suggested that monitoring for long term trends should continue. Such studies may be very important to future management and conservation programs for the Strait of Georgia and will greatly improve understanding of the complex interactions between the physical and biological components of the system. (Coyle-Wisconsin)
W78-03014

SOMATIC AND GENERATIVE PRODUCTION AND SIZE OF PLANKTONIC CRUSTACEANS,
Belorussian State Univ., Minsk (USSR).
V. A. Babitskii.
The Soviet Journal of Ecology, Vol. 7, No. 5, p. 425-430, September-October, 1976. 6 fig, 2 tab, 20 ref. Translated from Ekologiya, No. 5, p. 47-52, September-October, 1976.

Descriptors: *Crustaceans, *Growth stages, *Copepod, Zooplankton, Lakes, Size, Trophic level, Biomass, Productivity, *Generative production, *Belorussian(USSR), Lake Naroch(USSR), Lake Myastro(USSR), Lake Batorin(USSR).

A graphical method was used to calculate the growth and generative production of five crustacean species of the benthic plankton of Lakes Naroch, Myastro and Batorin in Belorussian, USSR. The values of the P/B coefficients of growth production were higher in species with greater body size, while the fraction of generative production from the total production declined in going from the smaller to the larger species of copepod and cladoceran crustaceans. A contradictory tendency was found in comparing the relative value of generative and growth production in species of different size. In the species with the smallest body size, the generative production in Lakes Naroch, Myastro and Batorin comprised respectively 86, 92 and 94 percent of the total. In the considerably larger species in generative growth was 44 percent in Lake Batorin, only 27 percent in Lake Myastro and 67 percent in Lake Naroch. In copepods with decrease in body length the fraction of generative increase from the total increase grew from tenths of a percent in Eudiaptomus to eight percent in Cyclops. Also, as body lenght increased, a tendency towards decrease in the generative P/B coefficients was observed. (Coyle-Wisconsin)
W78-03015

STRUCTURE OF SEASONAL ZOOPLANKTON COMPLEXES OF VOLGO GRAD RESERVOIR,
Gosudarstvennyi Nauchno-Issledovatelskii Inst. Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
V. P. V'yushkova.
The Soviet Journal of Ecology, Vol. 7, No. 5, p. 419-424, September-October, 1976. 1 fig, 3 tab, 18 ref. Translated from Ekologiya, No. 5, p. 41-46, September-October, 1976.

Descriptors: *Zooplankton, Food abundance, Copepods, Rotifers, Crustaceans, Protozoa, Reservoirs, *Seasonal, Temperature, *Volgograd Reservoir(USSR).

The zooplankton composition of Volgograd Reservoir in different seasons of the year was examined on the basis of materials collected in 1966. In temperate Palasarctic latitudes the principal factor determining seasonal changes is the position of the sun and the temperature and hydrologic conditions depending on it, influencing the life activity of both zooplankton organisms and the phyto- and bacterioplankton organisms that are their food. During the winter time at a temperature from 0 to 4 degrees C the zooplankton was characterized by the lowest level of development. The majority of the organisms were in the form ofeggs or dominant stages. However, representatives of all groups were occasionally encountered in an active state. In April, copepods, especially in their young stages, were encountered. Thus the existence of seasonal species complexes regularly changing in relation to outside conditions was established. The amount of heat and food is the leading factor affecting zooplankton change in the reservoir. The zooplankton changes quantitatively and qualitatively, with the greatest development and diversity characteristic of the warm time of the year. (Coyle-Wisconsin)
W78-03016

A NOTE ON SOME DISTINCTIVE LIMNOLOGICAL FEATURES OF GOVINDSAGAR RESERVOIR, HIMACHAL PRADESH,
Central Inland Fisheries Research Inst., Barrackpore (India); and All-India Coordinated Research Project on Ecology and Fisheries of Fresh Water Reservoirs, Hazribagh (India).
S. K. Sarkar, B. V. Govind, and A. V. Natarajan.
Indian Journal of Animal Sciences, Vol. 47, No. 7, p. 435-439, July 1977. 1 fig, 2 tab, 11 ref.

Descriptors: *Limnology, *Reservoirs, *Thermal stratification, Aerobic conditions, Alkalinity, Plankton, Impoundments, *Govindsagar reservoir(India).

Though general limnological information is available for some impoundments in peninsular India, it is only recently that reservoirs in north India have been subjected to similar observations. Govindsager reservoir, located at a latitude far above any reservoir studied so far, presents certain interesting limnological features. The impoundments present thermal stratification in summer. Impoundments in lower latitudes are conspicuous by the absence of thermal stratification in summer months. In Govindsagar the epilimnion, marked by near homothermal conditions, was limited to 3 m from surface. The oxygen curve followed a pattern similar to thermal stratification and represented a klinograde distribution. It was remarkable that while oxygen values were as high as 9.4 ppm in the epilimnion its values dropped sharply to 2.3 ppm at the hypolimnion bottom. The behavior of the oxygen curve indicated the

metabolically active character of the reservoir. The impoundment was equally interesting from the point of view of abundance and qualitative composition of plankton. The plankton concentration was more or less of uniform density in littoral, sub-littoral and profundal areas of lotic zone but they occurred in significantly higher concentrations in sub-littoral areas of intermediate and lentic zones. (Coyle-Wisconsin)
W78-03017

BIOMASS PRODUCTION IN MASS CULTURES OF MARINE PHYTOPLANKTON AT VARYING TEMPERATURES,
Woods Hole Oceaographic Institution, MA.
J. C. Goldman.
Journal of Experimental Marine Biology and Economy, Vol. 27, No. 2, p. 161-169, May 1977. 2 fig, 2 tab, 27 ref.

Descriptors: *Phytoplankton, *Temperature, Nitrogen, Food chains, Growth rates, Nutrients, Marine algae, Sea water, Waste water disposal, Proteins, Aquiculture, Effluents, Laboratory tests, *Biomass, *Nutrient uptake, Phaeodactylum tricornutum, Nitzschia sp., Oscillatoria sp.

Natural populations of marine phytoplankton obtained from a large outdoor pond were grown on waste water-sea water mixtures in laboratory continuous cultures in the temperature range of five degrees centigrade to 33 degrees. This method was chosen because it is impossible to completely isolate temperature as the only variable in outdoor studies. The phytoplankton was grown under conditions similar to those typically used outdoors in the aquaculture research program at the Environmental Systems Laboratory of the Woods Hole Oceanographic Institution. Virtually all the influent inorganic nitrogen was assimilated at every temperature tested. There was, however, a distinct change in dominant species with temperature. Below 19.8C, Phaeodactylum tricornutum was dominant. At 27 degrees C, Nitzshia sp. was the main species, and as the temperature increased above 27 degrees C, a blue-green alga, Oscillatoria sp., became increasingly dominant. There is some indication that the excellent growth of P. tricornutum below 10 degrees C was related to a dramatic increase in the nutrient content per cell as the temperature decreased. Thus at low temperatures reduced division rates are compensated for by increased nutrient uptake rates. (Coyle-Wisconsin)
W78-03018

DISTRIBUTION OF PLANKTONIC OSTRACODA (HALOPRIDIDAE) IN THE NORTH ADRIATIC WITH THE DESCRIPTION OF A NEW SUBSPECIES, CONCHOECIA PORRECTA ADRIATICA,
Institute of Oceaographic Sciences, Wormley (England).
A. J. Gooday, and M. V. Angel.
Crustaceana, Vol. 32, No. 2, p. 139-154, 1977. 10 fig, 2 tab, 24 ref.

Descriptors: *Adriatic sea, *Conchoecia porrecta, *Ostracods, Plankton, *Halocyprid ostracods, *Spatial distribution, *Systematics, *Crustaceans, Temporal distribution, Salt tolerance.

The paper deals with the geographic distribution of planktonic halocyprid ostracods in the north Adriatic sea. A small form of Conchoecia porrecta Claus 1891 collected from this region, is described as a new subspecies. Maps are included showing numbers of ostracods caught at each station during January, February, March, May, June, August, September and December, 1965. Specimen drawings are part of the paper, along with detailed descriptions of the newly-identified subspecies. A total of 975 adult and juvenile planktonic ostracods were caught. Of these, 699 belonged to the new subspecies. Taking the year as a whole, ostracods were much commoner in the southern part of the north Adriatic. Results confirm and document more fully the northerly winter movement of planktonic ostracods. The movement is clearly linked with the influx of warm saline Mediterranean water in the intermediate and surface layers of the Adriatic. This Adriatic ingression is much stronger in certain years and displaces elements of the dominantly oceanic south Adriatic fauna. The halocyprids are thus a seasonal and essentially allochthonous element of the north Adriatic fauna. (Coyle-Wisconsin)
W78-03019

PLANKTONIC DIATOMS AND SOME DIATOM-SILICA RELATIONS IN A SHALLOW EUTROPHIC SCOTTISH LOCH,
Institute of Terrestrial Ecology, Edinburgh (Scotland). Wetlands Research Group.
A. E. Bailey-Watts.
Freshwater Biology, Vol 6, No 1, p 69-80, 1976. 6 fig, 6 tab, 63 ref.

Descriptors: *Diatoms, *Silica, *Eutrophication, Phytoplankton, Shallow water, Nutrients, Algae, Grazing, Frustules, Trophic levels, Mixing, Nutrient requirements, Oligotrophy, Lakes, *Loch Level(Scotland), Lochs, Centric diatoms, Cyclotella pseudostelligera, Stephanodiscus hantzschii, Stephanodiscus tenuis, Stephanodiscus rotula.

Studies of planktonic diatom populations of Loch Leven, Kenross, Scotland, in 1968-71 showed considerable variation in species composition, with centric forms dominant. Loch Leven, which covers 13.3 sq km, has a mean depth of only about 4 m. The water column is isothermal most of the year. Rich inputs of nitrogen and phosphorus are due to urban and agricultural activities, and the resultant eutrophic conditions are conducive to high phytoplankton production. Temperature, chlorophyll-a, cell numbers, algal volumes, and silica were monitored. Of centric diatoms, Cyclotella pseudostelligera, Stephanodiscus hantzschii, S. tenuis, and S. rotula predominated. Centric species formed denser crops than pennate forms and were more important in terms of volume of matter produced over the four years. Other important diatoms were Diatom elongatum, Asterionella formosa, Synedra ulna, and S. rumpens var. scotica. The predominance of centric diatoms in this eutrophic lake is not in accordance with other studies which showed Centrales reflecting oligotrophy and Araphidineae (Pennales) indicating eutrophy; on the other hand, such associates were best illustrated by deep dimictic lakes. Lock Leven produced very dense diatom populations. With exceptions, the data generally corroborated other studies in which diatom maxima coincided with low levels of dissolved silica, but Silica was apparently not the only limiting factor. (Lynch-Wisconsin)
W78-03020

GLUTAMINE SYNTHETASE AND NITROGENASE ACTIVITY IN THE BLUE-GREEN ALGA ANABAENA CYLINDRICA,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
P. Rowell, S. Enticott, and W. D. P. Stewart.
The New Phytologist, Vol 79, No 1, p 41-54, July 1977. 10 fig, 6 tab, 34 ref.

Descriptors: *Cyanophyta, *Nitrogen fixation, *Inhibitors, Ammonium compounds, Anabaena, Regulation, Synthesis, Enzymes, Biochemistry, *Glutamine synthetase, Glutamine pool, *Anabaena cylindrica, Nitrogenase activity.

The ways in which the glutamine synthetase of Anabaena cylindrica is regulated and the relationship between nitrogenase activity and glutamine synthetase activity are examined. On adding NH_4^+ to nitrogen-fixing cultures of Anabaena cylindrica, the glutamine pool of the intact filament increases within seconds. Nitrogenase activity and then glutamine synthetase activity decline. There are no changes in the activities of glutamate-asparatate aminotransferase, or in the pools of alanine, glycine and aspartate during this period. Nitrogenase activity is usually inversely related to the size of the glutamine pool and shows little correlation with glutamine synthetase activity per se. There is no evidence of adenylylation or deadenylylation of glutamine synthetase. Feed-back inhibition occurs, with alanine and glycine being particularly effective inhibitors and with some inhibition occurring with AMP, carbamoyl phosphate and aspartate. Histidine, lysine, ornithine, citrulline and arginine were non-inhibitory at the concentrations used. There is no evidence of inhibition of glutamine synthetase by glutamine. The addition of azaserine inhibits glutamine uptake by intact filaments and reduces the subsequent conversion of glutamine to glutamate within the filament by 77 percent. Results are consistent with the operation of the glutamine synthetase-glutamate synthase pathway in Anabaena cylindrica. (Coyle-Wisconsin)
W78-03021

MACROPHYTE SUCCESSION IN SWEDISH LAKES CAUSED BY DEPOSITION OF AIR-BORNE ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
O. Grahn.
Water, Air and Soil Pollution, Vol 7, No 3, p 295-305, March 1977. 6 fig, 20 ref.

Descriptors: *Precipitation(Atmospheric), *Acidity, Lakes, Ecosystems, Trophic levels, Water pollution effects, Air pollution effects, *Path of pollutants, *Sweden, *Sphagnum, *Macrophytes, *Acid precipitation.

Biological investigations in six small lakes in western Sweden found that the supply of acid substances from air pollution induces long term biological perturbations at all trophic levels in the lake ecosystem. It is concluded that plant community succession in the lakes occurs over a short period and that these changes are correlated with the increasing acidity of the lake water. The ecosystems of the lakes has changed from one of equilibrium to a biologically-accumulating system similar to acid biogene peat and forest soils. This type of system may cause an acceleration of the acidification process, which in turn leads to further disorders in the lake ecosystem. The disturbances occur among fish, macrophytes, bottom fauna, and plankton as well as among microorganisms. Of these ecological changes, the macrophyte succession--in particular that of Sphagnum--is one that may strongly affect the dynamics in the lake. A quantification of the Sphagnum expansion in different depth zones of a lake was made and the rate of this invasion was found to be highest in shaded and sheltered areas of the littoral. Abundance of Sphagnum mats is further more negatively correlated to the pH of the lake water. (Coyle-Wisconsin)
W78-03022

APPLICATION OF UNDERWATER LIGHT MEASUREMENTS IN NUTRIENT PRODUCTION STUDIES IN SHALLOW RIVERS,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
S. L. Wong, B. Clark, and D. S. Painter.
Freshwater Biology, Vol 6, No 6, p 543-550, 1976. 6 fig, 1 tab, 39 ref.

Descriptors: *Light intensity, *Light penetration, *Solar radiation, *Nutrients, *Photosynthesis, *Rivers, Turbidity, Depth, Aquatic plants, Cladophora, Oxygen, Measurement, Aquatic weed control, Phosphorus, Canada, Underwater, Submerged plants, *Cladophora glomerata, *Underwater light, Ontario(Canada).

Relationships between photosynthesis of a substrate-attached aquatic plant (Cladophora

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glomerata (L.) Keutzing), solar radiation at the water surface, and light energy at the plant depth are discussed, and practical uses of underwater light measurements in stream productivity studies are described. Photosynthetic production was positively correlated with light energy received at the plant depth (r=0.73). Six rivers in southwestern Ontario (Canada) were studied: Avon, Middle Maitland, Bayfield, Nith, Conestogo, and Thames. Solar radiation above the water surface was measured with a Weather Measure R401 Pyranometer, light transmission through the water column was measured with an underwater quantum sensor, LI-COR model 185. Oxygen fluctuation was monitored with E.I.L. oxygen meters and Rustrak recorders. Water temperature was not considered; photosynthetic oxygen production is relatively independent of temperature when light is the limiting factor, and temperature was relatively constant during the study. Since luxury storage of nutrients allows aquatic plants to grow independently of external nutrient sources, tissue contents were used as an index of phosphorus availability. Daily oxygen production is governed by nutrient supply as well as the availability of light energy, and plant growth is poorly related to phosphorus when correction is not made for the effect of light energy. It was found that photosynthesis of Cladophora was not affected by nutrients if the cellular phosphorus concentration remained above 1.7 mg/g dry weight. (Lynch-Wisconsin)
W78-03023

THE ROLE OF FILTER FEEDERS IN FLOWING WATERS,
Georgia Univ., Athens. Dept. of Entomology; and Georgia Univ., Athens. Inst. of Ecology.
J. B. Wallace, J. R. Webster, and W. R. Woodall.
Archiv fur Hydrobiologic, Vol 79, No 4, p 506-532, May 1977. 11 fig, 5 tab, 62 ref. DEB 74-00618 A01, BMS 74-12088 A01.

Descriptors: *Larvae, *Seston, *Particle size, Rivers, Streams, Georgia, North Carolina, Competition, Coastal Plains, Nutrients, Ecosystems, Diatoms, Food habits, Detritus, *Trichoptera, *Filter feeders, *Tallaluh River(GA-NC), *Altamaha River(GA).

Two study sites, a small headwater river and a large coastal plain river, were shown to have filter-feeding, net-spinning species of Trichopteran larvae present which feed on a range of drifting stream seston particle sizes. The sites chosen were the Tallulah River near the Georgia-North Carolina border and the Altamaha River near Baxley, Georgia. The study suggests that considerable selection pressure was placed on these organisms in regard to the type and size of food particles fed upon the diverse stream types by competition with other species. Such selection pressure would play a major role in strategies such as capture net mesh size variations, microdistributional patterns, and temporal variations in life cycles and net construction, which are used to achieve partitioning of food resources. It is noted that stream ecosystems have no mechanism for controlling inputs of materials and proposed that one control in such ecosystems is imposed by the fauna through regulation of outflow losses of nutrients. It is also suggested that the evolutionary diversity of filter feeders has resulted in tighter and tighter control on the entire stream ecosystem by conserving nutrient and energy losses in these unidirectional flow systems. (Coyle-Wisconsin)
W78-03024

CONSEQUENCES OF DETERGENT POLLUTION OF THE SEA: EFFECTS ON REGENERATING SPONGE CUBES OF GEODIA CYDONIUM,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
R. K. Zahn, G. Zahn, W. E. G. Muller, I. Muller, and R. Beyer.
The Science of the Total Environment, Vol 8, No 2, p 109-151, September 1977. 11 fig, 3 tab.

Descriptors: *Detergents, *Water pollution effects, *Adsorption, Water pollution sources, Domestic wastes, Model studies, *Sponges, Thymidine, Uridine, Phenylalanine, Geodia sydonium, *Adriatic Sea.

Regenerating cubes of the sponge Geodia cydonium were used as a model in the investigation of detergent pollution in the sea. This sponge is found at the bottom of the Northern Adriatic sea in places that are relatively free of pollution and it reacts strongly to changes in ambient conditions, especially pollution. When cut into small pieces and kept under optimal conditions it will regenerate into a solid functional sponge. This cut up sponge in the state of regeneration is the basic model. The anionic detergent sodium dodecylsulphate (SDS) and a 1:1 mixture of Faks and Radion, two commercial laundry detergents, were used. It is shown that SDS is taken up, weakly accumulated but not incorporated into the macromolecular fractions of the sponge. At concentrations of 0.1 ppm and above, SDS decreases the uptake of thymidine, uridine and phenylalenine into the acid soluble sponge fraction. Their incorporation, which have been isolated, was different from the controls at 10 ppb and higher levels. Faks and Radion were less active by a factor of ten. However they showed similar effects. (Coyle-Wisconsin)
W78-03025

EXPERIMENTAL LAKES AREA AND CANADIAN LIMNOLOGY, (IN GERMAN),
Max-Planck-Inst. fuer Limnologie zu Ploen (West Germany).
W. Ohle.
Arch Hydrobiol 79(2), p 274-280, 1977.

Descriptors: Benthos, *Canada(Ontario lake area), Chaoborus, Chironomids, Chlorophyll, Humus, Ontario, Periphyton, Photosynthesis, Pisidium, Plankton, Pontoporeia, Zooplankton, Lakes, *Primary productivity.

Advances reported in Canadian fisheries publications show outstanding developments in limnology. The Experimental Lakes Area(ELA) comprises a group of 1004 lakes in northwestern Ontario (Canada). These lakes have very low levels of electrolytes but contain considerable humus derivatives and show the 1st primary production of phytoplankton. A new method for the determination of CO2 and another for assaying the chlorophyll content of the water were contributed. The maximal photosynthesis activity of the phytoplankton in these lakes averaged only 0.4 g C/mile2. In the series of P, Fe, N, etc., the nutrients were regulators of productivity on the basis of bioassays. There were also extensive reports on the periphyton, zooplankton and zoobenthos, especially pontoporeia, Pisidum, Chaoborus and chironomids. Copyright 1978, Biological Abstracts, Inc.
W78-03026

CARBON BUDGETS IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
M. N. Charlton.
Journal of Fisheries Research Board Canada, Vol. 34, No. 8, p 1240-1241, 1977. 1 tab, 3 ref.

Descriptors: *Lake Ontario, *Carbon, *Carbon dioxide, Carbon cycle, Primary productivity, Decomposing organic matter, *Primary carbon production, *Carbon budgets.

A 1975 carbon budget for Lake Ontario reported from an earlier study appears to indicate an approximate balance between inputs and outputs. The carbon inputs to the lake used in calculating the budget were inorganic and organic forms in rivers and lakes primary production. Carbon outputs considered were inorganic and organic forms in rivers, gaseous carbon dioxide exchange, precipitation and sedimentation. While the achievement of a balance appeared to lend some credibility to the various measurements, the inclusion of primary production as an input to these calculations unfortunately produces major error. Primary production processes move carbon from the dissolved inorganic form to a particulate organic form. The flux of carbon is from water to particles. Primary production alone is neither an input nor an output in a lake carbon budget and should be removed from the list of inputs. If this approach is taken, the annual budget of the earlier study does not balance. Approximately equal amounts of carbon enter and exit via rivers and what is striking is that the amount of carbon leaving the lake via gaseous exchange is equivalent to half the total lost by way of rivers. (Coyle-Wisconsin)
W78-03027

THERMALLY STRATIFIED ACID WATER IN LATE WINTER - A KEY FACTOR INDUCTING SELF-ACCELERATING PROCESSES WHICH INCREASE ACIDIFICATION,
Swedish Water and Air Pollution Research Lab., Gothenburg.
H. Hultberg.
Water, Air, and Soil Pollution, Vol. 7, No. 3, p. 279-294, March 1977. 13 fig, 1 tab, 13 ref.

Descriptors: *Snow, *Oligotrophy, *Lakes, Invertebrates, Microorganisms, Acidic water, Chemistry of precipitation, Precipitation(Atmospheric), *Ion separation, *Sweden, Sphagnum.

Annual variations in pH have been studied in lakes in two areas of southwestern Sweden: ten in the province of Bohuslan since late 1969, and three in the province of Varmland since 1973. It is concluded that through ion separation out of snow at an early state of snowmelting, acid substances cover the littoral bottoms of the lakes with a highly acid layer. This leads to poor fish reproduction and death among groups of invertebrates. It also induces a Sphagnum invasion and affects the microflora in both lakes and running waters already at an early stage of acidification. These biological disorders brought about by thermally-stratified acid water in late winter lead to oligotrophication which in turn accelerates the acidification process. Among the investigated lakes in Bohuslan, the yearly pH variation is greatest in summer with values around 5.2 to 5.5. In the very acid lakes the variations are small. In all lakes a sharp drop in pH occurred in the spring of 1970, following a winter of unusual snow. No snowmelting occurred until mid-April. pH was 4.4 to 4.5 in snow profiles in the area but the pH drop in lakes in the area was even greater. (Coyle-Wisconsin)
W78-03028

ABYSSAL MEIOBENTHOS IN THE BAY OF BISCAY: I. CONSIDERATIONS ON QUANTITATIVE DATA, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5A.
W78-03030

EVALUATING AUTROPHICATION POTENTIAL FROM RIVER COMMUNITY PRODUCTIVITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
G. M. Hornberger, M. G. Kelley, and B. J. Cosby.
Water Research, Vol. 11, No. 1, p. 65-69, 1977. 4 fig, 2 tab, 12 ref.

Descriptors: *Rivers, *Testing, *Dissolved oxygen, *Temperature, *Solar radiation, Trophic level, Low flow, Nutrients, *Productivity, Measurements, Streams, *Eutrophication potential, *Production-respiration ratio.

Measurements of dissolved oxygen, temperature and solar radiation were used to estimate net community production, respiration, gross production and the production-respiration ratio for six rivers during the summer of 1974. Data analysis and comparison with a subjective ranking of the eutrophy of the rivers based on nutrient and chlorophyll data, showed that productivity measurements in streams can be used to evaluate eutrophication potential. No single parameter or index provided reliable, but a discriminant analysis suggested that the use of respiration and the production-respiration ratio in conjuction can be useful. The degree of temporal variability of community metabolism was a consistently good indicator of water quality. It is suggested that the eutrophication potential of an unknown river can be determined by comparing several weeks of productivity data for summer, low-flow conditions with data presented in the paper. The paper notes also that if only physical and chemical measurements are made, then continuous measurements are made, then continuous monitoring of oxygen, temperature and radiation are important because they allow photosynthetic and respiration rates of the biota to be estimated without direct measurement of biological parameters. (Coyle-Wisconsin)
W78-03031

THE TOXIC ACTION OF ENDRIN ON AQUATIC INVERTEBRATES, (IN GERMAN),
J. Trnkova.
Prirodoved Pr Ustavu Cesk Akad Ved Brne 11(3), p 1-32, 1977.

Descriptors: *Endrin, *Invertebrates, *Toxicity, Water pollution effects, Absorption, Asellus-aquaticus, Caenis-robusta, Cloeon-dipterum, Culex-pipiens, Daphnia-pulex, *Insecticide, Larvae, Planaria -gonocephala, Pupa, Tubifex-tubifex.

The toxicity of endrin in form of the preparation Endrin 20 Spolana was determined for 23 spp. of aquatic invertebrates from stagnant and running waters. Of the tested stagnant water species, Daphnia pulex was the most sensitive, showing the toxicity value LC50 (72 h) of 8.10-9 mg/l at 20 degrees C.; Tubifex tubifex was the most resistant, with LC50 (72 h) of 21.11 mg/l at 20 degrees. Of the running water species, larvae of Caenis robusta were the most sensitive, with LC50 (72 h) of 1.1 . 10-8 mg/l at 14 degrees C.; Planaria gonocephala was the most resistant, with LC50 (72 h) of 0.1 mg/l at 15 degrees C. Juvenile Asellus aquaticus at the age of 1 wk were more resistant than those at the age of 2-4 wk the LC50 values for juveniles at 5 mo. were of the same order of magnitude as those for adults. The sensitivity of larvae of Cloeon dipterum to endrin was inversely proportional to age. Pupae of Culex pipiens were 10(2) times more resistant than 4th instar larvae, and 10(4) times more resistant than 3rd instar larvae. The age of prepared emulsion of the toxicant, the temperature of the emulsion as well as the absence of substrate in the testing vessels may affect the experimental results. Endrin is accumulated in tissues of certain aquatic invertebrates in amounts up to 100 times higher than the concentration of the testing emulsion, and can persist in the tissues for up to 4 mo.--Copyright 1978, Biological Abstracts, Inc.
W78-03034

TRACE ORGANIC EMISSIONS FROM LEAD MINING-MILLING OPERATIONS,
Syracuse Univ., NY. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-03036

A QUANTITATIVE STUDY OF THE STRUCTURE AND DYNAMICS OF BENTHIC SUBTIDAL ALGAL VEGETATION IN GHANA (TROPHICAL WEST AFRICA),
Ghana Univ., Legon. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-03037

L OLIVIER LAGOON, (IN FRENCH),
Centre Univ. de Luminy, Marseille (France). Lab. du Histol. Morphogen. Anim.
M. Marilley.
Bull Ecol 7(3), p 267-274, 1976.

Descriptors: *Eutrophication, Lagoons, *Mullets, Dissolved oxygen, Nutrients, Phytoplankton, Water pollution effects, Decomposing, Organic matter, Hydrogen sulfide, *Cyanophyceae, Mortality, Salts, Water temperature, Weather, Zooplankton.

The physical, chemical and biological phenomena responsible for the death of a large number of mullet in 1967 were studied. Data on weather, water levels, water agitation, dissolved Oz and nutrient salts were observed. A combination of relatively calm waters, warm temperatures and the lack of exchange between this and an adjacent lagoon resulted in above normal phytoplanktonic blooms, especially near the bottom. Increased Cyanophyceae populations lead to reduced zooplanktonic levels and eventually caused the build up decomposing organic material, increased Oz deficit and high hydrogen sulfide levels resulting in a significant mortality rate of fish.--Copyright 1978, Biological Abstracts, Inc.
W78-03039

CHNSED: SIMULATION OF SEDIMENT AND TRACE CONTAMINATION TRANSPORT WITH SEDIMENT/CONTAMINANT INTERACTION,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-03057

CALCULATION METHODS IN THE HYGIENIC STANDARDIZATION OF CHEMICAL WATER CONTAMINATION, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (USSR). Dept. of General Hygiene.
For primary bibliographic entry see Field 5A.
W78-03063

PARTICULAR CHARACTER OF THE EUTROPHICATION MECHANISM IN THE ETANG DE BERRE, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
M. Minas, M. -C. Bonin, B. Coste, P. David, and H. -J. Minas.
Ann Inst Oceanogr 52(2), p 153-164, 1976.

Descriptors: *Eutrophication, Water pollution effects, Lakes, Brackish lakes, *Brackish water, Biomass, Chlorophyll, *France(Etang deBerre), Halocline, Marseilles, Mixing, *Nutrients, Phytoplankton, Vertical mixing.

Eutrophication processes in the brackish water of the Etang de Berre, small lake near Marseilles (France) was studied over a 1 mo. period particularly on nutrient distribution and phytoplankton biomass. The nutrient trap which characterized the estuarine circulation system of the lake is strongly modified under strong wind conditions. A breakdown of the halocline by vertical mixing provides a nutrient input in the photic zone inducing an extremely intense bloom of phytoplankton. The chlorophyll a and Oz saturation values reach respectively 50 micron g/l and 190%. This eutrophication provides an output of organic material to the open sea and constitutes a mechanism for reducing the general accumulation of organic and mineral material under the halocline.-Copyright 1978, Biological Abstracts, Inc.
W78-03065

PRIMARY PRODUCTION, ORGANIC MATTER DESTRUCTION AND BACTERIAL NUMBERS IN THE SARATOV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
A. N. Dzyuban.
Gidrobiol Zh 13(1), p 81-85, 1977.

Descriptors: *Primary productivity, Phytoplankton, Reservoirs, *Organic matter, *Bacteria, Biomass, Water pollution effects, Zooplankton, *Saratov Reservoir(USSR).

As a result of unfavorable hydrometeorological conditions in 1973, the phytoplankton in the Saratov Reservoir (Russian SFSR, USSR) was weakly developed and primary production was low. This fact and the intensive feeding of zooplankton caused a reduction in bacterial numbers. For the vegetation period of 1973 (180 days), primary production was 57 g/m to the second power, bacterial biomass production was 39 g/m to the second power and organic matter destruction was 110 g/m to the second power. The destruction/phytoplankton production ratio was 1.9, which is less than that in other bodies of water of the Middle and Lower Volga (USSR). Thus, primary production is important in organic matter supply and bacterial numbers and activity.-Copyright 1978, Biological Abstracts, Inc.
W78-03066

ENERGY FLOW MODEL OF AN OXYGEN-DEFICIENT ESTUARY ON THE SWEDISH WEST COAST,
Swedish Water and Air Pollution Research Lab., Gothenberg.
R. Rosenberg, I. Olsson, and E. Olundh.
Marine Biology, Vol. 42, p. 99-107, 1977. 4 fig, 34 ref.

Descriptors: *Carbons, *Energy, *Fjords, Model studies, Estuaries, Oxygen, Zooplankton, Primary productivity, Fish, Eutrophication, Water pollution, Ecosystems, Clams, *Oxygen, *Byfjords(Sweden), Sweden, Halocline, Mytilus edulis.

An energy flow (carbon flow) model was developed for a specific ecosystem, the Byfjord on the west coast of Sweden. The Byfjord is an almost nontidal, eutrophic, stagnant, oxygen-deficient estuary connected by a narrow sound to an adjacent fjord. A sill at 12 m virtually prevents water exchange below the halocline (12-15m), and creates anoxic conditions. Studies of fauna from 1970-73 showed that the estuary is characterized by high primary production, a well-developed meifauna (dominated by foraminifera and nematodes) compared to macrofauna, high epifaunal biomass, low number of herbivorous copepods, and small fish population. Meiofaunal number and biomass were negatively correlated with depth (Maximum at 5-8m) and oxygen concentration. Energy flow is defined as changes in biomass of a given area of the system expressed as energy per unit of time per unit of area. Biomass data was transformed into carbon. Some 25% of the annual primary production (300 metric tons carbon) is estimated to be directly consumed, and to produce 5 tons zooplankton carbon and 40 tons epifaunal (mainly Mytilus edulis) carbon. About 500 tons carbon from detritus are utilized in animal production, and produce about 5 tons zooplankton carbon, 6 tons meiofaunal carbon, and 3 tons benthic macrofaunal carbon. Fish production is about 0.3 tons carbon/year. (Lynch-Wisc)
W78-03067

DIRECT MEASUREMENT OF DISSOLVED ORGANIC CARBON RELEASE BY PHYTOPLANKTON AND INCORPORATION BY MICROHETEROTROPHS,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W78-03068

SOME RESULTS OF STUDIES ON THE CYCLE OF SUBSTANCES AND BIOLOGICAL SELF-PURIFICATION OF BODIES OF WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vunutrennykh Vod.
For primary bibliographic entry see Field 5G.
W78-03070

AUTOMATIC SORTING OF ZOOPLANKTON BY ISOPYCNIC SEDIMENTATION IN GRADIENTS OF SILICA: PERFORMANCE OF A 'RHO SPECTROMETER',
Rutgers - The State Univ., New Brunswick, NJ. Waksman Inst. of Microbiology.
For primary bibliographic entry see Field 5A.
W78-03071

BENTHIC FAUNA SPECIES DIVERSITY IN SIX CENTRAL FLORIDA LAKES IN SUMMER,
Florida Technological Univ., Orlando.
J. A. Osborne, M. P. Wanielista, and Y. A. Yousef.
Hydrobiologia, Vol. 48, No. 2, p. 125-129, 1976. 1 fig, 2 tab, 18 ref.

Descriptors: *Speciation, *Benthic fauna, *Trophic level, *Lakes, *Oligotrophy, Florida, Invertebrates, Water pollution, Water quality, Diptera, Dissolved oxygen, Eutrophication, Systematics, Macroinvertebrates, Banana Lakes(FL), Species diversity index.

A study of benthic macroinvertebrates in six of the Banana Lakes chain in central Florida showed that oligotrophic lakes can naturally contain few species with low species diversity values (d values here ranging from 0.735 to 1.731). This may be the rule rather than the exception for the benthic macroinvertebrate community in an oligotrophic lake. The lakes ranged in surface area from 2.8-18.2 ha, wiht maximum water depth of 3.0 m. Deep deposits of organically derived sediments were found at maximum depth in all lakes. Water temperature, light penetration, turbidity, dissolved oxygen, pH, inorganic and organic C, specific conductance, color, and chlorophyll were measured. All lakes showed 50% less dissolved oxygen at the bottom than at the surface; only small temperature variations were noted. Of 22 species collected, only four (all dipterans) were common to all six lakes. Species distribution and numbers varied greatly among the lakes. Dipterans dominated and were more uniformly distributed number of species ranged from 6 to 15 among the lakes. Species sensitive to dissolved oxygen levels and organic pollution, as well as tolerant species, were found in the lakes. (Lynch-Wisconsin)
W78-03072

EFFECTS OF A FRESHWATER EFFLUENT ON THE DEVELOPMENT OF BENTHIC COMMUNITIES IN A MARINE LAGOON, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
G. Stora.
Bull Ecol 7(3), p 275-282, 1976.

Descriptors: Hydroelectric powerplants, Marine lagoons, Benthos, Water pollution effects, Bivalves, Brackish water, Durance Channel(France), *Etang-de-Berre(France), Polychaetes, Salinity.

Since 1966, after installation of the Saint-Chamas hydroelectric plant, the Etang de Berre, (France), has received freshwaters of the Durance Channel. This important freshwater inflow representing approximately 4 times the volume of the lagoon during a year has considerably decreased the water salinity. Studies were made in 1965, 1970 and 1972 to follow the evolution of the benthic populations of the Etang de Berre. Charcterized by typical marine populations in 1964 (Bivalves, polychaetes), the studies in 1970 show a general degradation of the lagoon populations without substitution of benthic marine population by a brackish population. However, in 1972 the benthic populations were replaced on the littoral coast by a characteristic brackish benthic population.-Copyright 1978, biological Abstracts, Inc.
W78-03076

FINGER-FILL CANAL STUDIES, FLORIDA AND NORTH CAROLINA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-03079

AN ECOLOGICAL STUDY OF THE EFFECTS OF POWER PLANTS ON BENTHIC MACROPLANT MICROCOSMS IN SUBTROPICAL AND TROPICAL ESTUARIES,
A. Thorhaug.
Available from the National Technical Information Service, Springfield, VA 22161 as ORO-4493 3, Price codes: A02 in paper copy, A01 in microfiche. Annual Progress Report No. ORO-4493-3: Energy and Research Development Administration - 1975 - 1976, May 1976. 22 p. E (40-1) - 9493.

Descriptors: *Water pollution effects, *Powerplants, *Environmental effects, *Thermal pollution, *Aquatic plants, Florida, Ecology, Benthos, Nuclear powerplants, Seagrass, Thalassia testudinum, Fossil fuel powerplants.

The effect of two fossil fuel and two nuclear plants on a near-shore seagrass community have been studied in South Biscayne Bay, Dade County, Florida over the past three years. The focus of the study has been to delineate the effects that a series of various pollutants have had on the dominant system of the seagrass, Thalassia testidinum, and its related community. The function of the seagrass community was studied and related to the impact of energy related activities, particularly, thermal effluent. In addition, the increased turbidity, current, siltation and heavy metals were factors at the Turkey Point site. Attempts were made to delineate the effect of heat in the laboratory to determine the upper thermal tolerance of the seagrass. This was shown to be quite close to the combined effect of all the pollutants in the field for Thalassia and the macroalgae. This would indicate that temperature is a very fundamental factor in the growth and survival of the seagrass community. (Sinha-OEIS)
W78-03094

THE RELATIONSHIP OF BACTERIOPLANKTON WITH PHYTO- AND ZOOPLANKTON IN FISH-REARING PONDS, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
A. F. Antipchuk.
Gidrobiol Zh 13(1), p 78-80, 1977.

Descriptors: *Cyanophyta, *Eutrophication, *Bacterioplankton, Ponds, Water pollution effects, Algae, Algal growth, *Bacteria, Euglenoid, Nutrition, Plankton, Protococcal, Zooplankton.

A statistical evaluation of the quantitative development of bacterio-, phyto- and zooplankton in fish-rearing ponds with different types of blooms was conducted. There was an inverse correlation between bacterial and blue-green algal development, a strong direct correlation between bacterial and protococcal development and a weak direct correlation, independent of the type of bloom, between bacterial and euglenoid development. The relationship between bacteria and zooplankton was essentially a function of the dominant group of algae, with the massive development of blue-green algae resulting in an increase in the bacterial fraction of zooplankton nutrition.-Copyright 1978, Biological Abstracts, Inc.
W78-03097

RISK ANALYSIS METHODS FOR DEEPWATER PORT OIL TRANSFER SYSTEMS,
Transportation Systems Center, Cambridge, MA.
L. Frenkel, and W. T. Hathaway.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 329, Price codes: A07 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development, Report No CG-D-69-76, June 1976. 144 p, 23 fig, 23 tab, 13 ref, 3 append. DOT-TSC-USCG-76-2.

Descriptors: *Coasts, *Estuaries, *Resources development, *Environmental effects, *Water pollution sources, *Water pollution effects, Wetlands, Water resources, *Outer Continental Shelf, *Deepwater ports, *Risk analysis, Oil transfer, Environmental impact.

The risk analysis is methodology for oil spills from the oil transfer systems in deepwater ports is presented. Failure mode and effect analysis in combination with fault tree analysis are identified as the methods best suited for the assessment of comparative risk from different technical alternatives. The necessary methodology and analytical expressions are developed and their application is demonstrated in some general sample calculations. Basic data sources are listed, and the quality of the data is discussed. It is shown that the available data are not sufficiently complete for quantitative calculations of the risk for the entire system. Comparative calculations, however, can be made, and a systematic qualitative examination of the system is possible. (Sinha-OEIS)
W78-03098

BASELINE STUDY PROGRAM, NORTH PUGET SOUND. BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL I - TEXT,
Beak Consultants Inc., Portland, OR.
J. W. Buell, and V. W. Kaczynski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 291, Price codes: A10 in paper copy, A01 in microfiche. Beak Consultants Inc., Report to Washington State Department of Ecology No WA/DOE/BR-75-01, October 1975. 204 p, 1 fig, 7 tab, 2 append.

Descriptors: *Baseline studies, *Oil pollution, *Water pollution effects, *Bibliographies, Environmental effects, Aquatic life, Washington, Reviews, *Outer Continental Shelf, *Ecological effects, *Biological effects, Puget Sound, Petrochemical pollutants.

Pertinent literature on the impact of oil upon the significant biological resources of Puget Sound is reviewed and analyzed. Possible effects of oil spills and spills of petrochemical products on the biota are considered. Interpretative data is summarized by organism and habitat. (Sinha-OEIS)
W78-03104

STUDIES AND INVESTIGATIONS OF THE FATE AND EFFECT OF THE SHELL OIL SPILL, PLATFORM B, BLOCK 26, SOUTH TIMBALIER BAY (DECEMBER 1, 1970 - NOVEMBER 30, 1971),
Resources Technology Corp., Houston, TX.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 598, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Water Programs, Oil and Hazardous Materials Program Series, Report No. OHM 72 05 001, January 1972. 1972. 118 p, 2 tab, 47 ref. Dedman, E.V. (ed.). EPA-68-01-0051.

Descriptors: *Oil spills, *Water pollution effects, *Environmental effects, Louisiana, *Outer Continental Shelf, Ecological effects.

A formal documentation of selected field study activities for one major spill incident which initially occurred offshore Louisiana on December 1, 1970

and lasted until April 16, 1971 is presented. The report is based on data and information obtained through three field surveys undertaken by the Environmental Protection Agency. The purpose of these field studies was to determine the areal extent of the spilled material, the fate of the spill, and the effect of the material on the biota. The three surveys were: The Caminada Bay - Barataria Bay physical, chemical and biological sampling conducted by EPA Region VI personnel assisted by the State of Louisiana; the offshore physical, chemical and biological sampling conducted by EPA regional personnel; Oceanographic and remote sensory survey; and the joint physical, chemical and biological sampling. (Sinha-OEIS)
W78-03106

A NUMERICAL OIL TRAJECTORY FORECAST MODEL USED TO ASSESS THE HAZARD TO LONG ISLAND BEACHES FROM OIL ENTERING THE NEW YORK BIGHT APEX FROM FEBRUARY 11-24, 1977,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5B.
W78-03109

TRACE METALS IN FINFISH FROM THE NEW YORK BIGHT AND LONG ISLAND SOUND,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5B.
W78-03139

SELECTED AQUATIC PLANTS AS INDICATOR SPECIES FOR HEAVY METAL POLLUTION,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia); and Fisheries and Marine Service, Halifax (Nova Scotia). Dept. of Environment.
For primary bibliographic entry see Field 5A.
W78-03141

UPTAKE AND ACCUMULATION OF THE NICKEL ION BY MYTILUS EDULIS,
San Francisco Univ., CA. Dept. of Biology.
A. R. Friedrich, and F. P. Filice.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 6, p 750-755, 4 fig, 11 ref. 1976.

Descriptors: Environmental effects, *Water pollution effects, *Adsorption, *Mussels, *Nickel, *Ions, *Bioaccumulation, *Chlorides.

Investigations of the uptake and accumulation of nickel chloride by Mytilus edulis over a four week period showed that at total concentrations of 0.018 and 0.03 mg Ni/l, uptake and accumulation of nickel was not significant but that it was significant at concentrations of 0.056 and 0.107 mg Ni/l. Some mussels died during the course of the four weeks but it was concluded that there was no relationship between the number of deaths and the increasing concentrations of nickel. It was concluded that the accumulation of nickel by M. edulis may be due to an inadequate excretion of nickel. (Chilton-ORNL)
W78-03142

CLADOCERA (CRUSTACEA) AS INDICATORS OF WATER POLLUTION, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-03144

TUNICATE SPECIES AS MARINE POLLUTION INDICATORS,
Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.
For primary bibliographic entry see Field 5B.
W78-03148

AVOIDANCE BY HERRING OF DISSOLVED COMPONENTS IN PULP MILL EFFLUENTS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
D. J. Wildish, H. Akagi, and N. J. Poole.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 5, p 521-525, 1977. 3 tab, 7 ref.

Descriptors: *Pulp wastes, *Pollutant identification, *Fish behavior, *Herrings, Pollutants, Effluents, Environmental effects, Sodium compounds, Industrial wastes, Waste water disposal.

Herring, Clopea harengus, avoid whole sulfite pulp mill effluent (PME) at a threshold level equivalent to 2.5-2.9 mg/liter as sodium lignosulfonate. An attempt was made to identify the chemical components of PME that herring avoid in sea water. Groups of 9-13 herring were placed in a figure-eight maze and, except for control observations, the component tested was introduced into one end of the maze. The number of fish in each half of the maze was used as a measure of avoidance or preference. Only sodium lignosulfonate and humic acid were avoided at approximately 1 mg/liter. Nominal concentration thresholds estimated by interpolation were 0.1-0.3 mg/liter for sodium lignosulfonate and 0.1-0.2 mg/liter for humic acid. Herring apparently avoid long chain complex molecules, such as lignosulfonates, rather than relatively toxic resin acids and breakdown products of low molecular weight. The discrepancy with previous results using whole PME may be due to herring response to chemical differences in the two lignosulfonate samples tested or masking of lignosulfonate in PME by other chemicals present. (Snyder-FIRL)
W78-03194

5D. Waste Treatment Processes

EFFECTS OF WASTEWATER AND COOLING WATER CHLORINATION ON AQUATIC LIFE,
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-02749

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5G.
W78-02828

TENSIONS AND CONFLICTS IN FEDERAL POLLUTION CONTROL AND WATER RESOURCE POLICY,
Environmental Defense Fund, New York. Eastern Water Resources and Land Use Program.
For primary bibliographic entry see Field 5G.
W78-02841

ADJUSTABLE FLOW FLOATING WEIR ASSEMBLY,
T. H. Morgan, and W. S. Posey.
U.S. Patent No. 4,015,629, 5 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 122, April 5, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, Flow control, Equipment, *Weirs, Floating.

This weir assembly can be used to equalize the flow out of a basin which receives a variable input flow, while maintaining the ability to increase or decrease the output flow from the basin. An adjustable-flow floating weir assembly can therefore be of substantial benefit in the design of a waste water treatment facility by significantly reducing the maximum capacity requirements of the facility, thereby resulting in substantial savings. By varying the air under pressure acting on the underside of the weir assembly, the buoyancy of the assembly can be varied correspondingly vary the vertical position of the assembly relative to the surface of the liquid in the basin and thereby regulate the output flow of liquid through the notches and through the weir assembly to the exterior of the basin. Thus, by maintaining a constant rate since the assembly would always have the same elevation relative to the liquid level in the basin. By increasing or decreasing the air pressure beneath the weir assembly, the vertical position of the assembly can be varied relative to the liquid level in the basin to thereby increase or decrease the constant rate at which liquid flows from the basin. (Sinha-OEIS)
W78-02892

METHOD FOR SEPARATING SOLID POLLUTANTS FROM FLUIDS,
Societe Lab. Saint Dider-au-Mont-d'Or (France).
J-F. Vicard.
U.S. Patent No. 4,017,390, 5 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 957, No 2, p 710, April 12, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water pollution control, Solid wastes, Suspended solids, Separation techniques, Centrifugation.

The water to be treated comes from a washing, dust removal or like installation and it contains polluting particles which are to be removed. In certain cases these particles have a commercial value and their recovery may be an advantage. The water is first sent fo a preparatory apparatus where it is made to whirl at high speed. It circulates in the form of a revolving mass, for example a cylindrical mass, comprising an axial vacuum and located in this vacuum is an electrode having an appropriate potential for causing the agglomeration of the particles. The centrifigual field is used simultaneously for removing the gases and foam as well as the floating particles from the water and for initiating purification by centrifugation. The fraction of partly purified water is returned for use. The water pre-treated in this manner is supplied to a concentrator inside which it continues to rotate, thus ensuring increased centrifugal concentration. The clear water leaving the central part of the concentrator is extracted and the muddy water is supplied to a filter forming a thickener. The filtered water is returned to the concentrator and the thickened sludge is sent to a lock chamber which is evacuated periodically by pneumatic effect. (Sinha-OEIS)
W78-02894

WATER TREATMENT SYSTEM,
For primary bibliographic entry see Field 5F.
W78-02895

POLLUTION MONITORING WITH TOTAL ORGANIC CARBON ANALYSIS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-03009

DEVICE FOR EVALUATING COALESCENCE OF OIL EMULSIONS,
Engineering-Science, Inc., Houston, TX.
J. Chieu, E. F. Gloyna, F. Asce, and S. Schechter.
Journal of Environmental Engineering Division, Proceedings of ASCE Vol. 103, No. 2, p. 163-175, April 1977. 11 fig, 1 tab, 17 ref.

Descriptors: *Waste water treatment, *Laboratory tests, *Coalescence, *Viscosity, *Laboratory equipment, *Oily water, Equipment, Oil wastes, Oil pollution, Emulsions, *Oil emulsion coalescence test apparatus.

A laboratory apparatus is described which can provide useful information in the design and operation of coalescers used to break stable oil-water emulsions, a problem in oil removal in wastewater treatment systems. The compact unit tests for important variables such as wettability of media, coalescer depth, flow rates, and characteristics of oily wastes, all of which can be investigated in detail before pilot plant facilities are planned. Treatability results show how removal of oil-water emulsions through coalescence can be accomplished. Among results of test data was that media preferentially wetted by the media will exhibit lower head losses than nonwetting media. Further, coalescence decreases with increasing filter velocity and decreasing interfacial tension. No significant difference in oil separation was found for the range of viscosities studied. (Coyle-Wisconsin)
W78-03032

DECONTAMINATING LAKE SUPERIOR OF ASBESTOS FIBERS,
Army Mobility Research and Development Command, Fort Belvoir, VA. Sanitary Sciences Div.
R. P. Schmitt, D. C. Linsten, and T. F. Shannon.
Environmental Science and Technology, Vol. 11, No. 5, p 462-465, May, 1977. 4 fig, 2 tab.

Descriptors: *Lake Superior, *Asbestos, *Mining, *Filtration, *Water purification, Water pollution, Water pollution control, Iron, Minnesota, Pollutants, Water pollution sources, Equipment, Industrial wastes, Coagulation, Human pathology, Human diseases, Potable water, ERDLator water purification unit, Taconite, Clarification, Carcinogens, Taconite.

Virtually all the asbestos was removed from a sample of water from Lake Superior previously polluted by discharges of wastewater and siliceous tailings which contained the mineral from a taconite concentration plant, by means of a U.S. Army-developed ERDLator water purification unit. Results of tests of the unit indicate that charge neutralization, bridging and filtration are the logical approach to asbestos decontamination of Lake Superior. During the tests (1973) the count of asbestos fibers in the lake water varied from 300,000 to 8,300,000 particles/l, 90% of which were 0.06-1.1 microns in length. The tiny particle size and electrical charge results in virtualy complete dispersion and minimal settling. Health hazards of asbestos in drinking water include mesotheliomas of the pleura or peritoneum with a 20-year incubation period. The water purification unit consists of a conical solids contact clarifier, pressure diatomite filter, and supportive equipment, including engine, generator, and storage tanks. Nine operation variations were tested. Best results were obtained with the following procedure: (1) coagulation: 2 ppm cationic polyelectrolyte added in ERDLator wet well; (2) filtration: precoat, 0.4 lbs celite 535; body feed, 28 ppm Hyflo. The positively charged cationic polyelectrolyte neutralized the negative charge on the suspended asbestos fibers; the neutralized particles were then aggregated or 'bridged' on the long-chain polymer, and aggregates were removed by the subsequent filtration step. (Lynch-Wisconsin)
W78-03040

THE FRENCH MARKET FOR AIR AND WATER PURIFICATION AND POLLUTION CONTROL EQUIPMENT.
Domestic and International Business Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03042

FINANCIAL CRITICAL FACTORS ANALYSIS.
Miami Valley Regional Planning Commission, Dayton, OH.; and Linton and Co., Inc., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 377, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-208-MVRPC-M6, March 1976. 67 p, 1 fig, 11 tab, 7 ref, 2 append. P005160 01.

Descriptors: *Ohio, *Waste water treatment, *Financing, Waste water disposal, Regional development, Bond issues, Costs, Grants, Planning, Treatment facilities, *Miami Valley Regional Planning Commission(OH).

This review of methods available to Ohio municipalities and counties and the Miami Conservancy District for financing the construction of wastewater treatment facilities, is part of a series of eight reports giving background information for development of the management component of the Section 208 Areawide Water Quality Management Plan by the Miami Valley Regional Planning Commission. Factors were identified which affect the ability of finance treatment facilities, including methods of long-term financing available to public agencies, legal implications of such methods, current use level within those limits, voter reaction to bond issues, federal grant programs for water pollution control, state assistance for water pollution control, and mechanisms available to facilitate multijurisdictional wastewater treatment operations. Financing methods discussed included general obligation bonding, general obligation revenue or self-supporting bonding, straight revenue bonding, special assessment bonding, and contract financing. Ohio Water Development Authority (OWDA) and Farmers Home Administration (FHA) assistance was also reviewed. Conclusions were that where needs exist, appropriate financing methods are available, at both local and regional levels. For specific cases intensive analysis of the local situation is necessary to determine the best method and to estimate costs. (Lynch-Wisc)
W78-03052

WASTE NUTRIENT RECYCLING USING HYDROPONIC AND AQUACULTURAL METHODS,
California Univ., Los Angeles. Office of Environmental Science and Engineering.
J. A. Dracup, and R. A. Mah.
1975. 166 p, 58 fig, 249 ref, 9 append. RF 74070.

Descriptors: *Recycling, *Nutrients, *Hydroponics, *Aquaculture, *Waste water disposal, Model studies, California, Food chains, Algae, Reclaimed water, Social aspects, Daphnia, Channel catfish, Sewage disposal, Costs, Tapia Water Reclamation Facility(CA).

Hydroponics and aquaculture hold great potential for the producton of food and fiber as well as for wastewater treatment, pollution control, water reclamation, and nutrient recovery. Secondary effluent is here shown to be an adequate aquacultural growth medium for an artificial food chain consisting of freshwater algae, the crustacean Daphnia, and channel catfish. Using hydroponic techniques, chrysanthemums and tomatoes have been grown experimentally in reclaimed secondary effluent; peppers, eggplant, cucumbers, and lettuce are potential crops. The general uses of hydroponics and aquaculture in wastewater recycling are discussed, and public attitudes, health aspects, and legal and water quality considerations are analyzed. Simulation models for aquaculture and hydroponics operations are developed, and a proposed pilot plant is described, which utilizes the algae-crustacean-fish food chain and crop production in conjunction with the Tapia Water Reclamation Facility of the Las Virgines Municipal Water district at Calabasas, California. A 100,000 gal/day aquaculture facility would require a capital investment of $313,000 and annual operating costs of $106,745. A 1 MGD hydroponics operation could yield a net annual profit of $82,000 on a $499,046 capital investment and operating expenses of $159,000. (Lynch-Wisconsin)
W78-03077

COST REDUCTION FOR WASTEWATER TREATMENT UTILIZING WATER MANAGEMENT AT HOLSTON ARMY AMMUNITION PLANT,
DARCOM Intern Training Center, Taxarkana, TX. Product/Production Graduate Engineering Program.
For primary bibliographic entry see Field 6C.
W78-03085

THE CATALYTIC OXIDATION OF CYANIDES (DIE KATALYTISCHE LUFTOXIDATION VON ZYANIDEN),
A. T. Kuhn, and C. Wilson.
Oberflaeche-Surface, Vol. 18, No. 4, p 93-96, 1977. 3 fig, 20 ref.

Descriptors: Oxidation, *Nitrogen compounds, *Activated carbon, *Chemical wastes, Separation techniques, Industrial wastes, *Waste water treatment, *Cyanides, *Catalytic oxidation.

Atmospheric oxidation is an effective, inexpensive method for the elimination of cyanides from dilute solutions. The process is based upon the passage of the cyanide wastes and air through a column of carbon (charcoal) on an inert carrier. The direction of flow is intermittently reversed to allow a better distribution of the metallic hydroxides formed by this process, and the excess can be removed by flushing with hydrochloric acid solution. The cyanide ions are totally oxidized to carbon dioxide, ammonia, and nitrogen. The resulting increase in pH is favorable to the reaction in the range 5-9. Certain metallic ions, especially cadmium, inhibit or retard the reaction. Increased temperatures accelerate the reaction. The following carbons from various sources were studied using a solution containing 600 ppm cyanide in a period of 24 hr with 37.5 g carbon/liter and their percentage efficiency determined: coke, 67.5; sewage sludge, 93.4; spruce wood, 56.6; peat, 61.7. (Schwartz-FIRL)
W78-03158

INCINERATORS FOR WASTES FROM THE CHEMICAL INDUSTRY (INCINERATEURS DE DECHETS DE L'INDUSTRIE CHIMIQUE),
For primary bibliographic entry see Field 5E.
W78-03159

WASTE WATER, SLUDGES, AND SOLID WASTES OF CHEMICAL INDUSTRY--TREATMENT, INCINERATION, DUMPING (ABWASSER, SCHLAEMME SOWIE FESTE RUECKSTANDE DER CHEMISCHEN INDUSTRIE--AUBEREITEN, VERBRENNEN, DEPONIEREN),
Bayer A. G., Krefeld-Uerdingen (West Germany). Abt. Umweltschutz.
For primary bibliographic entry see Field 5E.
W78-03160

TREATMENT OF A CREAMERY EFFLUENT.
Effluent and Water Treatment Journal, Vol 17, No 9, p 476, September, 1977. 1 fig.

Descriptors: *Food processing industry, *Dairy industry, *Activated sludge, *Filtration, *Treatment facilities, Aeration, Effluents, Biochemical oxygen demand, Industrial wastes, Porous media, *Waste water treatment.

The North Cork Creamery in Kanturk, Bounty Cork, Ireland, produces waste water at rates up to 5000 gal/hr in the manufacture of casein. The waste water normally includes caustic soda, nitric acid, and trace amounts of oils and fats. Waste water treatment with two biofiltration stages followed by a single activated sludge stage was installed after the local government set a limit on

BOD discharge from the plant of 18 kg/day. Waste water from the creamery first undergoes coarse and fine screening and then passes through a series of grease traps. After equalization it passes through two high-rate biofilters which are filled with 7778 cu m of ICI Flocor. Sludge is collected in two sludge settling basins and then passes to a sludge holding tank. Two 7.5 hp aerators in the activated sludge reduce the BOD to a final concentration less than 20 mg/liter. The clarified liquor is discharged directly to the River Allow. The treatment system was designed and manufactured by Anderson and Martin Ltd. of Dublin in conjunction with Davenport Engineering Company Ltd. of Bradford, Ireland. (Schulz-FIRL)
W78-03161

SWEDISH POLLUTION CLEAN-UP.
Water Services, Vol 81, No 977, p 426-427, July, 1977.

Descriptors: *Chemical wastes, *Activated carbon, *Adsorption, *Organic wastes, Industrial wastes, Waste water treatment, Treatment facilities, Water pollution control, *Sweden.

The Chemviron Adsorption Service, supplied by Chemviron Ltd. of Hampton Wick, Kingston-on-Thames, Surrey, England, is being used by the BT Kemi chemical plant in Teckomatorp, Sweden, to treat 50,000 tons of industrial waste water polluted with phenolics and herbicides. Although operations at the chemical plant had been shut down in response to more stringent pollution requirements laid down by the Environmental Board of Sweden, treatment was still required for the 50,000 tons of chemical wastes in storage in a series of lagoons near the factory complex. The Chemviron Adsorption Service was installed within 14 days and currently is treating the effluent at a rate of 240 sq m/day. Treatment with carbon adsorption as well as maintenance, technical advice, and regular monitoring of the effluent are all provided as part of the service. (Schulz-FIRL)
W78-03162

CLARIFIERS KEY TO EXPANSION OF TENNESSEE EASTMEN WASTEWATER FACILITY.
Chemical Processing, Vol 40, No 6, p 22, May, 1977.

Descriptors: *Clarification, *Chemical wastes, *Aeration, Equipment, *Treatment facilities, Biochemical oxygen demand, Design data, Sludge treatment, Industrial wastes, *Waste water treatment, Tennessee.

Waste water treatment facilities at the Tennessee Eastman Company in Kingsport were expanded at a cost of $6 million to include three aeration basins, three clarifiers, an aerobic digester, and a post-aeration basin. Liquid wastes are generated at a rate of 500,000 lb per day in the manufacture of over 350 fiber, chemical, and plastic products. Although approximately 72% of the wastes is isolated and incinerated, the remaining 28% must be treated. The three 120-ft dia clarifiers receive effluent from the aeration basins for settling of solids which consist largely of biologically active organisms. The clarifiers were designed for rapid sludge removal and are equipped with uptake pipes and alternate rake and deflector blades. BOD in the overflow from the clarifiers has been reduced by better than 95% and further additions are planned for the facility to reduce the BOD by 99%. Facilities at Kingsport prior to the expansion included a neutralization system, settling lagoon, and two aeration basins. (Schulz-FIRL)
W78-03163

CATALYTICALLY ASSISTED OXIDATION PROCESSES,
Rohrer A.G. (Switzerland). Lab.
E. Rohrer.
Chemistry and Industry, Vol 20, p 816-821, October, 1977. 7 tab, 28 ref.

Descriptors: *Chemical wastes, *Catalysts, *Chemical reactions, *Oxidation, *Chemical oxygen demand, Sewage treatment, Industrial wastes, *Waste water treatment.

Catalytically assisted oxidation mechanisms and their controls for reactions during sewage treatment are described for those situations in which the oxygen is reduced through the substrate partly or completely to water (non-insertion reactions), or in which the oxygen enters into a compound with the substrate (insertion reactions). Since the point of oxygen insertion in a compound is dependent on the strength of the bond which must be broken, dissociation energies and dissociation reactions are given for oxidation reactions encountered in sewage treatment. The initial stage of the reaction involves the formation of free radicals and the accumulation of peroxides. Since the cleavage of the hyperperoxides is an oxidation-reduction reaction which requires a catalyst, types of catalysts used for oxidation processes are discussed. The catalytic activity of activated carbon in sewage treatment is evaluated. Oxidation efficiency is defined as a parameter for estimating the performance of oxidation in terms of total organic carbon or COD. (Schulz-FIRL)
W78-03164

EPA DEVELOPS PROCESS TO DESTROY KEPONE,
For primary bibliographic entry see Field 5E.
W78-03165

SUPER BUGS RESCUE WASTE PLANTS.
Chemical Week, Vol 121, No 22, p 47, November, 1977. 1 fig.

Descriptors: *Bacteria, *Oil wastes, *Phenols, *Biological treatment, Treatment facilities, *Chemical wastes, Industrial plants, Bacteria, Waste treatment, Industrial wastes, *Waste water treatment.

Tailor-made, mutant bacteria strains can handle difficult jobs in waste treatment, including the breakdown of complex hydrocarbons. When the Mobay chemical plant in New Martinsville, West Virginia, was shut down because of a fuel shortage, bacteria used in the waste treatment plant died. Efforts to reseed the plant with bacteria from other plants failed. Phenobac, a mutant bacteria strain developed by Worne Biochemicals of Berlin, New Jersey, was added to the treatment system at a rate of 1 lb/mgd. Within three weeks after Phenobac was added, the plant again achieved 90% removal. Bacteria developed by Worne Biochemicals are available through the Polybac Corporation of New York, New York. Polybac bacteria have been used in the treatment of cellulose fats, greases, detergents, inks, dyes, cyanides, and hydrocarbons from various industrial operations. The mutant bacteria have been used in pilot-scale studies with a fluidized bed-bioreactor for the treatment of coal conversion wastes. (Snyder-FIRL)
W78-03166

TREATMENT OF SOLID EFFLUENT FROM A BICHROMATE PLANT FOR PREVENTION OF WATER POLLUTION,
Indian Inst. of Tech., Madras. Dept. of Chemical Engineering.
K. R. Rao, and C. S. Rao.
Indian Chemical Journal, Vol 12, No 2, p 27-28, August, 1977. 4 tab.

Descriptors: *Industrial wastes, *Chemical wastes, *Chemical industry, *Waste water treatment, *Solid wastes, Water pollution, Pollution abatement, Chemicals, Rain water, Leaching, Chromium, Chemical reactions, Carbonates.

Sodium dichromate is produced during the treatment of chrome ore with sodium carbonate addition and water leaching to remove the soluble sodium chromate. In actual operation, the leached out solid mass from the rotary kiln still contains residual soluble chromate. Studies were undertaken to reduce the water soluble hexavalent chrome ion by washing the solid waste with sodium carbonate solution. Sodium carbonate solutions in concentrations of 1, 5, and 10% were added to the waste which was then reheated in a muffle furnace to 1100C. The 5% solution reduced 100% of the hexavalent chromium in the waste material which had been heated for one hour and 98.4% of the chromium in a sample which had been heated for two hours. A countercurrent system of carbonate leaching is recommended for concentration of the chromate solution to reduce the load on evaporators. (Snyder-FIRL)
W78-03167

SEWAGE SLUDGE COMBUSTION.
For primary bibliographic entry see Field 5E.
W78-03168

AUTOMATIC MEASUREMENT OF TOTAL OXYGEN DEMAND APPLIED TO THE CONTROL OF WASTE WATERS (LA MESURE AUTOMATIQUE DE LA DEMANDE TOTALE EN OXYGENE APPLIQUEE AU CONTROLE DES EAUX RESIDUAIRES),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
For primary bibliographic entry see Field 5A.
W78-03169

FLOTATION CELLS FIND USE IN WATER POLLUTION CONTROL.
Plant Engineering, Vol 31, No 23, p 90, 94, November, 1977.

Descriptors: *Flotation, *Food processing industry, *Separation techniques, *Froth flotation, *Industrial wastes, Clarification, Pilot plants, Waste water treatment.

The Wexler Meat Company in Chicago, Illinois, was required to comply with a new sewage and waste control ordinance imposed by the Metropolitan Sanitary District of Greater Chicago on meat packing, food processing, and manufacturing plants. Effluents sampling and a series of tests on a small pilot flotation cell were conducted by the Denver Equipment Division of Joy Manufacturing Company to determine the size and type of flotation unit which would provide optimum treatment for the Wexler facility. A 6000-gal wooden retention tank was chosen for treatment of all effluent from the nightly clean-up drains. The effluent is agitated and pumped to a series of four dispersed air flotation cells. The flotation processes are assisted by the addition of a reagent to the first cell. The dispersing mechanisms contain a rotating impeller which draws air through a vertical standpipe, mixes it with the liquid, and saturates it with fine bubbles. Nonwettable impurities adhere to the surface of the bubbles and rotating skimmers remove the resulting froth from the water. The system, which treats up to 6000 gal of effluent daily in a 2.5-hr treatment cycle, was installed at a cost of $7000. (Schulz-FIRL)
W78-03170

RECOVERY AND REUSE OF WASTES FROM ORGANIC CHEMICAL INDUSTRIES,
K. C. Shroff, and P. R. Sheth.
Indian Chemical Journal, Annual Number, p 79-84, 1977.

Descriptors: *Water reuse, *Recycling, *Chemical wastes, *Pesticides, *Industrial wastes, Activated carbon, Adsorption, Separation techniques, Centrifugation, Membrane processes, Ion exchange, Organic compounds, Soil-water-plant relationships, *Waste water treatment, Waste water disposal, *Organic wastes.

Various aspects of the recovery and reuse of water and chemicals from waste water produced during the manufacture of various organic chemicals in India are discussed. Water and waste management practices are discussed with respect to their cost-benefit ratios. Activated carbon adsorption is evaluated for use with organic compounds. The use of evaporation is described for the recovery of acids, alkalis, and salts. Solvent extraction and distillation are examined for the recovery of acids, alcohols, and organic solvents. Centrifugation is presented as a separation technique for oil or organic solvents from water, or for the separation of suspended particles of pesticides like DDT and BHC from waste water. Reverse osmosis and ion exchange are described as membrane processes in waste water treatment for industrial chemicals. Case studies on the recovery and treatment of liquid and gaseous wastes are presented for an oxalic acid plant and a malathion plant. Limitations on the reuse of fully and partially treated industrial wastes are discussed. (Schulz-FIRL)
W78-03171

WATER TREATMENT CAN TURN YOUR DRAINS INTO MAINS,
D. Martin.
Process Engineering, p 24-25, February, 1977.

Descriptors: *Effluents, *Industrial wastes, *Metal wastes, *Costs, *Food processing industry, Treatment facilities, Industrial water, Waste water treatment.

Increasing costs for water and waste water treatment have led to the development of advanced means of waste water treatment for industrial wastes which include some degree of water reuse. Charges for water and waste water treatment are discussed with respect to a variety of British industries, including textiles, food processing, metals plating, and slaughterhouse operations. Experiences with the use of Permutit-Boby waste water treatment equipment are described. The 1670-cu-m/day treatment unit at a frozen vegetable processing plant included flow balancing, primary settlement, high rate plastic media filtration, activated sludge, sludge thickening, dewatering, tertiary filtration, and chlorination. Daily savings produced by reuse of 50% of the waste water returned the capital cost for the facility within 540 days. A Permutit-Boby automatically controlled demineralizing plant is being used to remove the scale- and corrosion-forming impurities from boiler water at a truck and tractor plant in Liverpool, England. A Permutit-Boby effluent treatment plant with manual controls is being used to treat wastes at a metal plating plant. (Schulz-FIRL)
W78-03172

RECOVERY OF USEFUL BY-PRODUCTS FROM DISTILLERY WASTES,
Indian Engineers Ltd., New Delhi.
For primary bibliographic entry see Field 5E.
W78-03173

MEMBRANE PROCESSES FOR EFFLUENT TREATMENT,
Paterson Candy International Ltd., Whitchurch (England).
D. Pepper.
Chemistry and Industry, No. 20, p 834-836, October, 1977. 3 fig, 4 tab, 6 ref.

Descriptors: *Membrane processes, *Reverse osmosis, *Filtration, Municipal wastes, *Food processing industry, Chemical wastes, Chemical industry, Oil wastes, Sewage treatment, Separation techniques, Industrial wastes, *Waste water treatment.

Reverse osmosis uses a thin plastic film which allows water to flow through it under pressure but which prevents the passage of dissolved substances. Ultrafiltration uses a more open membrane which allows inorganic salts and small molecules to pass through with the water and excludes larger molecules. Reverse osmosis and ultrafiltration membranes are available as tubes, flat sheets, and hollow fibers. Reverse osmosis is being used to remove lactose and protein from whey produced during cheese manufacturing. Reverse osmosis is also being evaluated for reducing the volume of potato processing waste water. Reverse osmosis is used in sugar processing to remove 6 cu m/hr of water from a molasses fraction containing 6.2% total solids. A chemical factory uses reverse osmosis to separate effluents into water suitable for discharge and a concentrate for incineration. Ultrafiltration is being used to concentrate soluble oil emulsions. A pilot-scale reverse osmosis plant in Portsmouth, England, has produced potable quality water and a nutrient-rich compost from municipal waste water. (Snyder-FIRL)
W78-03174

TREATMENT OF HIGH-ORGANIC WASTE WATERS FROM THE FOOD INDUSTRY,
Research Inst. for Water Resources Development, Budapest (Hungary).
I. Tookos.
Effluent and Water Treatment Journal, Vol 17, No 9, p 449-459, September, 1977. 5 fig, 3 tab, 11 ref.

Descriptors: *Biological treatment, *Food processing industry, *Activated sludge, Dairy industry, Organic matter, Organic wastes, Waste water(Pollution), Industrial wastes, *Waste water treatment, Waste water disposal.

Experiments using activated sludge to treat waste water containing organics in high concentrations are reviewed. Effluents from meat and poultry processing, wheat starch factories, and dairies were used in batch and continuous models which had been seeded with municipal activated sludge. The waste water components and the behavior of dissolved colloidal and suspended pollutants controlled the nutrient removal and the amount of activated sludge produced. The amount of blood and fat affected the treatment system's oxygen demand with meat and poultry processing wastes. Measurements on effluents from starch factories indicated the presence of several complex organic substances, which caused a high oxygen demand for extended periods. The quantity of whey in the dairy waste water influenced aeration requirements for COD removal. When the differences in experimental conditions and the properties of waste water components are considered, these results compare favorably with previous data. (Snyder-FIRL)
W78-03175

TREATING WASTEWATER FOR RECYCLING,
Ecodyne Corp., Union, NJ. Industrial Wastewater Div.
G. Mace.
Plant Engineering, Vol 31, No 22, p 101-104, October, 1977. 2 fig, 3 tab.

Descriptors: *Water reuse, *Recycling, *Tertiary treatment, Equipment, Analytical techniques, Reverse osmosis, Filtration, Ion exchange, Flocculation, Industrial wastes, Industrial water, Waste water treatment.

Stricter environmental regulations and increasing water and sewage treatment costs have prefaced this discussion of the reclamation of industrial waste water for production processes and cooling. A flow scheme is presented to describe how much water should undergo treatment for reuse and where it should be reused. Primary, secondary, and tertiary levels of waste water treatment are described. Factors which influence the feasibility of waste water reuse are related to the relative effects of suspended solids, water temperature, dissolved solids, oily wastes, and process modifications to reduce overall water consumption. Capital costs, installation costs, and operating expenses are discussed with respect to equipment selection. Standard clarifiers, flocculators, and solids-contact flocculators which are used to remove suspended solids in most waste water treatment systems are described. Granular media filters are recommended for further treatment of clarified effluents, and the effects of media type, size, and filter design are examined. A cost analysis is presented for recycling 90%, 50%, and 0% of the waste water produced at a typical plant. Typical space requirements for recycling are described. Recycling operations at the Armco Steel Corporation plant in Houston, Texas, are described. (Schulz-FIRL)
W78-03176

SPECTROSCOPIC DETERMINATION OF METALS IN WASTEWATERS (PRIMENENIE METODA POLYAROGRAFII S NAKOPLENIEM (INVERSIONNOI VOL'TAMPEROMETRII) V ANALIZE MAKRO I MIKROOBEKTOV),
For primary bibliographic entry see Field 5A.
W78-03177

THE COLLECTION, NEUTRALIZATION, AND DISPOSAL OF RINSE WATER,
Armco Steel Corp., Kansas City, MO.
J. K. Fuller.
Wire Journal, Vol 10, No 1, p 60-63, January, 1977. 8 fig.

Descriptors: *Neutralization, *Chemical wastes, *Acidic water, *Treatment facilities, *Oxidation, Waste water disposal, Iron compounds, Industrial wastes, Waste water treatment.

The Union Wire Rope Division of Armco Steel Corporation in Kansas City, Missouri, produces a wide variety of products from high-carbon rods in its rod cleaning and wire coating operations. The plant is located on a portion of the Bid Blue River, into which the Missouri Clean Water Commission has prohibited the discharge of even treated industrial waste waters. The Kansas City Pollution Control Department had agreed to accept the discharge of Armco's waste water into the municipal treatment system, provided that the acidic rinse waters were neutralized and all ferrous iron had been oxidized to ferric iron. The proposed treatment system for Union Wire included rinse water collection, equalization, neutralization, aeration, and discharge to a large-diameter reinforced concrete municipal sanitary sewer that passed through the plant. A sampling program was instituted to determine the chemical and hydraulic loading on the proposed plant with monitoring for pH, free acidity, total acidity, and dissolved metals in waste water from various sources within the plant. Neutralization of the acidic waste water was accomplished with a 50% sodium hydroxide solution. Rising costs for sodium hydroxide eventually led to the use of a carbide lime slurry, a waste by-product from the production of acetylene gas, for neutralization. (Schulz-FIRL)
W78-03178

THE EFFLUENT TREATMENT SYSTEM OF THE ZAPOROZHE REFRACTORIES PLANT,
I. G. Kal'chik, and A. M. Levin.
Refractories, Vol 17, Nos 3-4, p 217-219, January, 1977. 2 fig, 3 tab.

Descriptors: *Treatment facilities, *Metals, *Sludge treatment, Effluents, Industrial wastes, Coagulation, Neutralization, *Waste water treatment, *USSR.

Waste water treatment facilities went into operation at the Zaporozhe Refractories Plant in the USSR in September 1973. The treatment system handles industrial wastes from the plant in addition to the initial, more highly polluted fraction of storm water which enters the collection system.

Characteristics of the 6000 cu m/day of waste water generated at the plant are presented. Industrial wastes and storm water are combined and pumped to a cascade mixing tank, where aluminum sulfide and lime are added for coagulation in a horizontal settling tank. The clarified effluent is discharged to the Panskaya Ravine. The settling tanks are equipped with scraper mechanisms which were adjusted to travel at a speed of 6 m/hr. Filter presses are used to dewater the sludge to a final moisture content of 45-50% and a cake thickness of 8-10 mm. Characteristics of the effluent before and after treatment are presented. (Schulz-FIRL)
W78-03179

SLUDGE RECLAMATION.
For primary bibliographic entry see Field 5E.
W78-03180

WE'RE GOOD BOYS NOW--BUT CAN WE STAY IN BUSINESS,
Gameson (Thomas) and Sons Ltd., Cannock (England).
J. W. Barrett.
Product Finishing, Vol. 30, No. 3, p 8-12, March, 1977. 5 fig.

Descriptors: *Acids, *Nitrogen compounds, *Chemical precipitation, *Neutralization, *Metals, Treatment facilities, Europe, Effluents, Industrial plants, Industrial production, Industrial water, Industrial wastes, *Waste water treatment, Waste water disposal.

Thomas Gameson and Sons Ltd's experiences with developing a reasonably satisfactory method of effluent treatment for metal finishing wastes are described. The alkaline outfall of cyanide-bearing washwaters is mixed with sodium hypochlorite and then used to partially neutralize the acid outfall. Although the system worked well for 3 months, chemical precipitation then increased greatly in direct proportion to the increase in iron in the pickle tanks. The optimum pH for settling out metals was 9.8, but this also resulted in considerable scaling. Changing the caustic dosing system to provide a final uniform pH of 7.0 to match the pH in the settling basins resulted in water suitable for recycling. The authorities failed to sea that increases in costs accompanying the Deposit of Poisonous Wastes Act fell simultaneously across all dischargers of effluent. A high-pressure filter press is used to dewater the sludge. (Snyder-FIRL)
W78-03181

ALUMINUM SWARF.
Water and Waste Treatment, Vol. 20, No. 9, p 48, September, 1977. 1 fig.

Descriptors: *Aluminum, *Metals, *Industrial wastes, *Filtration, Treatment facilities, Filters, Suspended solids, *Waste water treatment, Waste water disposal.

A 60-cm plate and frame filter has been used by Rank Xerox Ltd. in Mitcheldean, Gloucestershire, England, to reduce the level of solids in the industrial waste water to 11 mg/liter. The effluent from vibratory deburring to clean aluminum castings for copying machines averages nearly 2,800 mg/liter suspended solids before filtration. Filtration lowers the level of heavy materials in suspension from an average of 0.93 mg/liter to an average of 0.19 mg/liter and reduces chemical oxygen demand (COD) from 328 mg/liter to 47 mg/liter. The filtered water can be recycled for process water in the plant. The standard Carlson 60-cm kieselguhr filter, with 20 plates and frames, runs for 8.5 hours continuously each day, discharging 400-500 gph. Two 60-cm sheet filters were previously installed for final polishing after settlement of treated waters from electroplating processes. (Snyder-FIRL)
W78-03182

EFFLUENT TREATMENT: THREE CASE HISTORIES.
Product Finishing, Vol. 30, No. 4, p 46-47, April, 1977.

Descriptors: *Metals, *Industrial wastes, *Toxicity, *Suspended solids, *Separation techniques, Chromium, Oxidation, Chemical precipitation, Treatment facilities, *Waste water treatment.

The design and operation of three treatment plants were described and their effluents were characterized. One plant handles the wastes from an electronic components manufacturer. The effluent contains cyanide and hexavalent chrome VI. A cyanide oxidation-chrome reduction system was designed to incorporate downstream neutralization and solids removal by dissolved air flotation, and to dewater sludge. The acid/chrome and the alkali/cyanide streams each had a flow of 5000 gph. The final effluent produced had a pH range of 6 to 10, a maximum suspended solids level of 100 ppm, a maximum toxic metals level of 10 ppm, a maximum chromium VI level of 0.5 ppm, and a total CN- maximum level of 1.0 ppm. Another plant treats the chrome, cyanide, and acid swills from an electroplating works having a 1500 gph effluent flow. Sodium bisulfite reduces chrome dumps to chrome III. Chrome swills are reduced by sodium dithionite; cyanide dumps and swills are oxidized with hypochlorite. The final effluent, after neutralization, settlement and filtration, is free of cyanide and toxic metals. A third treatment plant, operating continuously with a 6000 gph flow, was designed for a plating company. It removes about 500 ppm of suspended solids and precipitates and removes soluble toxic metal contaminants, to produce a final discharge containing less than 40 ppm of suspended matter, and less than 10 ppm of total toxic metals. The acid swills flow to a neutralization tank for metal hydroxide formation and solids deposition. The effluent then undergoes solid-liquid separation and the clear liquor is discharged. The sludge is filter pressed for disposal. Small treatment systems of this type can be planned and implemented within a short period. (Kutcher-FIRL)
W78-03183

TREATMENT SYSTEM FOR OILY WASTES.
Water and Pollution Control, Vol. 115, No. 10, p 28, October, 1977. 1 fig.

Descriptors: *Oily water, *Flotation, *Separation techniques, *Suspended solids, *Industrial wastes, Food processing industry, Pulp and paper industry, Separation techniques, Equipment, Colloids, Oil wastes, *Waste water treatment.

The Favair dissolved air flotation system has been developed by the Permutit Company, Inc. of Paramus, New Jersey, for separating suspended particles and colloidal materials in waste streams. Areas of application include treating oily wastes, food processing, pulp and paper processing, latex manufacturing and biological wastes. Efficiencies for removal of suspended materials typically range from 80 to 90%. Liquid waste is pressurized at about 50 lbs/sq in and aerated in a retention tank. The liquid is then released to a flotation tank at atmospheric pressure. The air forms microscopic bubbles which attach to suspended particles and rise to the surface. Scrapers then remove the solids from the liquid surface, leaving clarified waste water at the bottom of the flotation tank. The Favair system provides up to double the capacity of conventional flotation systems and is available in capacities of 50-4,500gpm. (Snyder-FIRL)
W78-03184

SURFACE PROPERTIES OF PETROLEUM REFINERY WASTE OIL EMULSIONS,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-03185

ROTATING DISC WASTE TREATMENT SYSTEM MAKES LOW HP DEMANDS, OCCUPIES 1/3 THE SPACE OF PONDS,
Lion Oil Co., Martinez, CA. Avon Refinery.
J. F. Dehnert, and K. Robe.
Chemical Processing, Vol 40, No 12, p 64-66, November, 1977. 1 fig.

Descriptors: *Biological treatment, *Trickling filters, *Oil wastes, *Activated sludge, *Oil industry, Flotation, Aerobic treatment, Filters, Separation techniques, Industrial wastes, Pilot plants, Treatment facilities, Biological treatment, *Waste water treatment.

Pilot plant studies were conducted in 1972 to evaluate three waste water treatment systems for the Lion Oil Company's Avon Refinery in Martinez, California. An activated sludge facility, a 21-ft trickling filter, and a 7-gpm RBS (Rotating Biological Disc) system were the three pilot units compared. Previously existing treatment facilities for initial solids and surface oil removal included API/DAF settling/skimming channels and dissolved air flotation; a foul water stripper removed H2S and NH3. Some biological treatment had been provided by a 20-acre aerated surge pond and a 108-acre bio-oxidation pond. The 12 newly-installed RBS units have thin polyethylene discs which rotate axially on a shaft through the waste water so that 40% of the disc surface is submerged. The biomass on the disc surface removes COD, BOD, and suspended solids. Dual media filters further polish the treated water before discharge into Suisun Bay. Alkali treatment in sour water strippers with alkali addition is used to remove ammonia. Since pilot plant studies with the RBS system did not completely eliminate the toxicity of the effluents to fish, a single-use powdered activated carbon adsorption system was incorporated into the $5.3 million treatment facility. The RBS units operate at 1/10th the hp required for conventional biological systems and require only 1/3 of the area needed for comparable activated sludge system. (Schulz-FIRL)
W78-03186

TREATING EFFLUENTS FROM WATER AND LEMONADE BOTTLING INDUSTRIES BY HIGH STRENGTH BACTERIAL BEDS (TRAITABILITE DES EFFLUENTS DE L'INDUSTRIE DES EAUX ET LIMONADES PAR LITS BACTERIENS A FORTE CHARGE),
L. Vandevenne, and A. Dubois.
La Tribune du Cebedeau, Vol 30, No 401, p 157-164, April, No. 1977. 7 fig, 5 tab, 8 ref.

Descriptors: *Food processing industry, *Biological treatment, *Biochemical oxygen demand, *Biodegradation, *Filtration, Industrial wastes, Sludge digestion, *Waste water treatment.

A study was carried out at a pilot plant to determine the parameters for a high-strength bacterial bed and to establish whether it could be applied to pretreat wastes before sewer discharge or be used as a first stage for complete biological treatment to purify wastes according to legislative standards. Spent waters from the soft drink industry are composed mainly of bottle prewash waters, and bottle rinse waters. To them are sporadically added rinse waters from beverage and bottling processes and discharges from sodium baths. The characteristics of these effluents are presented. Results of the study showed that these effluents are easily purified by plastic bacterial beds, after correcting for pH and lack of nitrogen. Under trial conditions 85% purification was achieved for a loading of one kg BOD5 per cu m per day; at 3 kg BOD5 per cu m per day the efficiency was 60%. Sludge produced from the beds must be digested aerobically or anerobically before removal. (Blits-FIRL)
W78-03187

NEW ASPECTS OF CLOSED-UP PAPERMAKING SYSTEMS,
Sulzer Bros. Ltd., Winterthur (Switzerland).
B. Morgeli, and L. Pelloni.
Pulp and Paper Canada, Vol 78, No 10, p T227-T230, October, 1977. 6 fig, 12 ref.

Descriptors: *Recycling, *Water reuse, *Pulp and paper industry, *Effluents, *Pulp wastes, Tertiary treatment, Filtration, Desalination, Industrial wastes, Industrial water, Waste water treatment, Corrosion control.

Closed-circuit processes have been used in the pulp and paper industry as a means of reducing the quantity of wastes requiring disposal and of recovering valuable substances in the waste water. Waste treatment at a paper/board plant can involve primary treatment for recovery of water to be used in feed preparation; secondary treatment for recovery of fibers, filters, and additives; and tertiary treatment for reuse of the residual effluent. Advantages and disadvantages of adding tertiary treatment are discussed. Desalination must be provided to reduce the corrosivity of recycled water. Biological activity may be controlled by temperature, salinity, the use of biocides, and the elimination of nutrients. The integration of a tertiary circuit into an existing plant with primary and secondary circuits is described. Volumetric filtration by granular media was chosen as the method for eliminating residual solids and collids. Caking on the filter by long paper fibers was eliminated by the addition of microstraining prior to filtration. (Schulz-FIRL)
W78-03188

WATER TREATMENT AND RECYCLING IN A PAPER MILL (RECYCLAGE ET TRAITEMENT DES EAUX DANS UNE PAPETERIE),
G. Guillaumou.
La Technique Moderne, No. 1, p 35-38, January, 1977. 2 fig.

Descriptors: *Pulp and paper industry, *Recycling, Water pollution control, *Pulp wastes, *Water reuse, Clarification, Flocculation, Industrial water, *Waste water treatment.

A paper mill which discharged to a river effluent equalling that produced by a town of 15,000 people decided, as its first anti-pollution measure, to change the content of its paper from a base of rye straw pulp to one of recycled old papers. The recycled paper contained few pollutants. Whatever pulp was needed was purchased elsewhere, eliminating the residues of processing liquors from the waste water and leaving only suspended matter to be treated. Next, the processing and treatment systems were revised in order to maximize the volume of unpurified water available for reuse, and to clarify the remainder in a flotation-decantation apparatus, so that before discharge to the river the water could be reused in various ways. Four different tanks were required, with a total volume of 600 cu m. Process stages and equipment are described. Certain adjustments and precautions were necessary as a result of water recycling: an agitator had to be placed in the digestion tank to avoid thickening caused by flocculants in the clarified water; the paper machine had to be equipped with rinsers; the water temperature of 34-36C made it necessary to use anti-slime and anti-bacterial products; and pipe networks, subject to corrosion, had to be replaced. The effluents discharged to the river after redesigning the plant equal the pollution load from 150 people, and are well within limits set by the Ministry of the Environment. (Blits-FIRL)
W78-03189

ENVIRONMENTALLY SOUND PAPER TECHNOLOGY (UMWELTFREUNDLICHE PAPIERTECHNOLOGIE),
Technische Univ., Darmstadt (West Germany). Waser- und Abwasserforschungsstelle; and Technische Univ., Darmstadt (West Germany). Inst. fuer Paperfabrikation.
H-L. Dalpke.
Wasser, Luft, und Betrieb, Vol 21, No 6, p 370-371, 1977.

Descriptors: *Water pollution control, *Pulp and paper industry, *Water reuse, *Recycling, *Pulp wastes, Hydrolysis, Fibers(Plant), Costs, Industrial wastes, Waste water treatment.

In order to limit environmental pollution, many paper mills are adopting the closed water system of production using recycled water. Usually 50 cu m of water for each ton of paper was needed, of which 49 cu m/ton paper was then to become effluent. The West German paper industry produces annually 320 million cu m of effluent. This effluent contains fibers, starch, additives such as glues and clays, dispersants, sulfites, and sulfates. The closed system offers savings in water and energy. Its use with the alkaline hydrolysis process allows the recovery of valuable by-products such as pentoses and hexoses. (Schwartz-FIRL)
W78-03190

RAYONIER SPENDS BIG FOR SULFITE RECOVERY.
Canadian Chemical Processing, Vol 61, No 10, p 24-26, October, 1977.

Descriptors: *Sludge digestion, *Pulp wastes, *Water reuse, *Recycling, *Sulfite liquors, Pulp and paper industry, Water pollution control, Waste water treatment, Treatment facilities, Separation techniques, Evaporators, Costs.

Operations at Rayonier Canada's ammonia-base sulfite pulp mill in Port Alice, British Columbia, are described. Environmental regulations for Port Alice required recycling of red liquor at the plant or closing of the operation. A $50-million recovery system to treat up to 95% of the spent sulfite cooking liquor previously discharged into and ocean inlet near the pulp mill was subsequently built. The recovery complex includes a 30-m tall recovery boiler; evaporation and incineration equipment; and a new 16,000-kW turbogenerator. An emergency spill lagoon was installed to contain spent sulfite liquor when the recovery equipment requires maintenance. Details of the sulfur dioxide stripping system and recovery operations are presented. Cooling waters from the stripping system and recovery operations are presented. Cooling waters from the stripping process pass through heat exchangers and are used as warm wash water in the bleach plant and drying machine. The recovered bisulfite solution is pumped to a storage tank, where ammonia and water are added to bring the flow rate up to production needs for digester cooking acid. (Schulz-FIRL)
W78-03192

CONVEYOR SYSTEM TRANSPORTS SLUDGE THROUGH COMPLEX ROUTE WITH EASE.
Chemical Processing, Vol 40, No 5, p 44, April, 1977.

Descriptors: *Pulp wastes, *Conveyance structures, Equipment, *Sludge treatment, *Pulp and paper industry, Filters, Sludge disposal, Chutes, Industrial wastes, Waste water treatment.

Three conveyors are being used to transport sludge at the St. Regis Paper Company plant in Bucksport, Maine. Sludge from the waste water treatment facilities is transported to one of the two rotary vacuum filters in operation, where the volume is reduced by a ratio of 10:1. The filters include stainless steel coil spring layers which are separated over discharge rolls to allow complete media washing and positive cake discharge. The sludge, which then contains 18-22% solids, is fed to the first conveyor belt which parallels two filters to receive sludge and leads to a dewatering press. The second conveyor receives sludge at a 30-35% solids content from the dewatering press and transports it to either a storage hopper or a truck for subsequent disposal. The third conveyor is used to transport sludge from the storage hopper to trucks at its north and south ends. The conveyors, manufactured by Serpentix Conveyor Corporation of Denver, Colorado, were chosen because of their flexibility, reversibility, and other design features. The amount of floor space required was reduced by the ability of the conveyors to elevate sludge at angles up to 30 degrees. (Schulz-FIRL)
W78-03193

AN ACTIVATED CARBON WASTEWATER TREATMENT SYSTEM AT FITCHBURG, MASS.,
Camp Dresser and McKee, Inc., Boston, MA.
W. F. Callahan, and A. B. Pincince.
Tappi, Vol. 60, No. 11, p 146-149, November, 1977. 3 tab, 4 ref.

Descriptors: *Sulfides, *Activated carbon, Pulp and paper industry, *Clarification, *Pulp wastes, *Industrial wastes, Municipal wastes, Biochemical oxygen demand, Pilot plants, Filtration, Neutralization, Odor, *Waste water treatment, Treatment facilities, Massachusetts.

Fitchburg, Massachusetts, has two advanced waste water treatment plants. The West Plant treats largely paper mill waste water using a physical-chemical activated carbon process. The treatment facilities were designed for an average daily flow of 15.3 mgd at a BOD loading of 9,700 lb/day. The chlorinated municipal effluent is discharged from the municipal clarifiers and mixed with industrial waste water, lime, and alum. The combined waste waters then pass through two flocculation basins, two industrial clarifiers, and activated carbon filters. Hydrogen sulfide detected in the effluent was attributed to the development of bacteria in the filters during intermittent operation. A pilot-scale study with four carbon columns was used to evaluate methods of hydrogen sulfide control in conjunction with carbon regeneration. The pilot-plant tests indicate that addition of approximately 5 mg/liter of nitrate nitrogen and sodium hydroxide effectively controls odors associated with hydrogen sulfide. The adsorptive capacity of the carbon decreased during the tests, and sodium hydroxide treatment appeared to have little effect on prolonging column life. (Snyder-FIRL)
W78-03195

POLLUTION ABATEMENT=GOOD HOUSEKEEPING=ENERGY/MATERIAL CONSERVATION,
R. van Soest.
Canadian Pulp and Paper Industry, Vol. 30, No. 16, p 20-22, November, 1977. 2 fig.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Pollution abatement, *Energy, Industrial plants, Industrial water, Water pollution, Industrial wastes, Waste water treatment, Waste water disposal, Water reuse, Water conservation.

The tremendous cost of energy has forced pulp and paper mills to take a closer look at their energy requirements for waste water treatment. Reducing the specific water consumption can produce a corresponding reduction in heat loss and the BOD and suspended solids levels in effluents. Process modifications to reduce water consumption also make it possible to reduce the size of the external treatment units, move them closer to the production facilities, and reuse the treated water. Primary clarifier performance can be adversely affected by improper sizing and design. The use of the waste activated sludge from a secondary treatment system in a sulfite mill's pulping digester has been suggested. The solution to pulp and paper mills' environmental problems must be found in an in-

tegrated program which involves all mill processes and gives due consideration to the inter-relationship between effluent treatment cost, energy and fiber conservation, and present and future legislation. (Snyder-FIRL)
W78-03196

A REVIEW OF THE STATE OF THE ART, (TREATMENT FACILITIES).
Water and Pollution Control, Vol. 115, No. 11, p 39-40, November, 1977. 1 fig.

Descriptors: *Municipal wastes, *Pulp wastes, *Pulp and paper industry, *Sewerage, *Treatment facilities, *Reviews, Water pollution control, Industrial wastes, Waste water treatment, Waste water disposal, *Canada.

Unless there are several working applications of an innovative type of waste water treatment equipment, design approval by Canadian regulatory agencies is frequently difficult to obtain. Since many municipalities could not independently fund new waste treatment plants, regulatory agencies provided financial support. It is unlikely that government agencies would prosecute if a publicly-owned plant failed to meet regulatory standards. There is a need for improved in-plant processes in industrial waste treatment. A major pulp and paper operation has been designed with potential for operating as an essentially pollution-free closed system. It has been demonstrated that polychlorinated biphenyls and waste lubricating oils containing toxicants can be safely used as supplementary fuels in cement plants. (Snyder-FIRL)
W78-03197

BIG DIGESTIVE PONDS FOR CANADIAN HARDBOARD PLANT.
Water and Waste Treatment, Vol. 20, No. 9, p 50, September, 1977. 1 fig.

Descriptors: *Pulp and paper industry, *Biological treatment, *Aeration, *Treatment facilities, *Lagoons, Sludge digestion, Pulp wastes, Industrial wastes, *Canada, Waste water treatment.

It is expected that installing 14,000 sq m of elasticized polyolefin sheeting will help the Masonite Canada Lt. hardboard plant solve an unusual effluent problem and conform to environmental regulations. A corrosion-resistant polyolefin pond and pit liner system was used for the 3.8 million liter equalization pond and the 18.9 million liter treatment pond in the extended aeration treatment plant. The equalization pond holds the effluent for one day, after which it flows into the two aeration ponds to be completely digested and clarified. The system was installed by Dunline Ltd. of Ontario in 10 days. The liner was placed over a 15-cm layer of sand which covered compacted soil. The lining was anchored by digging 45-cm ditches, securing the sheet in the ditch by logs, and backfilling the trenches. Where exposed to sunlight, the lining is expected to be resistant to ultraviolet radiation, ozone, and other atmospheric influences. The Du Pont '3110' polyolefin lining accommodates a wide range of liquids with excellent resistance to acids and solvents. (Snyder-FIRL)
W78-03198

FRP TOWER IS KEY PART OF MILL'S RECOVERY UNIT.
Water and Pollution Control, Vol. 115, No. 10, p 13, October, 1977.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Treatment facilities, *Reclamation, *Sulfite liquors, Absorption, Canada, Industrial wastes, Waste water treatment.

A $50 million recovery plant for spent liquor is being added to the Rayonier Canada Ltd. sulfite mill in Port Alice, Vancouver Island, Canada. The system includes a 23-ft diameter, 73-ft high absorber-cooler tower for recovering hot water and absorbing sulfur dioxide in flue gases. The mill produces around 450 tons of dissolving pulp per day for the manufacture of film, tire cord, artificial leather, and fine paper. Unitl recently, it discharged its wastes into the waters of Neroutsos Inlet. Facilities to recover spent liquor were provided to comply with stricter provincial pollution control measures. The quench section of the absorber-cooler contains bubble cap trays in which aqueous ammonia absorbs sulfur dioxide. Heat exchangers recover heat from hot water; stack exhaust vents to the atmosphere; and filtered ammonium bisulfate is eventually pumped to the acid plant. The fiberglass-reinforced plastic shell of the absorber-cooler unit was made in sections on a vertical filament winder. The conical top, which has an inspection walkway, was molded separately. The tower contains approximately 100,000 lb of fire-retardant resin. The recovery plant was built for Rayonier Canada Ltd. by ICL Engineering Ltd. of Richmond, British Columbia, Canada. (Snyder-FIRL)
W78-03199

AIR/WATER POLLUTION MINIMIZED BY BURNING WASTES UNDER WATER,
A. P. Cadotte, and R. G. Laughlin.
Canadian Pulp and Paper Industry, Vol. 30, No. 16, p 31-33, November, 1977. 5 fig, 1 tab.

Descriptors: *Oxidation, *Incineration, *Pulp wastes, *Pulp and paper industry, *Chemical oxygen demand, Treatment facilities, Water pollution, Air pollution, Water pollution control, Industrial wastes, Waste water treatment, *Wet oxidation.

A wet oxidation process for treating spend sulfite liquors will be economically viable for small to medium sized sulfite pulping operations. It is most economical where the concentration of oxidizable material is 2-20% by weight in water. Atuo-thermal operation is achieved on wastes containing 2-3% organics, and excess energy can be economically recovered when the waste stream contains more than 6% organics. The process employs a reactor which consists of a multi-compartmented, horizontal unit with agitation and oxygen addition in each compartment. The extent of oxidation by the patented Wetox process is primarily determined by the temperature of operation. Chemical oxygen demand (COD) was reduced over 90% in 30 min using about 250 ppm of CuO as a catalyst. Neutralization and settling of the liquid phase effluent is usually required. One process configuration can be applied to all sulfite mills with only minor changes. The total net cost for a sodium base spent sulfite liquor system would e on the order of $5-6/ADT. Total net costs for calcium- or ammonia- base mills are expected to be about $3/ADT. (Snyder-FIRL)
W78-03200

5E. Ultimate Disposal Of Wastes

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX A: INVESTIGATIONS OF THE HYDRAULIC REGIME AND THE PHYSICAL CHARACTERISTICS OF BOTTOM SEDIMENTATION,
Yale Univ., New Haven, CT. Dept.of Geology and Geophysics.
H. Bokuniewicz, C. Bultman, M. Dowling, J. Gerbert, and R. Gordon.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 421, Price codes: A00 in paper copy, A01 in microfiche. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, September 1977. 195 p, 27 fig, 9 tab, 32 pl, 5 append, 35 ref.

Descriptors: *Benthic fauna, Waste disposal, *Sedimentation, Sediment transport, *Waste water disposal, *Water quality, New York, Bottom sediments, *Dredged material, *Long Island Sound(NY).

The major goal of the Eatons Neck disposal site field investigation was to evaluate the effects of aquatic disposal of dredged material on organisms and water quality, including the significance of physical, chemical, and biological factors that influence the rate of disposal site recolonization by benthic animals. A comprehensive research program was planned and conducted at Eatons Neck in order to evaluate cause and effect relationships associated with the impacts of open-water disposal. This volume of the study presents the investigation of the hydraulic regime and the physical characteristics of bottom sedimentation. The study concluded that there was no physical evidence of significant dispersion of dredged material from the Eatons Neck disposal site; no previously deposited material was detected outside the designated disposal area. (See W78-02783 thru W78-02785) (WES)
W78-02782

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX D: PREDISPOSAL BASELINE CONDITIONS OF DEMERSAL FISH ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
R. J. Valenti, and S. Peters.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 720, Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, September 1977. 93 p, 21 fig, 7 tab, 24 ref.

Descriptors: *Benthic fauna, Waste disposal, *Fisheries, Sampling, *Waste water disposal, New York, *Long Island Sound(NY).

A comprehensive research program was planned and conducted at Eatons Neck in order to evaluate cause and effect relationships associated with the impact of open-water disposal. This volume of the study presents demersal fish sampling data at Eatons Neck. The spatial and temporal distributions of the more abundant demersal fish are discussed. The food habits of eight benthic foraging fish species are also presented. Data on lobsters, include monthly histograms denoting spatial and temporal distributions, male-female ratios, and relative abundance of exploitable legal-sized lobsters. The report concludes that the Eatons Neck site is a valuable area with regard to fishery resources. Throughout the sampling, with few exceptions, the disposal site accounted for the largest catches of fish. The disposal site was also found to be a prime lobstering area and accounted for 91.3 percent of the total number of lobsters collected. (See also W78-02782) (WES)
W78-02783

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX E: PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
R. I. Caplan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 310, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, September 1977. 104 p, 11 fig, 16 tab, 24 ref.

Descriptors: *Aquatic microorganisms, *Waste water disposal, *Fisheries, *Sampling, *Zooplankton, New York, *Dredged material, *Long Island Sound(NY).

A zooplankton and ichthyoplankton study was initiated in October 1974 for the purpose of establishing a baseline data bank at the Eatons Neck disposal site. A control site was also studied. During the 9-month study (October 1974 through June 1975), a total of 147 samples were taken at each of three stations (two disposal sites and one control) consisting of multi-depth tows utilizing 60-cm Bongo samplers (363 and 202 micron mesh nets.) Concomitantly, temperature and salinity profiling was done. The winter patterns of copepod abundance, indicated two important findings: (1) There was a copepod bloom in December 1974, 6 weeks before the spring diatom bloom. (b) Copepod densities were maximum at depth during the November diurnal, indicating a reproductive strategy not previously reported. (See also W78-02782) (WES)
W78-02784

AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND; APPENDIX F: PREDISPOSAL BASELINE CONDITIONS OF PHYTOPLANKTON ASSEMBLAGES,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 313, Price codes: A04 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-6, September 1977. 42 p, 11 fig, 6 tab, 12 ref.

Descriptors: *Benthic fauna, *Waste disposal, Sampling, *Waste water disposal, Water quality, *Long Island Sound(NY), Path of pollutants, Water pollution effects, *Phytoplankton, *Dredged material.

The major goal of the Eatons Neck disposal site field investigaton was to evaluate the effects of aquatic disposal of dredged material on organisms and water quality, including the significance of physical, chemical, and biological factors that influence the rate of disposal site recolonization by benthic animals. A comprehensive research program was planned and conducted at Eatons neck in order to evaluate cause and effect relationships associated with the impacts of open-water disposal. This volume presents the results of an investigation to determine the baseline conditions of the phytoplankton population at the disposal site for future comparison with similar data collected after the disposal of dredged material. The ultimate objective is to determine the effects of the open-water disposal of dredged material on the phytoplankton population located within the area of the Eatons Neck disposal site. (See also W78-02782), (WES)
W78-02785

LEACHATE TESTING TECHNIQUES SURVEYED,
Mitre Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 5A.
W78-02816

THE CONFINED DISPOSAL PROGRAM FOR POLLUTED DREDGE SPOIL IN THE GREAT LAKES,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 5G.
W78-02856

MICROECONOMIC IMPACTS OF THE PROPOSED MARKING AND DISPOSAL REGULATIONS FOR PCBS.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W78-03043

COMBUSTION EXPERIMENTS USING PENTACHLOROPHENOL ON A PILOT SCALE AND FULL-SCALE,
Swedish Water and Air Pollution Research Lab., Stockholm.
B. Ahling, and L. Johansson.
Chemosphere, No. 7, p. 425-436, 1977. 2 tab, 11 ref.

Descriptors: *Phenols, *Saw mills, *Burning, *Water pollution control, Sludge disposal, Waste disposal, Industrial wastes, Incineration, Pentachlorophenol, Saw timber, Chlorinated phenols.

Use of chlorinated phenols for impregnation saw timer at saw mills through immersion results in waste products which constitute a water pollution hazard. Experiments investigating the destruction of used dipping fluids and sludge in existing combustion facilities (for burning bark and saw dust), show that if the temperature is kept above 750-800C reliable destruction can be accomplished. Excessively high loading resulted in unacceptable emissions of chlorinated phenols, which probably occurred in great part when the temperature fell below about 700C. Preparations containing pentachlorophenol or other chlorinated phenols are commonly used in the impregnation process; plants which reuse the fluid must first remove the sludge, while othe mills simply empty immersion tanks usng sludge suction systems. Dumping of used fluids and sludge has been the only treatment method heretofore available. Pilot scale tests with 50-70 g pentachlorophenol fed in per hour indicate that at a transit time of 3.5 sec the unburnt residue of pentachlorophenol was 52 mg/kg feed at 600C, 23 mg/kg at 700C, and 16 mg/kg at 800C. Combustion was carried out with a large surplus of air. No formation of octachlorodioxin occurred. In full-scale tests, analysis showed that waste fed in contained much teteachlorophenol than pentachlorophenol; nevertheless test results are considered applicable to disposal of the latter as well. (Lynch-Wisconsin)
W78-03058

SWINE FECES RECYCLING IN CARP FEEDING (CYPRINUS CARPIO, LINNAEUS), (IN PORTUGESE),
G. C. Albuquerque-F, E. J. Campos, S. S. Cavalcanti, and I. B. M. Sampaio.
Arq Esc Vet Univ Fed Minas Gerais 28(2), p 147-152, 1976.

Descriptors: *Hogs, *Recycling, *Carp, Fish food, Taste, Economics, *Farm wastes.

The use of pig feces to feed carps was studied. Feed ration consisting of 25, 50 and 75% feces was observed for 245 days. Carp weight gain was significantly greater than control groups. Economic value of this method and acceptable palatability of feces-fed carp to a human taste panel are discussed.-Copyright 1978, Biological Abstracts, Inc.
W78-03082

ON RECYCLING AS A MOOT ENVIRONMENTAL ISSUE,
Princeton Univ., NJ. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-03086

A BIBLIOGRAPHY ON OCEAN WASTE DISPOSAL, SECOND EDITION,
Interstate Electronics Corp., Anaheim, CA. Environmental Engineering Div.
H. G. Stanley, and D. W. Kaplanek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 831, Price codes: A08 in paper copy, A01 in microfiche. Final Report to Environmental Protection Agency, September 1976. 153 p, (600 ref). EPA-68-01-0796.

Descriptors: *Waste disposal, *Bibliographies, *Water pollution sources, Oil pollution, *Outer Continental Shelf, *Ocean dumping, Pollution monitoring, Coastal zone management.

In May of 1973 the need for a specialized bibliography in ocean waste disposal was recognized and the first edition of this publication was issued. New material has become available resulting in the preparation of an updated and expanded second edition. This volume contains listings of more than 600 documents with 82 of them abstracted. It is primarily limited to recent publications in the categories of: general ocean waste disposal, nonpoint source oceanic disposal of radioactive wastes, and at-sea incineration. A list of identifiers for computerized accession is included. (Sinha-OEIS)
W78-03087

A COMPUTER ANALYSIS OF THE SPREAD OF POLLUTION ON LONG ISLAND BEACHES,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5B.
W78-03103

MOVEMENT OF SPILLED OIL OVER THE BEAUFORT SEA SHELF - A FORECAST,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5B.
W78-03108

TEMPORARY STORAGE AND ULTIMATE DISPOSAL OF OIL RECOVERED FROM SPILLS IN ALASKA,
Battelle Pacific Northwest Labs., Richland, WA.
P. L. Peterson, R. A. Yano, and M. M. Orgill.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 749, Price codes: A12 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-181-75, December 1975. 239 p, numerous charts, fig, ref. DOT-CG-23223-A.

Descriptors: *Alaska, *Oil pollution, *Ultimate disposal, Waste storage, Oil wastes, Water quality control, Pollution abatement, *Outer Continental Shelf, Prudhoe Bay(Alas).

Alternative methods for temporary storage and ultimate disposal of oil recovered from postulated spills in Alaska are identified. Seven representative sites felt to be future areas of high spill potential are evaluated with respect to storage and disposal of spills ranging in volume from 100 to 50,000 barrels. The types of spills considered are crude oil, distillate fuel oil, residual fuel oil and gasoline. The potential adverse effects of the Alaskan environment on handling, storage and ultimate disposal of oil spills are compared to more temperate climates is also discussed. Two distinct requirements for storage were identified: immediate (from hours to days) and temporary storage (up to one year). It was concluded that all temporary storage should be on land. Portable storage containers and the use of natural terrain features are evaluated from the range of spill sizes and types. Alternatives evaluated for the ultimate disposal of oil include both in-situ turning and burning in conventional burners and incinerators. In-situ burning emerged as the preferred method of disposal at virtually all sites evaluated. (Sinha-OEIS)
W78-03110

HYDROLOGIC MONITORING OF A WASTE-INJECTION WELL NEAR MILTON, FLORIDA, JUNE 1975 - DECEMBER 1976,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03126

INCINERATORS FOR WASTES FROM THE CHEMICAL INDUSTRY (INCINERATEURS DE DECHETS DE L'INDUSTRIE CHIMIQUE),
R. Dorre, and C. De Bouille.
La Technique Moderne, No. 1, p 39-42, January, 1977. 5 fig.

Descriptors: *Chemical wastes, *Incineration, *Heat exchangers, *Centrifugation, *Industrial wastes, Waste water treatment, Sludge treatment, Pesticides, Waste disposal, Ultimate disposal.

In general, wastes from the chemical industry fall within four categories: liquid wastes, arising from production, laboratories, and service stations; sludges, arising from purification of waste waters and having a solids content of 15-50%; solid wastes; and polluted gases. For liquid, sludge, and gaseous wastes special kinds of incinerators can be used, such as combustion chambers and fluidized bed incinerators. Rotating kilns, described in detail, are especially useful for solids wastes. When these are combined with other wastes, special adaptations are necessary. By integrating a fluidized bed burner with a rotating kiln, sludges containing 18% solid matter after centrifugation can be disposed. The resulting ashes and smoke from the two furnaces can be burned in a common post-combustion chamber. As a complement, a heat recovery system can be combined with this installation. An application of the installation for incinerating wastes from pesticides manufacturing is described. (BLITS-FIRL)
W78-03159

WASTE WATER, SLUDGES, AND SOLID WASTES OF CHEMICAL INDUSTRY--TREATMENT, INCINERATION, DUMPING (ABWASSER, SCHLAEMME SOWIE FESTE RUECKSTANDE DER CHEMISCHEN INDUSTRIE--AUBEREITEN, VERBRENNEN, DEPONIEREN),
Bayer A. G., Krefeld-Uerdingen (West Germany). Abt. Umweltschutz.
G. Franke.
Fette-Seifen-Anstrichmittel, Vol. 79, No. 5, p 212-214, 1977. 5 fig.

Descriptors: *Chemical wastes, *Biological treatment, *Incineration, *Recycling, *Organic compounds, Industrial wastes, Sludge disposal, Landfills, Waste water treatment.

As an example of waste treatment the procedures of the Uerdingen Works of Bayer AG were described. The waste water from that plant was found to consist of 80% cooling water, 10% waste water from inorganic chemical production, and 10% waste water from organic chemical production. The organics waste water was treated first during the plant operations with extraction of the organic material for recycling purposes, then subjected to biological degradation and residue incineration. The total sludge from the treatment plant for the cooling water and organics waste was dried and then incinerated in a fluid-bed furnace. The inorganic residues consisting of building rubble, cinders, and slag from incinerators, as well as wastes from the production of inorganic pigments, were considered non-combustible special wastes. These were neutralized, reduced, and precipitated before being dumped in landfills. Dangerous residues were sealed in drums and stored in an abandoned salt mine. (Schwartz-FIRL)
W78-03160

EPA DEVELOPS PROCESS TO DESTROY KEPONE,
M. L. Motl.
Environmental Management, Vol 1, No 6, p 491-493, 1977. 2 fig, 3 ref.

Descriptors: *Pesticide removal, *Chlorinated hydrocarbon pesticides, *Insecticides, *Chemical wastes, Sewage treatment, Sewerage, Waste treatment, Industrial wastes, Waste water treatment, Waste water disposal, *Kepone.

After production of Kepone was stopped, tens of thousands of pounds of the pesticide already produced had to be destroyed, as did sewage sludge and wash water containing Kepone. Because no known microbial or biological agent can degrade Kepone and the compound has great thermal stability, it is very difficult to remove. The Solid and Hazardous Waste Research Division of the Environmental Protection Agency cooperated with the Department of Health of the Commonwealth of Virginia in investigations on Kepone degradation. The final cost of the research effort will come to approximately $400,000 with extensive precautions and isolation procedures to protect personnel during experimentation accounting for a large proportion of the cost. The pesticide is first vaporized at 200-300C and then passed through a special high temperature quartz tube at approximately 1000C for one sec. All the Kepone is degraded into innocuous products. Wash water accumulated when Life Science Products Inc. Kepone plant in Hopewell, Virginia, was leveled. Currently, 1.5 million gallons of contaminated sewage sludge await treatment in a lagoon. (Snyder-FIRL)
W78-03165

SEWAGE SLUDGE COMBUSTION.
Water and Waste Treatment, Vol 20, No 9, p 38, September, 1977.

Descriptors: *Incineration, *Recycling, *Fuels, *Energy, Equipment, Food processing wastes, Drying, *Dewatering, Industrial wastes, Waste water treatment.

Wellman Incandescent in England has recently designed, installed, and commissioned a series of Copeland fluidized bed recovery systems for the combustion of sewage sludge with recovery of inorganic chemicals and heat values. A Wellman system has been installed for the disposal of radioactive wastes at the CEGB nuclear power station in Somerset, England. Wellman's Swenson range of evaporation, crystallization, and drying equipment has been used at the Long John's Strathclyde Distillery for the conversion of spent wash to a usable cattle feed and in the chemical, fertilizer, and food and paper processing industries. Effluent recovery systems have been developed for use with plating wastes and radioactive wastes. Inert gas and nitrogen generators, multi-fuel burners, carbon dioxide removal systems, and compression and drying equipment are also produced by Wellman. (Schulz-FIRL)
W78-03168

RECOVERY AND REUSE OF WASTES FROM ORGANIC CHEMICAL INDUSTRIES,
For primary bibliographic entry see Field 5D.
W78-03171

RECOVERY OF USEFUL BY-PRODUCTS FROM DISTILLERY WASTES,
Indian Engineers Ltd., New Delhi.
R. N. Chakrabarthy.
Indian Chemical Journal, Annual Number, p 101-106, 1977. 1 fig, 6 tab, 10 ref.

Descriptors: *Food processing industry, *Fuels, *Recycling, *Costs, *Methane, Industrial wastes, Water reuse, Fertilizers, Nutrient removal, Waste water treatment.

The recovery of nutrients and methane from molasses distillery wastes has been considered, since fertilizers and fuels are in great demand in India. Previous studies on the recovery of methane, potash, and vitamin B12 from distillery wastes are described. A 90-gal/hr pilot plant is operated at the Mohan Meaken Breweries Ltd. plant in Lucknow. Treatment of the spent wash includes neutralization, filtration, and evaporation. The thick evaporated liquor is then transferred to an incinerator and the potassium salts are recovered from the resulting ash. Economics of the treatment and recovery process are described. Operations of a 1,000-gpd pilot plant for the biological treatment of distillery waste at the Hindustan Sugar Mills Ltd. plant in Galagokarannath are described. The plant includes a closed digester, heat exchanger, gas collection and burning equipment, activated sludge process, aeration tank, and sludge treatment equipment. A savings of approximately 60% in fuel costs is predicted from the use of spent wash-generated fuel in distillery operations. (Schulz-FIRL)
W78-03173

TREATING WASTEWATER FOR RECYCLING,
Ecodyne Corp., Union, NJ. Industrial Wastewater Div.
For primary bibliographic entry see Field 5D.
W78-03176

THE COLLECTION, NEUTRALIZATION, AND DISPOSAL OF RINSE WATER,
Armco Steel Corp., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-03178

SLUDGE RECLAMATION.
Electroplating and Metal Finishing, Vol. 29, No. 11, p 3-4, November, 1976.

Descriptors: *Industrial wastes, *Waste water treatment, *Treatment facilities, Europe, *Sludge treatment, Sludge, Reclamation, Metals, Effluents, Economics.

In Britain, sludge dumping is expensive although not unusually hard to organize, but in other parts of Europe obtaining permission for dumping industrial wastes has been more difficult. Many European electroplaters have been puzzled as to how to dispose of heavy metal-rich sludges. Commercial metal recovery companies will normally reprocess dewatered sludges containing fairly high proportions of nickel and copper, as long as they are relatively uncontaminated with difficult impurities. A good deal of thought has been invested in developing recovery techniques for less valuable materials. The main goal is to develop practicable as well as economic separation techniques. One planned sludge treatment plant will chlorinate heavy metal sludges at a pH above 4 to oxidize iron and trivalent chromium. Then, the sludge will be acidified to pH 1.5-2.5 using sulfuric acid, bringing the chromium, copper, nickel, and zinc into solution, but leaving behind the iron, silicates, calcium, and about 20% of the aluminum. Chromium is removed from the solution by ion exchange. Copper, zinc, and aluminum are concentrated by solvent extraction. Aluminum is precipitated with caustic soda, and nickel is recovered by acid stripping and electro-deposition. (Snyder-FIRL)
W78-03180

WATER TREATMENT AND RECYCLING IN A PAPER MILL (RECYCLAGE ET TRAITEMENT DES EAUX DANS UNE PAPETERIE),
For primary bibliographic entry see Field 5D.
W78-03189

AIR/WATER POLLUTION MINIMIZED BY BURNING WASTES UNDER WATER,
For primary bibliographic entry see Field 5D.
W78-03200

5F. Water Treatment and Quality Alteration

NATIONAL SURVEY OF PESTICIDES IN DRINKING WATER,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-02750

IMPLEMENTING THE DRINKING WATER ACT--A NEW APPROACH FOR EPA,
For primary bibliographic entry see Field 5G.
W78-02869

WATER TREATMENT SYSTEM,
A. P. Black.
U.S. Patent No. 4,017,391, 23 p, 5 fig, 5 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 957, No 2, p 710, April 12, 1977.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water purification, Water softening, Separation techniques, Magnesium, Calcium, Turbidity, Product recovery.

This invention relates to the treatment of raw water supplies such as those used by municipalities and industries as a source of fresh water and has to do with the removal of turbidity factors and coloring matter from such supplies and also with the recovery of waste water and chemical values that are commonly discarded as waste products of the treatments. Chemical and aqueous components of sludge derived from lime treatments of raw water supplies are recovered by procedures involving carbonation of the sludges to effect a phase separation between magnesium and calcium components. When the magnesium content of the rawwater is intolerable in the treated water, a magnesium carbonate is recovered from the liquid phase by its decarbonation, and the aqueous component of the liquid phase is recycled to recover the water values of the treated sludge. When the magnesium content of the raw water can be tolerated in the treated water, the liquid phase magnesium bicarbonate solution is recycled to the water treatment plant. Turbidity factors separated with the sludges remain with the insoluble calcium carbonate that is separated from the liquid phase and by avoiding conventional coagulants other than magnesium hydroxide in the treatment of the raw water, turbidity and calcium carbonate components can be separated as by conventional froth flotation procedures to recover a quality lime product. (Sinha-OEIS)
W78-02895

PURIFICATION OF SALINE WATER,
For primary bibliographic entry see Field 3A.
W78-02910

EFFECTS OF INTERMITTENT CHLORINATION ON AQUATIC ORGANISMS AND COMMUNITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-02993

TECHNIQUES FOR CONCENTRATING VIRUSES FROM WATER TREATED FOR PUBLIC DISTRIBUTION, (IN FRENCH),
Ecole Polytechnique, Montreal (Quebec).
A. J. Drapeau, H. Hoang Van, and P. P. Dumoulin.
Annee Biol 15(11/12), p 486-518, 1976.

Descriptors: *Viruses, Absorption, Potable water, *Water treatment, Public health, Alginate, Electrolytes, Filtration, Iron oxide, *Membranes(Micropore), *Polyelectrolyte.

Of the methods described in the literature for concentrating minute amounts of viruses from large volumes of drinking water, 4 are considered most promising: Absorption on micropore membrane, on an alginate membrane, on polyelectrolytes such as PE60 between prefilters and on iron oxide between prefilters. Prefilters are necessary to keep sediment out of the virus concentrate but they cause a considerable loss of absorbed viruses. Adsorption and elution techniques determine the yields by these methods to a large extent. The type of virus and the nature of the viral suspension influence the efficacy of adsorption. Except for alginate membranes, the volume of eluant required is too large to permit direct viral titration, and it must be reconcentrated. These problems render the yield of these absorption techniques highly variable, and often make the choice of technique highly debatable.--Copyright 1978, Biological Abstracts, Inc.
W78-03038

THE FRENCH MARKET FOR AIR AND WATER PURIFICATION AND POLLUTION CONTROL EQUIPMENT.
Domestic and International Business Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03042

LEAD IN DRINKING WATER IN SOFT WATER AREAS -- HEALTH HAZARDS,
Glasgow Univ., Glasgow (Scotland). Dept. of Materia Medica.
For primary bibliographic entry see Field 5B.
W78-03143

5G. Water Quality Control

CHEMICAL CONTROL OF ZOOTHAMNIUM SP. ON LARVAL MACROBRACHIUM ACANTHURUS,
Texas Parks and Wildlife Dept., Ingram. Heart of Hills Fisheries Research Station.
M. A. Roegge, W. P. Rutledge, and W. C. Guest.
Aquaculture, Vol 12, 1977, p 137-140. 1 tab, 3 ref.

Descriptors: *Aquiculture, *Fish diseases, Commercial shellfish, *Crawfish, *Metals, Copper sulfate, Protozoa, Fish hatcheries, Fish handling, Establishments, Potassium compounds, Parasitism, Bioassay, *Chemcontrol, *Macrobrachium, *Ciliate protozoa, *Zoothamnium, *Disease treatments, Dylox, Methylene blue, Terramycin, Combiotic, Potassium permanganate, Roccal, Nitrofurazone, Malachite green, Disease control.

Ten chemicals were tested for their ability to control an outbreak of Zoothamnium sp. on larval Macrobrachium acanthurus. Larvae were exposed for 24 h to various concentrations of each chemical. Copper sulfate, Dylox(R), methylene blue, Terramycin(R), Combiotic(R), potassium permanganate, Roccal(R), nitrofurazone, and malachite green showed little control of Zoothamnium sp. or were toxic to larvae. Formalin at 50 ppm gave complete control of Zoothamnium sp. and had no ill effects on the larvae. (Katz)
W78-02711

BIBLIOGRAPHY OF STRIP MINE ECOLOGY,
Iowa State Univ., Ames. Energy and Mineral Resources Research Inst.
D. C. Glenn-Lewin, G. Fay, and S. D. Cecil.
Energy and Mineral Resources Research Institute, Report No. 15-ICP-20, May 1976. 47 p, 564 ref.

Descriptors: *Mineral industry, Mining, Mining engineering, *Mine wastes, Mine waters, *Strip mines, *Strip mine wastes, Terrestial habitats, Plant population, Planting management, Water quality, Freshwater fish, Aquatic plants, Reclamation, Agronomy, Forestry, Wildlife, Wildlife habitats, Bibliographies.

A bibliography was prepared to serve those interested in the ecology, environment, and reclamation of surface mine spoil banks, especially those of local strip mines. The major categories treated are bacteria, terrestial environment, physical environment and soils, plants. natural revegetation, physiological effects, animals, water quality, and hydrology, flora, and fauna, fish, reclamation, agronomy, forage and livestock, forestry, fish and wildlife, and recreation. (Katz)
W78-02744

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 19-22 OCTOBER 1976.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02757

A MANAGEMENT PROCEDURE FOR THE INTRODUCTION OF BIOLOGICAL AGENTS FOR CONTROL OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02758

A CONCEPT FOR THE DEVELOPMENT OF LONG-TERM MANAGEMENT PLANS FOR AQUATIC PLANT CONTROL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02759

A FIELD TEST OF SELECTED INSECTS AND PATHOGENS FOR CONTROL OF WATER-HYACINTHS; REPORT 1, PRELIMINARY RESULTS FOR THE 1975-76 SEASON,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02766

REAERATION TESTS, OUTLET WORKS, BELTZVILLE, DAM, POHOPOCO CREEK, PENNSYLVANIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
E. D. Hart, and S. C. Wilhelms.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 291, Price codes: A03 in paper copy, A01 in microfiche. Technical Report H-77-14, July 1977. 38 p, 9 fig, 2 tab, 10 pl, 9 ref, append.

Descriptors: *Outlet works, Prototype tests, *Reaeration, Pennsylvania, Water quality control, *Beltzville Dam(Pa), *Pohopoco Creek(Pa).

Prototype water-quality tests were conducted at Beltzville Dam during August 1976. Twelve tests were conducted. Temperatur and dissolved oxygen data (vertical profiles) were collected upstream of the dam, at seven stations within the outlet structure, and at one station in the downstream channel. The tests involved various flow rates and various outflow port elevations. The results of these prototype tests showed: (1) the dissolved oxygen content of the release flows was approximately 90 to 95 percent of the saturation level regardless of the dissolved oxygen content of the flow entering the structure or the discharge, and major reaeration occurred within the outlet structure downstream of the water-quality gate; (2) the predictions of the SELECT model were in close agreement with the observed data; and (3) the hydraulic measurements were close to those of the 1973 tests. (WES)
W78-02771

LITERATURE SURVEY AND PRELIMINARY EVALUATION OF STREAMBANK PROTECTION METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2J.
W78-02776

FREEZE-THAW ENHANCEMENT OF THE DRAINAGE AND CONSOLIDATION OF FINE-GRAINED DREDGED MATERIAL IN CONFINED DISPOSAL AREAS,
Cold Regions Research and Engineering, Hanover, NH.
For primary bibliographic entry see Field 4A.
W78-02777

RECENT TANKER ACCIDENTS: LEGISLATION FOR IMPROVED TANKER SAFETY (PART 2; HEARINGS ON S. 182, S. 568, S. 682, S. 715, AND S. 898).
For primary bibliographic entry see Field 6E.
W78-02825

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN.
Environmental Protection Agency, Chicago, IL. Region V.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 336, Price codes: A10 in paper copy, A01 in microfiche.
Proceedings of the Public Session on Pollution of Lake Michigan and its Tributary Basin, Illinois, Indiana, Michigan, and Wisconsin, November 9, 1972, Chicago, Illinois. 141 p.

Descriptors: *Lake Michigan, *Federal Water Pollution Control Act, *Permits, *Thermal pollution, *Water quality standards, Michigan, Illinois, Indiana, Wisconsin, Fish, Wildlife, Discharge(Water), Monitoring, Economic feasibility, Environmental effects, Law enforcement, Nuclear powerplants, Cooperation, Phosphorus, Chlorides, Pesticides, Trace elements, Polychlorinated biphenyls, Cooling towers.

A public session of the Lake Michigan states and the Environmental Protection Agency (EPA) was held in 1972 in an attempt to bridge the gap between enforcement conference processes required before passage of the Federal Water Pollution Control Act Amendments of 1972 and the requirements of the new legislation. At the public session, participants discussed thermal and non-thermal pollution of Lake Michigan. Proposed water quality standards requiring installation of auxiliary cooling facilities at six nuclear powerplants under construction were explained, as were recommendations concerning status of compliance, and treatment of phosphorus, chlorides, pesticides, trace metals, phthalates, polychlorinated biphenyls and taste and odor problems in Lake Michigan. A panel of environmental experts from the Environmental Protection Agency, Michigan, Illinois, Indiana, and Wisconsin explained the newly instituted permit process for the benefit of the dischargers, powerplants and state and local regulators present at the hearing. The new act requires issuance of a permit before any discharge into the lake is permitted, and requires that the EPA Administrator conduct comprehensive studies on the effects and methods of controlling thermal discharges. (Spector-Florida)
W78-02828

MARINE RESOURCES COMMITTEE - ANNUAL REVIEW OF SIGNIFICANT ACTIVITIES - 1976,
W. M. Meyers, C. C. Smith, Jr., J. T. Bockrath, R. J. Greenwald, and J. E. Phillips, Jr.
Natural Resources Lawyer, Vol. 10, No. 1, p 115-28, 1977.

Descriptors: *Oil spills, *Exploration, *Environmental effects, *Oil industry, *Legislation, Judicial decisions, Water quality, Water pollution, Exploitation, Coasts, Environmental control, Federal government, Compensation, Financing, Fish, Fisheries, Law of the Sea, Legal aspects, Mining, Water pollution sources, Oil pollution, Water pollution.

Recent legislative and judicial activity has taken place with regard to the United States offshore seabed resources, deepwater ports, coastal zone management, fisheries, deep seabed hard minerals, preservation of the marine environment and the proposed Law of the Sea Convention. Although much of the activity has encouraged offshore gas and oil exploration and ocean mining, the preservation of the environment has also been a major concern. Projects designed for oil and gas exploration, development and production have not been authorized without first considering the economic, environmental, and coastal state impacts. In addition, the legislation has been broad with express provisions for liability and penalties for oil spills. The judiciary has imposed liability upon oil tankers for any oil spills they might cause. The federal government has even established a national assistance program to states and local governments with approved offshore oil exploration programs to meet their environmental needs resulting from specific activities involving energy development. The trend in federal legislation and judicial decisions reflects the growing need for energy sources balanced by stricter regulation and imposed liability in order to preserve the environment. (Kastner-Florida)
W78-02833

SEWERS, CLEAN WATER, AND PLANNED GROWTH: RESTRUCTURING THE FEDERAL POLLUTION ABATEMENT EFFORT.
Yale Law Journal, Vol. 86, No. 4, p 733-81, March 1977.

Descriptors: *Sewers, Grants, *Financing, *Regional development, Government finance, Cost repayment, Projects, Allotments, Cities, Comprehensive planning, Regional analysis, Urban hydrology, Sewage districts, Governments, Planning, Waste treatment, Land use, Urbanization, Zoning, Drainage systems, Community development, Growth rates.

Title II of the Federal Water Pollution Control Act of 1972 promises communities financial assistance for the construction of waste treatment facilities. There has been, however, a reluctance on the part of local communities to embrace the sewer construction grants. This note examines the flaws in the Federal Water Pollution Control Act (FWPCA) which invite this reluctance and outlines the author's suggestion for a program that would harmonize the potentially conflicting goals of clean water and planned growth. The author criticizes the FWPCA and the proposals for its amendment because of their functional approach. He recommends that Title II be replaced with a comprehensive program that would permit sewers to be designed in a manner consistent with local development objectives. This might be achieved by funding regional comprehensive planning agencies that have established pollution abatement programs which are compatible with the requirements of the FWPCA and governed by a regional growth plan. Instead of awarding construction grants to individual projects, the Environmental Protection Agency would make annual grants to qualifying programs. (Curran-Florida)
W78-02835

UNITED TO PROTECT THE MEDITERRANEAN,
United Nations Environment Program, Geneva (Switzerland).
P. S. Thacher.
Oceans, Vol. 10, No. 1, p 58-61, January 1977.

Descriptors: *Foreign projects, *Pollution abatement, *United Nations, *Water pollution control, *Water quality, Aquatic environment, Aquatic habitats, Aquatic life, Aquatic populations, Bodies of water, Chlorinated hydrocarbon pesticides, Ecosystems, Europe, Foreign waters, Metals, Monitoring, Oil wastes, Pollutants, Projects, Water pollution, Water pollution effects, Water quality control.

Representatives of sixteen states bordering the Mediterranean Sea convened the Intergovernmental Meeting on the Protection of the Mediterranean Sea in January, 1975, under the auspices of the United Nations Environmental Program. This article briefly reviews the major components of the Barcelona Plan approved at that meeting. An overall 'Framework Convention' treaty was proposed, under which signatory nations agree to cooperate in adopting environmental legislation, pollution monitoring, research and development, and enforcement of sanctions against violators of the Convention. Additional protocols were developed which pledged subscribers to abate dumping of pollutants. The delegates also approved a program consisting of the following pilot projects: (1) monitoring of oil and petroleum hydrocarbons in the Mediterranean; (2) monitoring of metals in marine organisms; (3) monitoring of DDT, PCBs, and other chlorinated hydrocarbons in marine organisms; (4) research on the effects of pollutants on marine organisms; (5) research on the effects of pollutants on marine communities and ecosystems; (6) problems of coastal dispersion of pollutants; and (7) coastal water quality control. The plan also called for intergovernmental cooperation in the prediction and management of future growth in the Mediterranean area. (White-Florida)
W78-02836

AN HONORABLE DISCHARGE FOR THE BIGGEST POLLUTANT,
Fish and Wildlife Service, Washington, DC.
J. Crowder.
Parks and Recreation, Vol 12, No 2, p 28a-30a, February 1977.

Descriptors: *Federal Water Pollution Control Act, *Dredging, *Permits, *Wetlands, *Water pollution sources, Channel improvement, Landfills, Ecology, Administrative agencies, Ecosystems, Pollutants, Legislation, Water pollution control, Legal aspects, Regulation, Land development, Wildlife conservation, Shellfish, Water quality, Aquatic environment, Waste disposal, Environmental effects.

The Federal Water Pollution Control Act is a complex, comprehensive piece of legislation. It is justifiably complex because of the enormity of the problem it is designed to correct. The water pollution problem of today is a result of decades of unawareness and unconcern. One specialized pollution problem the act addresses is how to deal with dredge and fill materials generated in the production of navigation systems and other water resource development activities. Dredge and fill materials can become pollutants when relocated in a way that damages the normal functioning of ecosystems or when they become a medium for transfer of contaminants absorbed or mixed with them. The amount of fill produced each year is enormous and Congress acknowledged the need for regulating dredge and fill activities by requiring permits. Through the permit process, proposals are studied with a view to anticipating environmental impact and finding ways to protect fish, shellfish, wildlife and their habitats, recreation and water quality. Therefore, unnecessarily destructive discharges will usually be prohibited. For instance, filling wetlands for projects such as residential developments that do not really require waterfront sites is now discouraged. (Beamer-Florida)
W78-02839

WATER MANAGEMENT–THE FUTURE OF FLORIDA LEGAL IMPLICATIONS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 6E.
W78-02840

TENSIONS AND CONFLICTS IN FEDERAL POLLUTION CONTROL AND WATER RESOURCE POLICY,
Environmental Defense Fund, New York. Eastern Water Resources and Land Use Program.
J. T. Tripp.
Harvard Journal on Legislation, Vol 24, No 2, p 225-80, April 1977.

Descriptors: *Water pollution, *Pollution abatement, *Administrative agencies, *Legislation, *Federal project policy, Water pollution sources, Wastes, Water pollution control, Water quality, Project planning, Project feasibility, Construction costs, Economic life, Financing, Recreation, Research and development, Fish reproduction.

The Environmental Protection Agency (EPA) administers the Federal Water Pollution Control Act Amendments of 1972. The main objective is 'to restore and maintain the chemical, physical, and biological integrity of the nation's waters'. Two goals are predominant: elimination of pollutant discharges into navigable waters; and water quality which provides for biological propagation and safe recreation. Deadlines have been established which tend to force implementation of short-range, incomplete programs. Long-range planning is required to insure program success. The EPA has two basic tools: the power to enforce established water quality standards; and the authority to finance grants for construction projects and research development efforts. Tight time schedules have created inconsistent goals within the EPA. Construction is hurried so that deadlines can be met. However, modern techniques becoming available require more time for perfection. The result is construction that lags behind the state of the art. Congress is partially to blame, expecting too much, too soon. The EPA has also aggravated the problem through delays in setting standards, poor planning, and underbudgeting of its' research and development efforts. (Thomas-Florida)
W78-02841

THE LIABILITY OF A SALVOR RESPONSIBLE FOR OIL POLLUTION DAMAGE,
B. A. Dubais.
Journal of Maritime Law and Commerce, Vol 8, No 3, p 375-86, April 1977.

Descriptors: *Oil spills, *Oil pollution, *Pollution abatement, *Water pollution control, *Water pollution sources, International law, International waters, Insurance, Common law, Oil industry, Oceans, Legal aspects, International commissions, Accidents, Disasters, Civil law, Law of the Sea, Regulation, Water treatment, Foreign waters, Federal government, Hazards.

In helping to control the damaging effects due to oil spills, salvors subject themselves to the risk of aggravating such pollution and must be afforded some protection. Oil companies have organized plans to fight accidental pollution, to guarantee adequate compensation to victims of pollution, and to devise techniques to reduce the risk of pollution; but these organizations do not protect salvors. Salvors may now rely on customary insurance market resources but some people believe that they would be better protected by an international legal regime like the one promulgated by the 1969 Convention of Civil Liability for oil Pollution Damage. However, this is doubtful since the salvor would then have to give up the common law criterion of fault liability. It is suggested that because of their common interest in the matter, it would be possible for shipowners and salvors to cooperate and use their respective expertise for developing some sort of code of salvage operations for oil tankers. While this has been attempted on an international level, the initiative will not be beneficial for years to come. Professional organizations could do the job better and faster. (Hammersley-Florida)
W78-02844

FEDERAL COMMON LAW REMEDIES FOR THE ABATEMENT OF WATER POLLUTION,
For primary bibliographic entry see Field 6E.
W78-02847

SECTION 10 OF THE RIVERS AND HARBORS ACT: JURISDICTION SHOREWARD OF THE MEAN HIGH TIDE LINE,
D. A. Haagensen.
University of Miami Law Review, Vol. 31, No. 3, p. 697-712, Spring 1977.

Descriptors: *Rivers and Harbors Act, *Navigable waters, *Permits, *Federal jurisdiction, *Dredging, Legislation, Jurisdiction, Water law, Federal government, Boundaries(Property), Land tenure, Drainage, Marshes, Canals, Legal aspects, Water pollution, Regulation, High water mark, Judicial decisions, Water pollution control.

Under Section 10 of the 1899 Rivers and Harbors Act, the Army Corps of Engineers requires permits for dredge and fill activities affecting navigable waters. The Fifth Circuit Court of Appeals recently upheld the Corps' assertion of permit jurisdiction above the mean high tide line (MHTL). The court said that such jurisdiction is proper if the dredge and fill operations alter the course or affect the navigable capacity of navigable waters. The decision is in direct opposition to numerous earlier cases but is justifiable since the MTHL is not a statutory jurisdictional limit and was only adopted because of its use in other areas. It has also become increasingly obvious that activities beyond the MHTL can have a definite affect on navigable waters. In another Fifth Circuit decision, the court held that an alteration and modification of the condition and capacity of a navigable water body could occur through ecological damage. Although dredge and fill jurisdiction under the Federal Water Pollution Control Act Amendments of 1972 is extremely broad, the efforts of Congress to restrict this jurisdiction make the Fifth Circuit decision important as a backup source of extended jurisdiction. (Capehart-Florida)
W78-02852

FEDERAL COMMON LAW AND INTRA-STATE POLLUTION,
For primary bibliographic entry see Field 6E.
W78-02854

THE CONFINED DISPOSAL PROGRAM FOR POLLUTED DREDGE SPOIL IN THE GREAT LAKES,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
E. Jaworski, and C. N. Raphael.
Coastal Zone Management Journal, Vol. 3, No. 1, p. 91-96, 1976.

Descriptors: *Great Lakes, *Waste water(Pollution), *Pollution abatement, *Water pollution treatment, Waste water treatment, Water treatment, Waste dilution, Sediments, Bottom sediments, Industrial wastes, Sewage, Municipal wastes, Waste disposal, Water quality, Local governments, Bottom sampling, Water pollution, Dredging, Harbors, Great Lakes region, Hypolimnion, Lake Michigan, Structures.

The 1970 Rivers and Harbors Flood Control Act authorized the Army Corps of Engineers to build containment facilities for polluted dredged spoil in the Great Lakes. The dredged material was to be held for a maximum of ten years while polluton elimination system were implemented. This method would avoid open-lake disposal of polluted material and improve the water quality of the Great Lakes. Delay in the construction of containment sites has resulted in certain modifications in the confined disposal program. The delay was caused by the reluctance of local communities to provide the necessary land and easements. Due to the Environmental Protection Agency's revision of the pollution criteria, less containment space is now required. However, cleanup of the area may not be accomplished within the authorized ten-year period unless technological improvements are made and pollution abatement plans are implemented. Polluton abatement can be accomplished through more effective treatment of municipal sewage and industrial wastes. (Quarles-Florida)
W78-02856

ENVIRONMENTAL PROTECTION AGENCY'S VIEW OF PROJECTED OIL DRILLING ON THE CONTINENTAL SHELF,
Environmental Protection Agency, Washington, DC. International Affairs.
For primary bibliographic entry see Field 6E.
W78-02862

DEPARTMENT DISCUSSES INTERNATIONAL APPROACHES TO PROBLEM OF OIL SPILLS FROM VESSELS,
Law of the Sea Conference, New York.
For primary bibliographic entry see Field 6E.
W78-02864

HOW PEOPLE WHO REMEMBER CLEAN WATER ARE USING NEW LAWS TO BRING IT BACK,
National Wildlife, Vol 15, p 26-27, December 1976.
For primary bibliographic entry see Field 6E.
W78-02865

IMPLEMENTING THE DRINKING WATER ACT--A NEW APPROACH FOR EPA,
A. J. Magida.
National Journal, Vol. 8, No. 24, p. 822-24, June 12, 1976.

Descriptors: *Potable water, *Water purification, *Water quality standards, *Regulation, Industrial wastes, Water quality, Water pollution sources, Legislation, State governments, Organic wastes, Water pollution, Environmental sanitation, Chemical wastes, Water policy, Consumptive use, Water pollution sources, Pesticide toxicity, Water law, Federal jurisdiction, Diseases, Water works.

Since the enactment of the 1974 Safe Drinking Water Act, environmentalists have condemned the Environmental Protection Agency (EPA) for failure to establish adequate standards for water pollutants. EPA and Environmental Defense Fund studies have revealed many dangerous pollutants, including carcinogens, in the drinking water of many cities. The EPA has used these findings to delay promulgation of organic chemical standards, in order to gain confidence and support in communities without raising too much alarm. Instead the National Drinking Water Advisory Board, composed of government, utility, industry and academic representatives drafted standards and regulations under the Act. Due to manpower and funding shortages, the EPA has had to rely too much of the Board and lax state agencies. In addition, there were too many water systems to control for the EPA to pursue strict standards. A federal suit by the Environmental Defense Fund was filed against the EPA. Among the charges were failure to monitor contaminants, to regulate carcinogens and to set maximum contaminant levels for toxic substances. Despite environmentalists' concerns, state officials have praised the EPA for its realistic administration and reliance on expert advice from the Advisory Board. (Cocheu-Florida)
W78-02869

TOWARD REGIONAL ARRANGEMENTS FOR REGULATION OF MARINE POLLUTION: AN APPRAISAL OF OPTIONS,
Nairobi Univ. (Kenya). Inst. for Development Studies.
C. O. Okidi.

Ocean Development and International Law Journal, Vol. 4, No 1, p. 1-25, 1977.

Descriptors: *Oil pollution, *International law, *Law of the Sea, *Oceans, *Water pollution control, Administrative agencies, Regional analysis, Water law, Indian Ocean, Oil spills, Water pollution, International waters, Treaties, Foreign waters, International commissions, Regulation, Governments, Standards, Foreign countries, Wastes, Coasts.

Marine pollution affects two interest categories: the international community's interest in preserving the living resources for nutrition and other purposes; and, the coastal-states' interest in protecting their coastal waters and shoreline. This article analyzes and appraises three institutional options by which states may control and regulate pollution of the seas to protect these interests. These options are: (1) a continuation of the present decentralized system by which states may take unilateral regulatory measures of the type adopted by Canada in 1970; (2) a global regulatory system centered around a global superagency; and (3) a network of regional regulatory arrangements. The author rejects the unilateral approach to the regulation of pollution in the high seas because it is likely to lead to serious conflicts between nations. The author feels that a global regulatory scheme is necessary because the complex task of regulating a global problem requires a global agency. However, factors such as regional types of polluton, regional mechanisms for dealing with ecological catastrophes, and a need for maximum participation by states in a regulatory system may make a system of regional organizations more desirable. (Curran-Florida)
W78-02870

WETLANDS LEGISLATION IN NEW HAMPSHIRE,
For primary bibliographic entry see Field 6E.
W78-02872

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, DC. Environmental Quality Dept.
B. C. Grefrath.
Journal of Forestry, Vol 72, No 12, p 757-59, December 1974.

Descriptors: *Forest management, *Federal Water Pollution Control Act, *Water pollution sources, *Water resources development, Erosion control, Forest soils, Forestry, Sediment control, Forests, Natural resources, Legislation, Legal aspects, Governments, State government, Federal government, Local governments, Pollutants, Soil contamination, Wildlife management.

Enforcement of pollution control at the source, both point sources (industrial plants) and nonpoint sources (forestry and agricultural lands), is emphasized by the Federal Water Pollution Control Act (F W P C A). The Act does not give the Environmental Protecton Agency (EPA) direct authority over pollution control from nonpoint sources, but such sources are required to meet basic water quality standards, developed by the states. The federal role in nonpoint source control programs involves: (1) national planning and coordination of state programs; (2) development and dissemination of information; and (3) funding for state and local programs. The educational role of the EPA is extensive, including composing a model state forest practice act, focusing on soil erosion and sediment control. The FWPCA leaves enforcement of water quality control and planning to the states with strong influence anticipated from the EPA. State reports must be approved by the EPA before federal funding is approved. Local governments are required to develop waste treatment management programs for sources in areas with water quality problems. Several states require forestry professionals to administer their control programs through a state forestry agency. (Mulligan-Florida)
W78-02873

SOME RESULTS OF COMPARING THE ECOLOGICAL SCALES OF RAMENSKII, ELLENBERG, HUNDT AND KLAPP, (IN RUSSIAN),
Leningrad State Univ. (USSR). Biological Inst.
For primary bibliographic entry see Field 6G.
W78-02874

SAVING THE GREAT LAKES,
Maclaren (James F.) Ltd., Willowdale (Ontario).
J. W. MacLaren.
Journal of Soil and Water Conservation, Vol 32, No 3, p 116-17, May 1977.

Descriptors: *Comprehensive planning, *Great Lakes, *Great Lakes region, *International Joint Commission, Average flow, Environmental control, Canada, United States, Impaired water use, Industries, Municipal water, Natural resources, Oil spills, Water quality control, Recreation, Regional analysis, St. Lawrence River, Thermal pollution, Water resources.

The Great Lakes constitute a vast natural resource difficult to protect and control. On an average day, enough water comes from the Great Lakes watershed to supply each person in the United States and Canada with over five hundred gallons (Imperial) of water. The Great Lakes are presently threatened by domestic and industrial pollution, heat pollution from power plants, agricultural drainage, shoreline erosion, oil spills, and polluted dredge spoils. A comprehensive plan for development of the Great Lakes' water and related land resources is essential. Such a plan should be supervised by the International Joint Commission, which has jurisdiction over all cases of use, obstruction of diversion of Great Lake's waters. It should include the following: acceleration of the Great Lakes Basin Commission's program of planning and implementation to become the major vehicle of resource management in the United States portion of the Great Lakes; formation of Canadian counterpart to the Great Lakes Basin Commission; and, development of a comprehensive resource management plan by the two commissions to be financed through levy of a withdrawal charge on all Great Lakes users. (Spector-Florida)
W78-02875

OUTBOARD MOTOR FOR REDUCING EXHAUST GAS POLLUTANTS,
Aktiebolaget Volvo Penta, Goteborg (Sweden). (Assignee).
H. Pichl.
U.S. Patent No. 4,015,429, 4 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 54, April 5, 1977.

Descriptors: *Patents, *Water pollution control, *Water quality control, Oil pollution, Equipment, Outboard motors.

In an outboard motor having an engine located above the water level, a lower unit is provided extending downward from the engine. It includes an exhaust gas tube within the lower unit with its lower end positioned below the water level. Enclosing the exhaust gas tube is a liquid jacket and a heat insulating jacket for maintaining the temperature of the exhaust gases at a level such that an afterburning of any oil residue in the exhaust gases is achieved before the gases are discharged from the exhaust gas tube. (Sinha-OEIS)
W78-02887

FLOATABLE OIL FENCE,
Suzuei Co. Ltd. (Japan). (Assignee).
I. Ahiko.
U.S. Patent No. 4,015,431, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 54, April 5, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution control, Water quality control, Floating, Containment, Booms.

A bloatable boom which is capable of effectively opposing movement of a body of water, as the result of waves or the like, over the boom, as well as effectively opposing movement of a surface of the body of water beneath the boom is described. The bloatable boom includes an elongated tubular means for containing air under pressure so as to assume a floating condition. An upper fin is fixed to and extends longitudinally along the tubular means. This upper fin projects upward from the tubular means so as to oppose the movement of water over the tubular means. A lower fin is fixed to and extends longitudinally along the tubular means. The lower fin projects downward beyond the tubular means to oppose movement of water with any mateial floating on it, beneath the tubular means. The interior of the tubular means is divided into chambers which are prevented from connecting with each other by partitions. As a result, in the event that the tubular means ruptures at one of the chambers, the tubular means nevertheless will remain afloat. (Sinha-OEIS)
W78-02888

BILGE WATER DISPOSAL SYSTEM INCLUDING OIL RECOVERY MEANS,
National Marine Service, Inc., St. Louis, MO. (Assignee).
C. H. Walters, H. J. Barmeier, Jr., and G. E. Sullivan.
U.S. Patent No. 4,018,683, 15 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 957, No 3, p 1146, April 19, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution control, Separation techniques, Equipment, Control systems, Evaporation, Bilge water, Oil recovery.

An environmentally protective bilge water disposal system utilizes an inverted dome gravitational oil separator unit in combination with an engine exhaust flash water vaporizor to remove and recover oil contamination from the bilge water prior to its disposal by flash evaporation in the exhaust stack. Bilge water is drawn by suction into a hermetically sealed floating dome oil separator where the oil accumulates under the top of the floating dome. Depending upon the oil content of the incoming bilge mixture and the specific gravity of the oil, the dome rises quickly or slowly as more or less oil is collected during any span of time. The suction of bilge water is maintained by pumping processed water from the outlet side of the separator, this water being relatively free of oil contamination. However, since the processed water may still contain small amounts of oil or other dissolved contaminants, overboard discharge of the water is not always desirable and therefore this invention contemplates disposal of the water by flash evaporation of the water in the hot exhaust stream of an internal combustion engine aboard the vessel. An elaborate control arrangement is included within the system. (Sinha-OEIS)
W78-02902

TANK VESSEL TRAFFIC REGULATION ACT.
For primary bibliographic entry see Field 6E.
W78-02912

ABANDONED MINE DRAINAGE CONTROL ACT.
For primary bibliographic entry see Field 6E.
W78-02913

SURFACE MINING.
For primary bibliographic entry see Field 6E.

W78-02914

ALASKA OIL DISCHARGE PREVENTION AND POLLUTION CONTROL ACT (GENERAL AND MISCELLANEOUS PROVISIONS).
For primary bibliographic entry see Field 6E.
W78-02915

OIL TERMINAL FACILITIES: TRANSFER OF CRUDE OIL, REFINED PETROLEUM PRODUCTS OR THEIR BY-PRODUCTS.
For primary bibliographic entry see Field 6E.
W78-02916

LIMITATION ON OIL AND GAS LEASES IN CERTAIN AREAS, AND REACQUISITION OF LEASES.
For primary bibliographic entry see Field 6E.
W78-02918

COASTAL PROTECTION FUND.
For primary bibliographic entry see Field 6E.
W78-02919

CIVIL ACTION FOR POLLUTION; DAMAGES; INJUNCTIONS; CRIMINAL PENALTIES.
For primary bibliographic entry see Field 6E.
W78-02920

COX V. CAMBRIDGE SQUARE TOWNE HOUSES, INC.
For primary bibliographic entry see Field 6E.
W78-02922

PPG INDUSTRIES, INCORPORATED V. ENVIRONMENTAL PROTECTION AGENCY.
For primary bibliographic entry see Field 6E.
W78-02923

MOORE V. HAMPTON ROADS SANITATION DISTRICT (OYSTER BED DAMAGE FROM SEWAGE DISCHARGE NOT WITHIN FEDERAL ADMIRALTY JURISDICTION).
For primary bibliographic entry see Field 6E.
W78-02927

AMERICAN ASSOCIATION OF MEAT PROCESSORS V. COSTLE (STATUE OF LIMITATIONS FOR REVIEW OF EFFLUENT GUIDELINES).
For primary bibliographic entry see Field 6E.
W78-02930

MARINO PROPERTY COMPANY V. PORT OF SEATTLE (ENVIRONMENTAL IMPACT STATEMENT NOT REQUIRED FOR CHANGE IN OWNERSHIP).
For primary bibliographic entry see Field 6E.
W78-02936

WILLIAMS AND EBERLEY, INCORPORATED V. MACLEOD (ADEQUACY OF WATERS AND SEWAGE FACILITIES IN PROPOSED SUBDIVISION).
For primary bibliographic entry see Field 6E.
W78-02939

APPROPRIATION AND REGULATION OF GROUND WATER.
For primary bibliographic entry see Field 6E.
W78-02941

GRAY V. HUDSON (TITLE TO LAND CREATED BY FILL OPERATION).
For primary bibliographic entry see Field 6E.
W78-02956

IN RE LEGISLATIVE ROUTE (THE NECESSITY FOR STATE ENVIRONMENTAL IMPACT STATEMENT FOR BRIDGE REPAIRS).
For primary bibliographic entry see Field 6E.
W78-02957

COMMONWEALTH V. BARNES AND TUCKER COMPANY (POWER OF THE STATE TO COMPEL A MINE OWNER TO PREVENT THE DISCHARGE OF UNTREATED ACID MINE WATER).
For primary bibliographic entry see Field 6E.
W78-02959

FEDERAL COMMON LAW OF NUISANCE AS A BASIS FOR RELIEF IN ENVIRONMENTAL POLLUTION CASES.
For primary bibliographic entry see Field 6E.
W78-02961

LOVELADIES PROPERTY OWNERS ASSOCIATION, INCORPORATED V. RAAB, (PROCEDURAL REQUIREMENTS FOR CITIZEN SUITS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-02963

PARSELL V. SHELL OIL COMPANY (NO JURY TRIAL IN OIL SPILL DAMAGES SUIT UNDER FEDERAL ADMIRALTY JURISDICTION).
For primary bibliographic entry see Field 6E.
W78-02964

SAVE OUR SOUND FISHERIES ASSOCIATION V. CALLAWAY (AWARD OF ATTORNEY'S FEES IN ENVIRONMENTAL CITIZEN SUITS).
For primary bibliographic entry see Field 6E.
W78-02965

UNITED STATES V. KETCHIKAN PULP COMPANY (STANDARDS OF REVIEW FOR CHALLENGES TO FWPCA DISCHARGE PERMITS).
For primary bibliographic entry see Field 6E.
W78-02966

STATE WATER CONTROL BOARD V. HOFFMAN (LAKE DETERMINED NAVIGABLE AND SUBJECT TO FEDERAL PERMIT JURISDICTION).
For primary bibliographic entry see Field 6E.
W78-02967

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. MORTON (FEDERAL AUTHORITY IN APPROVING WATER OPTION CONTRACTS FOR INDUSTRIAL USE).
For primary bibliographic entry see Field 6E.
W78-02968

OHIO V. GASTOWN, INCORPORATED (STRICT LIABILITY FOR OIL SPILLS UNDER OHIO WATER POLLUTION LAW).
For primary bibliographic entry see Field 6E.
W78-02970

QUARLES PETROLEUM COMPANY, INCORPORATED V. UNITED STATES (SUBROGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W78-02971

NEVADA WATER POLLUTION CONTROL LAW.
For primary bibliographic entry see Field 6E.
W78-02975

DELANO V. COLLINS (REASONABLE ALTERATION OF NATURAL RUNOFF PATTERNS BY LANDFILL FOR IMPROVEMENT OF RESIDENTIAL PROPERTY).
For primary bibliographic entry see Field 6E.
W78-02977

REFUSE IN PUBLIC PLACES AND STREAMS.
For primary bibliographic entry see Field 6E.
W78-02984

THE RECOVERY OF DAMAGED STREAMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr., J. S. Crossman, K. L. Dickson, and E. E. Herricks.
ASB Bulletin, Vol. 18, No. 3, p 79-106, July, 1971, 20 fig, 8 tab, 26 ref.

Descriptors: *Streams, *Water pollution, *Industrial wastes, *Water pollution effects, Pollutants, Water quality, Virginia, Pennsylvania, Tennessee, Acidity, Acid mine water, Creosote, Fish, Benthic fauna, Toxicity, *Stream recovery, Spills(Industrial), Mill Creek(VA), Roanoke River(VA), Indian Creek(PA), Little Scrubgrass Creek(PA), Ethyl benzene, Clinch River(VA TN).

Four cases are described in which streams in the northeastern U.S. recovered from various stresses: (1) simulated shock acidification of Mill Creek, near Blacksburg, VA; (2) long-term acid mine drainage from Appalachian coal fields into Indian Creek in southern Pennsylvania and Little Scrubgrass Creek in northwestern Pennsylvania; (3) an ethyl benzene-creosote spill on October 10, 1970 in the Roanoke River at Salem, VA; and (4) two industrial spills on the Clinch River in southwestern Virginia and northeastern Tennessee. The ability of a stream to assimilate wastes depends on its capacity to transform them before they reach deleterious levels. Recovery from overload depends on (1) the severity and duration of the stress; (2) associated stresses; (3) recolonization by beneficial organisms; and (4) residual effects upon nonbiological units, such as the substrate. Short-term acute stress from release of acidic or caustic materials results in immediate reduction in the macroinvertebrate and fish communities. A rapid recovery may be expected when no residual toxicity is found and recolonizing organisms are available from undamaged areas. Long-term acute stress, and stresses from materials with residual toxicities, also produce an immediate reduction in both diversity and density of organisms, but with residual toxicities the surviving macroinvertebrates tend to form an interim atypical community which persists for the duration of the toxicity.
W78-02990

FEEDLOT MANURE TOP DRESSING FOR IRRIGATED PASTURE: GOOD AGRICULTURAL PRACTICE OF A HEALTH HAZARD,
Department of Agriculture, Lethbridge (Alberta). Research Station.
R. G. Bell, D. B. Wilson, and E. J. Dew.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 5, November 1976, p. 536-540. 4 tab, 12 ref.

Descriptors: *Pathogenic bacteria, *Coliforms, *Feed lots, *Irrigated land, *Farm wastes, *Animal diseases, Orchardgrass, Water pollution effects, Epidemiology, *Salmonella dublin, *Dactylis glomerata L., *Spray irrigation.

A study of the survival of Salmonella dublin (a major cause of acute salmonellosis in cattle) after feedlot manure is applied focused on three information points: (1) the yields of grass after application of manure at various rates; (2) the extent to which pasture top-dressed with feedlot manure

becomes contaminated during irrigation; and (3) how long the contamination persists. The study used fecal coliform bacteria which may themselves be pathogenic, but are accepted as indicators for the potential presence of Salmonella. An application of 25-t/ha of manure did not increase yield of orchard grass relative to the untreated plots. The yield of plots receiving top dressing at 118 kg inorganic N/HA, was double that of the untreated plots. Levels of fecal coliform contamination just after each irrigation varied greatly. Highly variable contamination occurring after the first irrigation was not caused by splashing from manure, since untreated plots were as contaminated as those that were top-dressed. This occurred because the irrigation water had been fecally contaminated by liquid waste from a packing house lagoon on neighboring property that had overflowed into the irrigation supply ditch. Fecal coliforms were essentially eliminated from the pasture after exposure to between 50 and 65 hours of bright sunlight. Little contamination of the pasture occurred after the second irrigation, when water contained only 80 fecal colifroms/100 ml. (Spaeth-Wisconsin)
W78-03000

EFFECTS OF DESTRATIFICATION AND AERATION OF A LAKE ON THE DISTRIBUTION OF PLANKTONIC CRUSTACEA, YELLOW PERCH, AND TROUT,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.
W78-03006

DEVICE FOR EVALUATING COALESCENCE OF OIL EMULSIONS,
Engineering-Science, Inc., Houston, TX.
For primary bibliographic entry see Field 5D.
W78-03032

DECONTAMINATING LAKE SUPERIOR OF ASBESTOS FIBERS,
Army Mobility Research and Development Command, Fort Belvoir, VA. Sanitary Sciences Div.
For primary bibliographic entry see Field 5D.
W78-03040

GREAT LAKES WATER QUALITY, FIFTH ANNUAL REPORT TO THE INTERNATIONAL JOINT COMMISSION.
International Joint Commission-United States and Canada. Great Lakes Water Quality Board.
1976 Annual Report, July, 1977. 81 p, 9 fig, 14 tab.

Descriptors: *International Joint Commission, *Great Lakes, *Water quality, *Water pollution control, Water pollution, Lake Michigan, Lake Erie, Lake Superior, Lake Huron, Lake Ontario, Pollution abatement, Toxins, United States, Canada, International commissions, Effluents.

This fifth annual report of the International Great Lakes Water Quality Board to the International Joint Commission concludes that there have been no major changes in open lake water quality since the fourth report a year ago. A detailed account is given of all major activities under the Canada-U.S. Great Lakes Water Quality Agreement, including: (1) governmental progress toward meeting the recommendations of the fourth report; (2) water quality objectives, standards, and regulatory requirements; (3) current water quality assessment; (4) status of pollution abatement programs; (5) review of obligations under the agreement; and (6) emerging pollution problems. It is recommended that: (1) governments increase emphasis on enforcing requirements for municipal and industrial dischargers; (2) new water quality objectives for chlorine, silver, and dodecachloropentacyclodecane (mirex) be adopted as proposed; (3) mirex be banned in the Great Lakes; (4) toxic substances control proposals in this report be adopted; (5) hazards to human health from persistent chemicals be evaluated; and (6) governments improve their response to Joint Commission recommendations prusuant to these annual reports. Of 63 water quality problem areas listed in the 1975 report, 17 have been deleted, and one (Waukegan Harbor) has been added. The reduction in problem areas more accurately reflects available data, but does not indicate major improvements in water quality. (Lynch-Wisconsin)
W78-03041

THE FRENCH MARKET FOR AIR AND WATER PURIFICATION AND POLLUTION CONTROL EQUIPMENT.
Domestic and International Business Administration, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as DIB-77-08-504, Price codes: A00 in paper copy, A01 in microfiche. Report No. DIB-77-08-504, May, 1977. 74 p, 17 tab, 5 append.

Descriptors: Equipment, *Air pollution, *Water pollution control, *Marketing, Pollution abatement, Economic feasibility, Export, Planning, *France, International trade.

The total market in France for air and water pollution control equipment in 1976 was valued at $327 million; for 1980 the projection is $417 million. Air pollution equipment in 1976 accounted for 25.8% of the total market, water pollution equipment 68.3%, and monitoring instrumentation 5.9%. A study determined the potential market in France for U.S. suppliers of such equipment, and identified major customers and distributors and specific products with the greatest sales potential for 1977-80. Products with the best potential for 1980 include industrial wastewater systems, absolute filters, scrubbers, and air and water monitoring equipment; the most important end user industries are expected to be chemicals, electrical power, petroleum, aluminum, and iron and steel. Imports in 1976 represented 6.5% of the market, but are expected to fall to 6.4% by 1980. Imports largely consisted of air and water monitoring equipment, and wastewater and gaseous air pollution control equipment. Pollution control equipment imported from the U.S. was valued at $4.31 million in 1974, $5.69 million in 1976, and is forecast at $7.49 million for 1980. In 1976 the greatest user demand for air pollution equipment was from iron and steel (20%), nonferrous metals (18%), and chemial processing, (16%); greatest users of water pollution equipment were local authorities (60%), iron and steel (9%), and pulp and paper (8%). (Lynch-Wisconsin)
W78-03042

MICROECONOMIC IMPACTS OF THE PROPOSED MARKING AND DISPOSAL REGULATIONS FOR PCBS.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 833, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-013, April 1977. 5 fig, 33 tab, 14 ref, 5 append. EPA 560/6-77-013, 68-01-3259.

Descriptors: *Polychlorinated biphenyls, *Pollutants, *Electrical equipment, *Economic impact, Economics, Costs, Toxins, Landfills, Incineration, Pollution abatement, Capacitors, *Toxic Substances Control Act, Transformers.

There is currently five times as much polychlorinated biphenyls (PCBs) in use in electrical equipment as there is free in the environment. Use of PCBs in manufacturing transformers and capacitors will be phased out by 1977 or 1978 under provisions of the Toxic Substances Control Act of 1976; marking and disposal regulations will therefore have little effect on manufactureres of new equipment, and will primarily affect owners and users of existing PCB transformers and capacitors. This study evaluates the economic impact of proposed EPA regulations pursuant to Section 6(e) (1) of the Control Act; they establish requirements for storage, record-keeping, labelling, and disposal of PCB equipment. the basic disposal requirement for all PCBs is controlled use and storage, followed by high temperature incineration. Due to high incineration costs, several exemptions have been permitted, including small capacitors in electrical equipment, PCB containers, and material with less than 500 ppm PCBs. One of three alternatives for disposal is recommended, in which all small capacitors are diverted to chemical waste landfills; this option requires only one new incinerator at a cost of $39 million annually, compared with $69 million for option 2 and $134 million for option 1. (Lynch-Wisconsin)
W78-03043

METHODOLOGY AND MEASUREMENTS OF BENEFITS OF POLLUTION ABATEMENT IN A COMMUNITY,
Pittsburg Univ., PA. Graduate School of Business.
R. F. Byrne, M. H. Spiro, C. Marshall, and W. Capitman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 452, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report, June 1976. 92 p, 10 lab, 47 ref, 4 append. 68-01-1876.

Descriptors: *Air pollution, *Pollution abatement, *Social aspects, *Benefits, Pennsylvania, Social impact, Cost-benefit analysis, Model studies, Analytical techniques, Methodology, *Clairton(PA), Willingness to pay.

A methodology developed for assessing community benefits from pollution abatement, based on willingness of residents to pay, was tested on a sample of 99 residents of Clairton, Pennsylvania. Social science survey techniques were combined with economic model building in the analysis. Clairton, with a population of 15,051 in 1970, is a highly industrialized town twenty miles from Pittsburgh dominated by giant steel, chemical, and coke works. Air pollution is very severe, although racial tensions are considered more important by residents. A preliminary series of interviews was followed by a 235-item questionnaire designed to explore the existence of differential social and psychological states and paterns of behavior, and to measure the relationship between pollution (and Pollution abatement) and satisfaction with the quality of life (well-being). Integral to the analysis was an index of subjective well-being. In general it was found that residents of Clairton are very concerned with air quality, and are willing to pay for a cleaner environment. An upward bias is suspected in the results, however, due to the substitution of subjective pollution assessment for objective measurement, necessitated by research budget constraints. It is recommended that the study should be replicated in ten communities across the country with differing pollution levels. (Lynch-Wisconsin)
W78-03044

NOTES ON THE SYMMETRY OF TAXES AND SUBSIDIES IN POLLUTION CONTROL,
Harvard Inst. of Economic Research, Cambridge, MA.
A. M. Polinsky.
Discussion Paper No. 515, October 1976. 16 p, 13 fig, 24 ref.

Descriptors: *Taxes, *Pollution abatement, *Pollution taxes(Charges), Economics, Model studies, Decision making, *Subsidies.

The proposition that efficient pollution control can be achieved by a balance of subsidies and pollution taxes has been critically examined in several studies with a consensus that the symmetry argument is valid only in the short-run. This paper

shows that not only are subsidies more inefficient in the long-run than has been realized, but may also be inefficient even in the short-run. It has been pointed out that in the long-run a subsidy induces an excessive number if firms to enter the industry, leading to excessive total output and pollution. What is not mentioned is that any given level of total output, even the wrong one, can be produced at different costs. A subsidy which conditions a fixed benefit on entry may also cause each firm to produce at an inefficient production level in the long-run. The subsidy may also be inefficient in the short-run since, even though no new firms can enter, existing firms can exit as a result of the corrective policy (i.e., produce zero output and earn negative profits equal to fixed costs). To achieve symmetry in the short-run, subsidies must be given to short-run 'potential entrants,' for which there may be political reluctance. Therefore, the tax might cause some firms to go out of business, while the subsidy could inefficiently induce these firms to stay in. The proposal to compensate firms existing when a tax is instituted with a lump sum may create serious disparity between efficiency and equity. (Lynch-Wisconsin)
W78-03048

IMPACT OF USER CHARGES APPLIED TO INLAND WATERWAYS.
Ernst and Ernst, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 459, Price codes: A07 in paper copy, A01 in microfiche. Maritime Administration, Washington, D.C., Office of Policy and Plans, December 1976. 23 fig, 16 ref, 2 append. MA-GEN-370-77084.

Descriptors: *Use rates, *Island waterways, *Barges, *Economic impact, Economics, Taxes, Inflation(Economic), Income distribution, Transportation, Ohio River, Water users, Water resources, Commodity flows.

Economic effects of imposing inland waterway user charges are assessed in terms of inflation, financial impact, tax incidence and income redistribution, and competing mode impact. A user charge is levied against persons or firms using inland waterways for transportation of commerce, and can be a license fee, fuel tax, ton-mile tax, or segment toll. Six raw materials (coal, crude petroleum, farm products, lumber and wood products, nonmetallic minerals (sand, gravel, cement), and iron ore), and three processed products (industrial chemicals, iron and steel products, and petroleum products) account for 90% of total barge traffic. Flow charts for these commodities were prepared and analyzed, and the impact of a user charge on the following sectors was evaluated: the barge, market, electricity market, consumer durable market, and rail markets, and the transportation sector. A case study of a user charge on coal transport on the Ohio River demonstrated effects on residential electricity prices, and on the output of three industries: industrial chemicals, primary metals, and fabricated metals. A significant result of the study was indentification of information needed to assess the impact of user charges. It was concluded that aggregation of impacts across transportation firms, intermediate goods producers and users, and consumers results in a misleading impact assessment. (Lynch-Wisconsin)
W78-03050

COST OF CLEANING THE ENVIRONMENT.
Environmental Protection Agency, San Francisco, CA. Region IX.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 632, Price codes: A04 in paper copy, A01 in microfiche. Panel Discussion, Environmental Protection Agency, Los Angeles, California, March 30, 1972. 70 p.

Descriptors: *Pollution abatement, *Economic impact, *Costs, Economics, Economic feasibility, Cost-benefit analysis, Water pollution control, Air pollution, Model studies, *Environmental Protection Agency.

This paper is a transcript of a panel discussion by administrators of the Environmental Protection Agency (EPA) held on March 30, 1972 in Los Angeles, California. Participants included William D. Ruckelshaus, Administrator, Paul De Falco, Jr., Thomas E. Carroll, Robert Sansom, Ellison Burton, Mark Pisano, and John Hill. Ruckelshaus asserted that the benefits of pollution control should at least equal costs. Air pollution costs for fiscal 1973-77 were estimated by the EPA at $42 billion, while the Council on Environmental Quality estimated total cost to industry and government of air and water clean-up and better solid waste management for 1970-75 at $105 billion (0.1% of the cumulative gross national product). Current pollution control requirements could force the closing of 200-300 industrial plants in 11 major industrial groups by 1976, but would not seriously hurt the industries. In these 11 industries 50,000-125,000 jobs could be eliminated (1.0-4.0%). Existing and anticipated pollution controls would reduce national GNP about 0.6% from 1972-1980, and overall unemployment would rise 0.1% (80,000-100,000 jobs). Other points discussed included the ability of the economy to absorb control costs, effects on consumer price index and on consumption, air and water pollution, automobile emission standards, and a macroeconomic model for cost inputs. (Lynch-Wisc).
W78-03051

FINANCIAL CRITICAL FACTORS ANALYSIS.
Miami Valley Regional Planning Commission, Dayton, OH.; and Linton and Co., Inc., Washington, DC.
For primary bibliographic entry see Field 5D.
W78-03052

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE SOAP AND DETERGENT INDUSTRY. PHASE I,
Environmental Protection Agency, Washington, DC. Office of Planning and Evaluation.
C. A. Houston, F. C. Herot, N. S. Douglas, and A. W. Fleer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 313, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-230/2-73-026, August, 1973. 122 p, 39 tab, 19 ref. 68-01-1566.

Descriptors: *Soaps, *Detergents, *Effluents, *Water pollution control, *Industrial wastes, Industrial water, Waste water treatment, Waste water disposal, Model studies, Economic impact, Prices, Federal Water Pollution Control Act Amendments(1972).

Proposed federal effluent guidelines for the soap and detergent industry would have a serious impact on smaller companies, leading to price increases, but would not greatly affect larger firms. No adverse community, employment, or balance of payment effects are foreseen, and no plant closings are anticipated. A small soap company, small liquid detergent company, and very large intergrated soap and detergent company were modelled to test economic effects of guidelines. Process changes required of small companies would require price increases, whereas the larger companies could more readily absorb such costs. However, since the industry is characterized by a highly concentrated market, market leaders probably will not wish to risk public censure or government punitive action due to an increase in their already large share of the market, and may be forced to raise their prices as well to avoid squeezing out the smaller producers. In 1970 four companies (Procter and Gamble, Lever Brothers, Colgate-Palmolive, and Purex) accounted for 70% of total shipment value, four more accounted for another 9%, and 350 firms made up the rest. Over 985 of plants now send effluents to public treatment facilities, and the greatest cost impact would therefore come from rising public waste treatment charges. (Lynch-Wisconsin)
W78-03053

SOME RESULTS OF STUDIES ON THE CYCLE OF SUBSTANCES AND BIOLOGICAL SELF-PURIFICATION OF BODIES OF WATER, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vunutrennykh Vod.
M. M. Kamshilov.
Gidrobiol Zh 13(1), p 5-13, 1977.

Descriptors: *Biological purification, *Self-purification, *Volga River(USSR), Phenol analysis, Organic matter, Aquatic plants, Biomass, Bodomarina, Bodo-saltans, Flagellates, Lemna-gibba, Lemna-minor, Lemna-trisulca, *Photosynthesis, Phytoplankton, Pleuromonas-jaculans.

When studying the floristic composition (Pleuromonas jaculans, Bodo saltans, B. marina, Lemna minor, L. gibba, L. trisulca) of the Volga, its trophy and saprobic character increase. Investigation of photosynthetic pigment composition in phytoplankton from water bodies of different types permitted the calculation of their average content per unit of phytoplankton biomass and the detection of the main factors on which it depends. A role of colorless flagellates is elucidated in the biotic cycle of lobes and streams. Phenol analysis of biological factors of organic matter destruction in aquatic media should be conducted from view points of biogeocenology.-Copyright 1978, Biological Abstracts, Inc.
W78-03070

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 2H.
W78-03073

WASTE NUTRIENT RECYCLING USING HYDROPONIC AND AQUACULTURAL METHODS,
California Univ., Los Angeles. Office of Environmental Science and Engineering.
For primary bibliographic entry see Field 5D.
W78-03077

USE OF ARTHROPODS TO EVALUATE WATER QUALITY OF STREAMS,
Wisconsin Dept.of Natural Resources, Madison.
For primary bibliographic entry see Field 5A.
W78-03078

FINGER-FILL CANAL STUDIES, FLORIDA AND NORTH CAROLINA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
D. B. Hicks, T. R. Cavinder, B. S. Carroll, R. L. Raschke, and P. M. Murphy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 645, Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-904/9-76/017, May, 1975. 446 p, 112 fig, 42 tab, 83 ref, 5 append.

Descriptors: *Wetlands, *Florida, *North Carolina, *Canals, *Land development, Environmental effects, Baseline studies, Sediments, Nutrients, Mathematical models, Water quality control, Water pollution control, Effluents, Wastewater(Pollution), Ecosystems, *Finger-fill canals, Flushing rates.

Four areas in Florida (Punta Gorda, Big Pine Key, Marathon, and Panama City, and one in southeast-

ern North Carolina (Atlantic Beach) were assessed for water quality effects of finger-fill canal developments. Coastal wetlands in the southeastern U.S., which are ecologically valuable transition zones between uplands and estuaries, are currently being developed for artificial water front real estate by dredging canals via two methods: (1) in the Carolinas and northern Gulf coastal area an access channel is often excavated through the wetlands, from which branches a perimeter canal along the marsh upland ecosystem, or a series of canals through the uplands; (2) in the Florida peninsula and keys, canals are generally excavated within the wetlands, with the spoil used to cover adjoining wetlands in order to raise elevation for residential development. Both methods adversely affect both wetlands and water quality; the second method not only permanently eliminates the wetland ecosystem, but creates a new system that usually negatively affects maintenance of a quality ecosystem. Based on extensive water quality, flushing rate, and nutrient exchange data, it is recommended that (1) coastal canal developments be restricted to nonwetland areas; (2) effects on shallow aquifers be assessed during planning; (3) canal depths should not exceed 4-6 ft below mean low water; and (4) no sewage effluents be discharged directly into finger-fill canal waters. (Lynch-Wisconsin)
W78-03079

REMOVAL OF ALGAE IN NATURAL BODIES OF WATER,
California Univ., Berkeley. Coll. of Engineering.
W. J. Oswald.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 086, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-059, May 1976. 140p, 41 fig, 31 tab, 18 ref. EPA802670;RWPCA16010EKS.

Descriptors: *Algae, *Aquatic weed control, *Algal control, *Harvesting of Algae, California, Mechanical control, Equipment, Eutrophication, Nutrients, Anabaena, Skimming, Cyanophyta, Lakes, Costs, Cost-benefit analysis, Nuisance algae, *Clear Lake(CA), Aphanizomenon, Microcystis.

A device for removing floating bluegreen algae from Clear Lake (CA) has been designed on the basis of several tests, and plans are underway for its construction. As most microalgae are highly hydrophilic and are repelled by intruded surfaces, the pickup unit must isolate the algae with little disturbance of the water surface. Once isolated in the unit, the algae is pumped to a screening system for concentration, and then to sand beds for dewatering. Clear Lake, a eutophic lake 130 km north of San Francisco, has a surface area of 17,000 ha and an average depth of 9 m. Flood waters from annual winter rains enter the lake carrying large quanities of nitrate, nitrite, ammonium, organic nitrogenous materials, phosphorous compounds, and trace minerals, thereby creating an ideal medium for algal growth. Removal methods based on skimming are feasible and cost-effective because of the natural flotation of the algal combined with wind-induced concentrations near the shores; concentrations range from 1,000-20,000 mg/l, compared with an average of 10 mg/l for the lake, and are 1-5 cm deep. About 2% of the lake's surface would have to be skimmed continually during the growing season to significantly reduce the scum problem; 1,000-5,000 metric tons of algae would probably be removed each year. Annual building and operating costs would be $50-60,000. A single permanent harvesting station would cost $120-150,000. Benefits from tourism and property values should amount to $200,000 as a result of algae control. (Lynch-Wisconsin).
W78-03080

CONTROL THEORY APPLIED TO NATURAL AND ENVIRONMENTAL RESOURCES; AN EXPOSITION,
Arizona Univ., Tucson. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W78-03081

ON RECYCLING AS A MOOT ENVIRONMENTAL ISSUE,
Princeton Univ., NJ. Dept. of Economics.
W. J. Baumol.
Journal of Environmental Economics and Management, Vol. 4, p 83-87, 1977. 1 fig, 4 ref.

Descriptors: *Recycling, *Waste treatment, *Resource allocation, *Economics, Environmental effects, Pollution abatement, Resources, Natural resources, Conservation, Economic efficiency, Air pollution, Water pollution, Taxes, Model studies, Cost-benefit analysis.

Recycling advantages/disadvantages are weighed and serious questions are raised concerning whether recycling truly contributes to resource conservation or pollution abatement. Recycling is not free; it uses up resources to produce other resources, and it is therefore not always certain that the marginal net product must be positive. A model is produced in which, other variables being equal, exogenously induced recycling must always reduce resources supply. The definition of recycling--purification and reconstitution of a previously-used raw material--does not include returnable bottles or discouragement of elaborate packaging. Legislation has actually favored use of virgin materials over recycled substitutes through tax advantages. Many items, such as plastics, do not readily lend themselves to recycling, while processing of other materials is difficult. In the absense of externalities, competitive general equilibrium must produce an optimal quantity of recycling, and the introduction of a recycling inducement would, if anything, reduce social welfare. Although waste disposal does generate externalities, the recycling processes themselves generate externalities. The use of garbage as fuel, for example, is likely to produce air pollution, especially in the form of particulates, and unburnable acid remains could poison land and waterways. (Lynch-Wisconsin)
W78-03086

WATER RESOURCES RESEARCH PROGRAM. TRANSPORT AND DISPERSION OF OIL-REFINERY WASTES IN THE COASTAL WATERS OF SOUTHWESTERN LAKE MICHIGAN (EXPERIMENTAL DESIGN--SINKING-PLUME CONDITION),
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W78-03092

ENVIRONMENTAL BASELINE FOR MAUMEE BAY,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W78-03095

RISK ANALYSIS METHODS FOR DEEPWATER PORT OIL TRANSFER SYSTEMS,
Transportation Systems Center, Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-03098

IMPLICATIONS OF THE U.S. COAST GUARD SEGREGATED BALLAST RETROFIT RULING ON IMPORT ALTERNATIVES AND POLLUTION OF THE MARINE ENVIRONMENT,
Operations Research, Inc., Silver Spring, MD.
R. Dayton, P. Daniels, L. Stoehr, and J. Kirkland.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 840, Price codes: A07 in paper copy, A01 in microfiche. Coast Guard Office of Merchant Safety Report No CG-M-06-77, October 1976. 126 p, 9 fig, 40 tab, 25 ref, 4 append. ONR-N00014-76-C-0918.

Descriptors: *Oil pollution, *Water pollution sources, *Water pollution effects, Environmental effects, Resources development, *Outer Continental Shelf, *Ballast disposal, Oil transport.

In May of 1976, the U.S. Coast Guard published an advance notice of proposed rule-making which would require the backfitting of segregated ballast tanks (SBT) on all tankers engaged in importing oil to the United States which displace 70,000 DWT or more. This study was commissioned to: (1) Estimate the economic costs and environmental benefits to be derived from implementation of the regulation, and (2) Examine the economic feasibility of alternative oil importing schemes (i.e., transshipment and lightering) which could circumvent the proposed regulation. The approach taken by ORI was to define in detail the U.S. oil import transportation system for a base year, 1975, in terms of the volume of crude and products delivered, the number and size of tankers involved, and the tankers' last port of call. Similar scenarios were developed for the following: (1) 1980 Status Quo, (2) SBT Retrofit Required (non-compliance), (3) 1980 Status Quo Plus Deepwater Ports, (4) 1980 SBT Retrofit Required Plus Deepwater Ports (non-compliance), (5) 1980 SBT Retrofit Required (compliance), (6) 1980 SBT Retrofit Plus Deepwater Ports (compliance). Within each scenario, required freight rates for tankers of various sizes were developed, and operational and accidental oil spills were calculated. It was determined that the 16% of the tankers in the present fleet which are subject to the SBT ruling, would very likely circumvent the retrofit requirement by lightering which is the most coast-effective transportation mode. There is no evidence that the proposed SBT ruling will be effective in reducing oil pollution of the marine environment. (Sinha-OEIS)
W78-03099

PROBABILISTIC TRAJECTORY ASSESSMENTS FOR OFFSHORE OIL SPILLS IMPACTING LONG ISLAND,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W78-03100

BASIC REMOTE SENSING INVESTIGATION FOR BEACH RECONNAISSANCE,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2L.
W78-03107

TEMPORARY STORAGE AND ULTIMATE DISPOSAL OF OIL RECOVERED FROM SPILLS IN ALASKA,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5E.
W78-03110

ANALYSIS OF OIL SPILL TRENDS,
GKY and Associates, Alexandria, VA.
For primary bibliographic entry see Field 5B.
W78-03112

SCIENTIFIC-TECHNICAL PROGRESS AND IMPROVEMENT OF THE SANITARY STATE OF BODIES OF WATER IN REGIONS OF OIL-REFINING AND OIL PETROCHEMICAL PLANTS, (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny i Profzabolevanii, Ufa (USSR).
F. G. Murzakaev, and A. A. Mingazetdinov.
Gig Sanit 7, p 7-10, 1976.

Descriptors: *Oil wastes, *Industrial wastes, *Belaya River(USSR), *Water pollution control, Chemical wastes, Organic wastes, Water quality standards, Public health.

Data showed that oil refining and oil chemical enterprises in Bashkirya (USSR) were carried out on a wide complex of technological, sanitary-technical and organizational measures to decrease the use and discharge of water and diminish the extent of contamination of the Belaya river with oil, oil products and other compounds.--Copyright 1978, Biological Abstracts, Inc.
W78-03145

TREATMENT SYSTEM FOR OILY WASTES.
For primary bibliographic entry see Field 5D.
W78-03184

THE IMPORTANCE OF THE 'EFFLUENT-FEE-LAW' EXEMPLIFIED BY THE CALCULATION FORMULA FOR THE PULP INDUSTRY (DIE BEDEUTUNG DES ABWASSERAB-GABENGESETZES NACH MASSGABE DER BEMESSUNGSFORMEL FUER DIE ZELLSTOF-FINDUSTRIE),
Papierwerke Waldhof-Aschaffenburg A. G., Raubling (Switzerland).
K. Hoch.
Muenchner Beitraege zur Abwasser-, Fischerei- und Flussbiologie, Vol 27, p 59-70, 1977. 8 fig.

Descriptors: *Costs, *Legislation, *Pulp wastes, *Pulp and paper industry, *Cellulose, Fibers(Plant), Wood wastes, Water pollution control, Pollution abatement, Industrial wastes, Waste water treatment, *West Germany.

In West Germany cellulose is obtained from sulfite process wood pulp. The cellulose factories were divided into four groups according to age. The first group included the newest plants with pollution control installations, while Group 4 included the oldest plants with no concentration tanks nor incinerators. In 1973 the 14 West German plants produced 719,000 tons of Cellulose. Of these, three were in Group 2 while two were in Group 4. The substances in the waste water from the cellulose production were dissolved lignin, organic acids, hemicelluloses, polysaccharides, and carbohydrates (hexoses, pentoses). The 'Effluent Fine Law' sets up a system of 'damage units' based upon the amount of pollutants produced. The fines charged for polluted effluents will come to 40.8% of the total value of the cellulose production in the transition period of January 1, 1976 to December 31, 1979. (Schwartz-FIRL)
W78-03191

POLLUTION ABATEMENT=GOOD HOUSEKEEPING=ENERGY/MATERIAL CONSERVATION,
For primary bibliographic entry see Field 5D.
W78-03196

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

MULTIPLE-OBJECTIVE PLANNING OF WATER RESOURCES,
Technische Hochschule, Aachen (West Germany).
For primary bibliographic entry see Field 6B.
W78-03047

CONTROL THEORY APPLIED TO NATURAL AND ENVIRONMENTAL RESOURCES; AN EXPOSITION,
Arizona Univ., Tucson. Dept. of Economics.
V. L. Smith.
Journal of Environmental Economics and Management, Vol 4, p 1-24, 1977. 13 fig, 31 ref.

Descriptors: *Economics, *Model studies, *Natural resources, Resource allocation, Capital, Equations, Recreation, Waste disposal, Recycling, *Control theory, Extinction, Nonrenewable resources, Renewable resources.

Four control theory models are applied to the dynamic economic analysis of natural and environmental resources with emphasis on their technical and decentralized interpretive similarity. The four cases are replenishable resources, exhaustible resources, wilder-ness recreational resources, and environmental waste and recycling. Technology production, and consumption of natural resource products is analyzed using simple two-commodity dynamic economic models. Renewable, nonrenewable, and amenity resource use are treated as closely related problems of optimal capital allocation over time. Thus, nonrenewable resources and the problem of exhaustion are simply zero growth cases of renewable resources and problem of species extenction. Just as exhaustion can be optimal, so can extinction. Since everything cannot be saved, society must make choices. A major value to man of preservation is retention of the gene pool, as in the case of the bison which, saved from extinction, is now being productively crossed with beef cattle. Wilderness use is treated as a problem of managing the regeneration of ecological capital, and waste recycling is treated as part of the problem of optimal regeneration of clean environmental capital. Waste accumulation is a joint consequence of household and decisions of firms to litter, that is, let waste degrade naturally instead of recycling it into production. Waste residue ultimately accumulates as a 'bad' from which there is no escape except through recycling. (Lynch-Wisconsin)
W78-03081

AN EXPERIMENTAL APPROACH TO PUBLIC PARTICIPATION FOR THE NORTH CAROLINA WATER PLAN.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Resource Planning and Evaluation.
For primary bibliographic entry see Field 6B.
W78-03084

6B. Evaluation Process

TRANSMISSION LINE RIGHTS-OF-WAY MANAGEMENT,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
D. H. Arner.
Fish and Wildlife Service, Biological Services Program, Report No. FWS/OBS-76/20.2, March 1977, 12 p. 33 ref, 1 fig.

Descriptors: *Right-of-way, *Transmission lines, *Land management, *Electric power, *Wildlife habitats, *Habitat improvement, *Multiple-Purpose Projects, *Wildlife conservation, Transmission(Electrical), Herbicides, Environmental effects, Fish conservation, Biological communities.

Proper management of transmission line rights-of-way (ROW) to maximize benefits to fish and wildlife resources is highly desirable because a large amount of land is now preempted by these ROW, and it is anticipated that future growth of electric generating capacity will require additional large acreages of land for transmission line ROW. This paper presents some current ROW management practices and their costs, the bases for selecting a specific management technique, and some possible management goals to benefit fish and wildlife in various local situations. (Katz)
W78-02730

METHODOLOGY AND MEASUREMENTS OF BENEFITS OF POLLUTION ABATEMENT IN A COMMUNITY,
Pittsburg Univ., PA. Graduate School of Business.
For primary bibliographic entry see Field 5G.
W78-03044

IMPACTS OF RECREATION IN THE COASTAL ZONE: ECONOMIC IMPACT AND NEEDS OF WISCONSIN'S GREAT LAKES BOATERS-1975,
Wisconsin Univ.-Madison. Recreation Resources Center.
A. Somersan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 933, Price codes: A04 in paper copy, A01 in microfiche. Report No. NOAA-77010606, July, 1976. 52 p, 3 tab, 4 append.

Descriptors: *Boating, *Wisconsin, *Great Lakes, *Recreation demand, *Economic impact, Recreation, Recreational facilities, Fishing, Coasts, Marinas, Lake Michigan, Social aspects, Lake Superior, Green Bay(WI).

Wisconsin's boaters on Lakes Michigan and Superior spent about $12.7 million during the 1975 summer boating season; $9.3 million (73%) was spent directly in coastal communites. Public ramp users spent $6.6 million, while marina users spent $6.1 million. Over 80% of the boaters listed fishing as their primary purpose in boating. Ramp users spent 44% of total expenditures on lodging, restaurants, and sporting goods; marina users spent 60% on food and beverages. Service stations accounted for 10-18% of spending. Total spending of ramp users in 16 coastal cities ranged from $1,812 in Oconto to $1,253,814 in Sturgeon Bay; average spending per party per trip varied from $9.55 in Oconto to $166.61 in Bayfield. Milwaukee had the highest number of boating parties, 42,085. Marina users' total spending in 27 communities was highest in Milwaukee with $1,401,215, and average spending per party was $21-44. More and improved launching facilities was the greatest need expressed; in 1975, for example, there were 1,031 boaters on marina waiting lists. Ramp users complained most of long waits for launching and pulling out of the water, plus limited facilities (particularly parking, toilets, and navigational information); marina users expresses the need for more docks, toilets, services, and supplies. (Lynch-Wisc)
W78-03045

MULTIPLE-OBJECTIVE PLANNING OF WATER RESOURCES,
Technische Hochschule, Aachen (West Germany).
F. G. Rohde, and G. Rouve.
AMBIO, Vol 6, No 1, p 83-86, 1977. 8 fig, 4 tab, 6 ref.

Descriptors: *Multiple purpose projects, *Planning, *Water policy, *Water resources, *Water resources development, Water management(Applied), Systems analysis, Environmental effects, Regional development, National income, Decision theory, National economic development, Water Resources Council, Multiple-objectives planning.

Social and environmental goals, elaburated in noneconomic formats, must be included in water resources planning and management. In 1970 the U.S. Water Resources Council proposed an operational concept embracing these objectives: (1) National Economic Development (NED), (2) Environmental Quality (EQ), and (3) Regional Development (RD). Concepts and techniques from systems analysis and decision theory can be useful in meeting these goals. Project effects with respect to NED are usually evaluated by cost-benefit analysis, with costs and benefits measured in terms of changes in national income. The most formidable accounting problem involves external economies, i.e., indirect or secondary costs and benefits of a

project. There is no consensus concerning how to meet EQ objectives. The Water Resources Council scheme describes a plan's environmental quality with quantifiable parameters (P), dimensionless quality ratings (q), and dimensionless significance ratings (s). This evaluation leads to a great amount of information rather than to one single value. The Batelle scheme summarizes the overall quality of a plan into a single parameter, the Environmental Quality Parameter (EQ). The main aspects of RD objectives are regional redistribution of income and of population, and planning success may be measured monetarily as well as in effects on employment, population, and recreation. (Lynch-Wisconsin)
W78-03047

IMPACT UPON LOCAL PROPERTY TAXES OF ACQUISITIONS WITHIN THE ST. CROIX RIVER STATE FOREST IN BURNETT AND POLK COUNTIES,
Wisconsin Dept. of Natural Resources, Madison.
M. H. Rosner.
Technical Bulletin No. 101, 1977, 24 p. 1 fig, 31 tab, 9 ref.

Descriptors: *Taxes, *Land use, Wisconsin, Forests, Recreation, Non-structural alternatives, Regional economics, *St. Croix River State Forest(WI), *Property taxes, Land acquisition.

An assessment of projected effects of land acquisition in the St. Croix State Forest, Wisconsin, between 1970 and 1980 by the National Park Service (NPS) and Wisconsin Department of Natural Resources (DNR) found that the net effect on local property taxes would be lower taxes in five towns, no change in one, and a small increase in a seventh. NPS purchases alone would increase taxes very slightly in each town, while DNR acquisitions alone would decrease taxes, due to its program of payments to towns in lieu of property taxes. Public land acquisition in Wisconsin does not result in increased local taxes because: (1) county tax bases are very large; (2) lower tax bases mean increased school aid; (3) the state payment can be in lieu of tax program; and (4) any initial change in local tax rate will be partially offset by state shared taxes and tax credits. The state makes up for most of the lost tax base, through increased school aid, in-lieu payments, shared taxes, and tax credits. Ultimately, the loss is borne by all the state's taxpayers, but at a very small increase to each. Of a total of 33,127 acres within the state forest boundaries, 27,999 are scheduled for acquisition by DNR, 2,577 by NPS for the National Scenic Riverway, and 2,251 will be retained by Northern States Power. Between 1970 and 1975 DNR acquired 9,932 acres at $374,807 and NPS 328 acres at $133,900 (1974 equalized valuation). (Lynch-Wisconsin)
W78-03049

THE RELATIONSHIP BETWEEN RESOURCE USE AND ECONOMIC GROWTH: FORCES DETERMINING THE FUTURE,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
K. E. F. Watt.
Sea Grant Publication No. LSU-R-76-008, June 1976. 19 p. 6 fig, 4 tab.

Descriptors: *Economics, *Wages, *Gross national product, Social aspects, Labor supply, Prices, *Resource depletion, *Resource prices.

A review of resource use and economic growth suggests that a wide variety of U.S. economic problems are the result of too high a value being placed on labor relative to resources, resulting in resource depletion, pollution, unemployment, crime, capital, misallocation, low economic growth, among other difficulties. Two broad strategies are suggested to break out of the trap: Price mechanism and taxation schemes. Conventional wisdom argues that with tax revenues the government could finance conservation of resources or development of new resources. The counter-argument is that government is vulnerable to interest groups that may not want a particular resource conserved or developed. The other approach is to get the government out of conservation and development and let prices float upwards without regulation. High resource prices would encourage entrepreneurs to develop a wide range of new energy and resource-acquisition systems, including solar, geothermal, and wind energy, mariculture and intense-cultured vegetables. However all this depends on a downward shift in the average level of wages relative to resource prices. It is concluded that ordinary cultural beliefs on how to attain the good life are defective and need to be changed. (Coyle-Wisconsin)
W78-03054

TECHNOLOGY IS NOT ENOUGH: THE PROVISION AND MAINTENANCE OF APPROPRIATE WATER SUPPLIES,
A. Pacey.
Aqua, Vol. 1, No. 1, p. 1-58, 1977. 23 fig, 3 tab, 18 ref.

Descriptors: *Potential water supply, *Water policy, *Institutional restraints, *Technology, Rural sociology, Potable water, Environmental sanitation, Human diseases, Pumps, Equipment, Regional development, *Western technology, *Developing countries, Technology transfer.

A review of water technology for undeveloped non-western countries concludes that any particular level of technology only has a role in a specific environment and socio-economic context. The most appropriate technology is often missed because the range of options offered to rural communities and considered by Asian, African and South American governments is too restricted. There are technologies and approaches with high or low capital costs, variable labor inputs and maintenance needs. Almost every situation lends itself to at least some improvement, even if funds and skills are severely limited. The hope of technology is that going back to basic objectives of water improvement and disregarding technical standards formulated elsewhere, and by choosing among the vast range of technological devices those which are most appropriate to the particular situation, water supplies for the poor nations can be steadily improved. A technically, appropriate water supply development scheme is described in which equipment is selected according to three criteria groups: (1) health and sanitary appropriateness; (2) functional appropriateness; and (3) environmental appropriateness. (Coyle-Wisconsin)
W78-03059

CONTROL THEORY APPLIED TO NATURAL AND ENVIRONMENTAL RESOURCES; AN EXPOSITION,
Arizona Univ., Tucson. Dept. of Economics.
For primary bibliographic entry see Field 6A.
W78-03081

NATURAL RESOURCES POLICY 1975-1985,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-03083

AN EXPERIMENTAL APPROACH TO PUBLIC PARTICIPATION FOR THE NORTH CAROLINA WATER PLAN.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Resource Planning and Evaluation.
Technical Report No II-05-D(1), August 1974. 9 p, 33 ref, 14 append.

Descriptors: North Carolina, *Planning, *Water resources, *Social aspects, Water resources development, Methodology, River basins, River basin development, *Public participation, Public relations, *North Carolina Water Plan, Citizen participation.

The 'interaction/dialogue' approach to public participation in water resources planning is recommended in connection with the Neuse River Basin Plan, a part of the North Carolina Water Plan. This approach employs workshops, interviews, advisory boards, study groups, and public meetings to include the public in planning-agency decision-making. An alternative approach which limits public participation to reacting to decisions of the planning agency was rejected as inadequate. In the Neuse River Basin project, the Citizen's Advisory Committee (CAC) was included as a full partner with the Water Resource Planning Section (WRPS). Three joint meetings for educational and planning purposes were, however, poorly attended; nevertheless a small nucleus of people emerged, who seemed committed to carrying on the program without aid from the WRPS. At the August meeting this group decided to schedule public meetings, set up a newsletter for the Neuse project, and hold quarterly CAC-WRPS meetings. Recommendations are: (1) the Department of Natural and Economic Resources (DNER) should announce an official policy goal of public participation; (2) a four-person staff should be hired by the DNER to carry out this goal; (3) ample advance time should be allowed for public participation; (4) WRPS staff should be educated in the need for public participation; (5) a CAC should be created in each basin. (Lynch-Wisconsin)
W78-03084

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE APPLICATION OF WIND ENERGY SYSTEMS TO DESALINATION,
Williamson Engineering Associates, Inc., Navarre, FL.
For primary bibliographic entry see Field 3A.
W78-02701

COMPETITIVE PRICE BEHAVIOR OF AN EXHAUSTABLE RESOURCE WHERE THE RATE OF SUBSTITUTION IS CONSTRAINED,
D. A. Hanson.
International Economic Review, Vol 18, No 1, p 135-149, February 1977. 6 fig, 5 ref. GK-42089.

Descriptors: *Resource allocation, *Investment, *Elasticity of supply, *Elasticity of demand, Competitive price, Natural resources, *Competitive market, *Capital accumulation, *Alternative process, *Backstop technology, Price behavior.

One approach to the theory of price behavior of an exhaustible natural resource in a competitive market is to relate the price of the resource to the cost of producing a perfect substitute from a process called a backstop technology. It is assumed capital can be accumulated instantly when the natural resource is exhausted. The approach taken in this paper is to introduce a constraint on the rate of investment. The constraint implies that production capacity for investment in the backstop technology is fixed. Moreover, capacity does not adjust in the face of abnormally high profits. These profits presumably accrue to factors in short supply, such as labor and specialized materials. The maximum price that the natural resource will attain will not be limited by the cost of production using the backstop technology. The price must reach the production cost for the technology before the resource is exhausted in order to build capacity in advance. If demand is perfectly inelastic, price will make a discontinuous drop when the resource is exhausted. If demand is not perfectly inelastic, price will be continuous but capacity in the

backstop technology will not be at equilibrium level when the resource is exhausted. (Coyle-Wisconsin)
W78-03046

NOTES ON THE SYMMETRY OF TAXES AND SUBSIDIES IN POLLUTION CONTROL,
Harvard Inst. of Economic Research, Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03048

IMPACT OF USER CHARGES APPLIED TO INLAND WATERWAYS.
Ernst and Ernst, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03050

COST OF CLEANING THE ENVIRONMENT.
Environmental Protection Agency, San Francisco, CA. Region IX.
For primary bibliographic entry see Field 5G.
W78-03051

FINANCIAL CRITICAL FACTORS ANALYSIS.
Miami Valley Regional Planning Commission, Dayton, OH.; and Linton and Co., Inc., Washington, DC.
For primary bibliographic entry see Field 5D.
W78-03052

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES FOR THE SOAP AND DETERGENT INDUSTRY. PHASE I,
Environmental Protection Agency, Washington, DC. Office of Planning and Evaluation.
For primary bibliographic entry see Field 5G.
W78-03053

COST REDUCTION FOR WASTEWATER TREATMENT UTILIZING WATER MANAGEMENT AT HOLSTON ARMY AMMUNITION PLANT,
DARCOM Intern Training Center, Taxarkana, TX. Product/Production Graduate Engineering Program.
D. J. Kravec.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 118, Price codes: A04 in paper copy, A01 in microfiche. Report No DARCOM-ITC-02-08-76-201, Final Report, May 1976. 47 p, 2 fig, 26 tab, 9 ref.

Descriptors: *Benefit-cost analysis, *Waste water treatment, Industrial water, Industrial effluents, Water quality control, Water management(Applied), Pollution abatement, Regulation, Industrial wastes, Water pollution, Water pollution sources, Rivers, Filtration, Trickling filters, Activated carbon, Adsorption, Water clarification, Denitrification, Chlorination, Cost analysis, Tennessee, *Holston Army Ammunition Plant(Tenn), Ammunition plants(Army).

A proposed wastewater treatment facility to meet new pollution standards at the Holston Army Ammunition Plant (Tenn.) is evaluated in terms of possible cost reductions to be effectuated by its use. Since the plant normally operates at 50% mobilization, the contractor proposed staged construction under which an initial facility would be installed to handle wastes at 50% mobilization, adequate in the absence of a national emergency. Total construction costs would be $24 million. This report analyzes possible savings if a 50% in-house reduction in hydraulic loading (quantity of wastewater) or contaminant loading (chemical contaminants per unit of wastewater) could be made. The facility includes steps for pretreatment, neutralization, denitrification, trickling filters, final clarification, sludge treatment, dual media filtration, breakpoint chlorination, activated carbon adsorption, and discharge into the Holston River. At 100% mobilization a 50% in-house reduction in hydraulic loading would result in savings of $.44 per 1000 gallons of wastewater treated over 5 years, compared with only $.18 for a 50% reduction in contaminant loading. The savings in the first case is due to reduction in equipment size, not possible in the second case. At 50% mobilization (staged construction), the savings would be $.42 for hydraulic load reduction, and $.14 for contaminant load reduction. The report concludes that the facility as designed is not the most cost effective, and fails to consider the cost and effects of improvements in existing equipment. (Lynch-Wisconsin)
W78-03085

6D. Water Demand

IMPACTS OF THE WESTERN DROUGHT ON REGIONAL ELECTRICITY GENERATION.
Federal Power Commission, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-02879

IMPACTS OF RECREATION IN THE COASTAL ZONE: ECONOMIC IMPACT AND NEEDS OF WISCONSIN'S GREAT LAKES BOATERS-1975,
Wisconsin Univ.-Madison. Recreation Resources Center.
For primary bibliographic entry see Field 6B.
W78-03045

COMPETITIVE PRICE BEHAVIOR OF AN EXHAUSTABLE RESOURCE WHERE THE RATE OF SUBSTITUTION IS CONSTRAINED,
For primary bibliographic entry see Field 6C.
W78-03046

6E. Water Law and Institutions

NEW RIVER (HEARINGS ON S. 158, WHICH PROVIDE FOR DESIGNATION OF A SEGMENT OF THE NEW RIVER WITHIN THE NATIONAL WILD AND SCENIC RIVERS SYSTEM).
Hearings--Subcomm. on the Environment and Land Resources, Comm. on Interior and Insular Affairs, U.S. Senate, May 20-21, 1976. 297 p.

Descriptors: *Wild Rivers Act, *Powerplants, *Hydroelectric plants, *North Carolina, *Conservation, Economic impact, Wild rivers, Electric powerplants, Social aspects, Wildlife conservation, National parks, National forests, Natural resources, Protection, Recreation, Scenery, Federal government, State governments, Water resources, Rivers, Natural streams, Wildlife, *New River(NC).

Hearings were held before the Senate Subcommittee on the Environment and Land Resources to consider legislation to designate a segment of the New River as a Potential component of the National Wild and Scenic Rivers System. The same legislation would also revoke a license issued by the Federal Power Commission (FPC) for the construction of the Blue Ridge Power project. Testimony was given by numerous federal, state, and local officials as well as private parties. Proponents of the legislation testified that construction of the power plant would drive 3,000 people from their lands and seriously hamper the lifestyle of the 50,000 who remained near the project. In addition, the historic value of one of the oldest river valleys in the world would be lost forever. The proposed power plant was described as totally inefficient and more of a burden than a benefit in solving the nation's energy problems. Opponents of the bill questioned the propriety of using the Wild and Scenic Rivers Act to block power plants and also highlighted the potential for a large electrical output without the aid of oil or gas. (Moorhouse-Florida)
W78-02819

DESIGNATION OF MISSOURI RIVER SEGMENT AS A WILD AND SCENIC RIVER (HEARINGS ON S. 1506).
Hearings--Subcomm. on National Parks and Recreation, Comm. on Interior and Insular Affairs, U.S. House Representatives, June 21, 1976, Serial No 94-64. 178 p.

Descriptors: *Wild rivers, *Wild Rivers Act, *Missouri River, *National recreation areas, *Conservation, Rivers, River beds, Federal government, River regulation, Resources, Water resources development, National parks, Natural resources, Scenery, Recreation facilities, Recreation, Facilities, National wildlife refuges, National forests, Economic impact.

The House of Representative's subcommittee on National Parks and Recreation held hearings on a bill to designate a segment of the Missouri River in Montana as a component of the National Wild and Scenic Rivers System. Numerous private and public interest groups submitted statements concerning the bill. The majority of comments supported passage citing the historical, archeological, geological, recreational, and scenic value of the river. Those opposed feared that reserving a 150-mile stretch of river would foreclose job opportunities by curtailing industrial development as well as raise property taxes due to the removal of large portions of land from the state tax rolls. (Moorhouse-Florida)
W78-02820

TO AMEND THE WILD AND SCENIC RIVERS ACT AND TO DESIGNATE CERTAIN LANDS AS WILDERNESS (HEARINGS ON S.3613, 3788, AND 2708).
Hearings - Subcommittee on the Environmental and Land Resources, Committee on Interior and Insular Affairs, U.S. Senate, September 24, 1976. 78 p.

Descriptors: *Rivers, *Wild Rivers Act, *National recreation areas, *Conservation, Tennessee, Montana, Wyoming, Wild rivers, River beds, Federal government, River regulation, Resources, Water resources, National parks, Natural resources, Scenery, Recreation facilities, Recreation, National wildlife refuges, National forests.

On September 24, 1976 the Senate subcommittee on the Environment and Land Resources held hearings on bills to add segments of the Obed River in Tennessee and the Flathead River in Montana to the National Wild and Scenic Rivers System and also to designate a wilderness area in the Shoshone National Forest in Wyoming. Testimony was taken from Senators and Representatives of the affected states as well as the Departments of Interior and Agriculture and private interest groups. The great weight of opinion favored the bills. However, the Department of Agriculture recommended delay in passage until the Executive branch completed a study and the President was given the opportunity to make recommendations. The only drawback cited as a result of the bill's passage was the possibility of foreclosing hydroelectrical generation from the rivers. (Moorhouse-Florida)
W78-02821

DESIGNATION OF OBED RIVER SEGMENT AS A WILD AND SCENIC RIVER (HEARINGS ON H.R. 13067 AND 13303).
Hearings--Subcomm. on National Parks and Recreation, Comm. on Interior and Insular Affairs, U.S. H. Rep. June 21, 1976, Serial No. 94-65. 132 p.

Descriptors: *Conservation, *Wild rivers, *Wild Rivers Act, *National recreation areas, *Tennessee, Rivers, River beds, Federal government, River regulation, Public lands, Resources, Water resources development, National parks, Natural resources, Scenery, Recreation facilities, Recreation, Facilities, National wildlife refuges, National forests, Safety, Hazards, *Obed River(Tenn).

The House of Representative's subcommittee on National Parks and Recreation held hearings concerning the inclusion of a segment of the Tennessee Obed River into the National Wild and Scenic Rivers System. Numerous public and private environmental groups spoke in favor of the proposal. Although most comments were general, testimony from the Tennessee Citizens for Wilderness Planning specified several major threats to the river's future in the absence of this legislation. These threats include dams, stripmining, oil and gas wells, timber cutting, real estate development, and over-use. The only dissenting opinion was expressed by the Tennessee Association of Rescue Squads who viewed the river as a dangerous recreation area. (Moorhouse-Florida)
W78-02822

NATIONAL OCEAN POLICY (OVERSIGHT TO EXAMINE GENERAL OCEAN POLICY FOR THE UNITED STATES; LAW OF THE SEA CONFERENCE BRIEFING.
Hearings--Subcomm. on Oceanography--Comm. on Merchant Marine and Fisheries, U.S. House of Representatives, Sept 9, 16, 17, June 15, 1976, Serial No 94-43. 210 p.

Descriptors: *Law of the Sea, *Research priorities, *Future planning(Projected), *Legislation, *Oceans, Water law, Legal aspects, International law, Governmental interrelations, Decision making, Governments, Federal government, Institutions, United States, Political aspects, Programs, Water resources development, Conferences, Oceanography.

The purpose of these hearings was to receive testimony to describe the position of the United States with regard to the description and implementation of a national oceans policy, to determine what the nation's goals should be in that regard, and to identify acceptable methodologies for achieving those goals. Rather than attempting to evaluate draft legislation, the committee was concerned with discerning the need for, and the form and content of, future legislation establishing a national oceans policy. The committee also received testimony concerning the New York session of the Third Conference of the Law of the Sea. The briefing dealt with where the treaty negotiations stood with respect to specific issues. Testimony indicated the positions of the three conference committees dealing with revision of various portions of the proposed treaty. Of special interest to the committee was the report that dispute settlement provisions had been limited to four basic categories: arbitration; the International Court of Justice; the new Law of the Sea Tribunal; and specialized procedures for particular kinds of disputes. (Brightman-Florida)
W78-02823

COASTAL ZONE MANAGEMENT--PART 2 (OVERSIGHT ON REGULATIONS BEING PROPOSED BY THE OFFICE OF COASTAL ZONE MANAGEMENT FOR IMPLEMENTATION OF THE COASTAL ZONE MANAGEMENT ACT AMENDMENTS).
Hearings--Subcomm. on Oceanography--Comm. on Merchant Marine and Fisheries, U.S. House of Representatives, Dec 10, 1976, Serial No 94-48. 102 p.

Descriptors: *Coasts, *Shore protection, *Environmental effects, *Project planning, Seashores, Oceans, Coastal engineering, Regulation, Legal aspects, Water law, Governments, Administration, Planning, Water resources development, Loans, Financing, Grants, Local governments, Energy.

Oversight hearings were held by the Subcommittee on Oceanography of the House Committee on Merchant Marine and Fisheries to evaluate regulations to implement the Coastal Zone Management Act amendments of July, 1976. These amendments created and funded the coastal energy impact program. Oversight into both the method used to draft the regulations and whether the proposed regulations expressed the intent of Congress was deemed necessary because of governmental, industrial, and individual expressions of concern over the proposed regulations. Objections were aired concerning: (1) regulations providing for funding administration by the Office of Coastal Zone Management (OCZM) instead of at the state level as was the Congressional intent; (2) the rapid-fire manner in which new draft proposals were issued; (3) the paucity of time provided for comments on the final draft; and (4) certain limitations on the amounts of grant money available for planning which were included in the regulations with no Congressional authorization. Testimony by OCZM personnel presents that office's rationale for the particular regulatory language chosen in these areas. Statements from individuals representing various concerned groups are also included in the hearing report. (Brighton-Florida)
W78-02824

RECENT TANKER ACCIDENTS: LEGISLATION FOR IMPROVED TANKER SAFETY (PART 2; HEARINGS ON S. 182, S. 568, S. 682, S. 715, AND S. 898).
Hearings, Committee on Commerce, Science, and Transportation, U.S. Senate, March 8, 15, 16 and 18, 1977, Serial No 95-4. 1027 p.

Descriptors: *Oil spills, *Legislation, *Oil pollution, *United States, *Transportation, Law of the Sea, Environmental effects, Ships, Water pollution, Oceans, Foreign trade, Damages, Compensation, Legal aspects, Oil, Accidents, Hazards, Safety, Safety factors, Structural design, Harbors.

In March 1977, the Senate Committee on Commerce, Science, and Transportation held hearings regarding recent tanker accidents and proposed legislation for improved tanker safety. The committee was considering five proposed bills related to tanker safety. S. 182 sought to amend the Ports and Waterways Safety Act of 1972 in order to establish liability and compensation for damages from oil spills. S. 682 also sought to amend the Safety Act by increasing the use of United States vessels to carry imported oil. Another proposed amendment to the Act was S. 715 which further attempted to improve port and waterway safety. S. 568 regulated the transportation of oil by tankers in the domestic and foreign commerce of the United States. The hearings also included discussion of S. 898, a bill entitled 'Spill Prevention and Cleanup for Energy Transportation Systems Act of 1977'. It regulated tanker pollution liability and compensation and provided incentives to prevent tanker discharge. It also sought to restore any resulting damage of natural resources. The report includes complete texts of the bills and also contains the transcripts of the various witnesses before the committee. (Quarles-Florida)
W78-02825

ESTUARINE SANCTUARY GUIDELINES.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 2L.
W78-02826

ACREAGE LIMITATION (RECLAMATION LAW AND FEDERALLY-SUBSIDIZED WATER ON NONEXCESS LANDS).
Bureau of Reclamation, Washington, DC.
Federal Register, Vol 42, No 165, p 43044-49, August 25, 1977.

Descriptors: *Federal Reclamation Law, *Water, *Acreage, *Irrigated land, *Water allocation(Policy), Administration, Reclamation, Legal aspects, Administrative agencies, Administrative decisions, Management, Water control, Water sources, Irrigation, Irrigation programs, Water requirements, Water distribution(Applied), Farm units, Farms, Regulation.

The Bureau of Reclamation has proposed rules and regulations to administer the acreage limitation and other provisions of reclamation law. The proposed regulations embody important changes in current practices to enforce the excess land (160 acre limit) and other reclamation laws. These changes include: (1) imposing immediate residency requirements upon all new purchasers of excess land benefitting from low-priced federal water and the preparation of regulations which would reimplement the residency requirement in all cases; (2) tightening the criteria for determining qualified purchasers; (3) continuing department supervision over the sale price of land after it is sold into non-excess status; (4) limiting leasing of excess and non-excess lands benefited by low-priced federal water in order to promote farm operation by the actual owner; and, (5) the alteration of procedures by which excess lands are sold to allow a large number of prospective purchasers to participate in the reclamation program. These changes are designed to fulfill the purpose of reclamation law that low-priced federal water be used as a means of encouraging the establishment of genuine small family farms. (Kastner-Florida)
W78-02827

POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN, ILLINOIS, INDIANA, MICHIGAN, AND WISCONSIN.
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5G.
W78-02828

COASTAL ZONE PROBLEMS: A BASIS FOR EVALUATION,
Washington Univ., Seattle. Dept. of Business, Government and Society.
E. Englander, J. Feldman, and M. Hershman.
Coastal Zone Management Journal, Vol 3, No 3, p 217-36, 1977.

Descriptors: *Evaluation, *Management, *Coasts, *Programs, Environmental effects, Analysis, Analytical techniques, Project planning, Quality control, Theoretical analysis, Decision making, Coordination, Administration, Control, Planning, Comprehensive planning, Financing, State governments, Administratives agencies.

Although program evaluation is essential for effective planning and management, little evaluation has been done to date in the coastal management area because most programs are either in the formulation or early implementation stage. However, evaluation of state programs could be beneficial by pointing out program deficiencies for possible correction by identifying problems that other states could avoid, and by sharpening the state policies and goals. The authors' discussion of coastal problems perceived prior to passage of the Coastal Zone Management Act is separated into resource outcome problems and organizational process problems. The authors conclude that the most important group of problems for which criteria should be derived for a national coastal management evaluation effort are: extensive environmental pollution; intensive-use conflicts among competing uses; destruction of coastal habitat; lack of coordination among public agencies; insufficient planning and regulatory authority: insufficient data base and lack of information for decision-making; little understanding of

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coastal ecosystems; resource decisions made primarily on the basis of economic considerations to the exclusion of ecological considerations. (Kastner-Florida)
W78-02829

THE UNITED STATES PROPOSAL FOR LEGAL REGULATION OF SEABED MINERAL EXPLOITATION BEYOND NATIONAL JURISDICTION,
J. R. Stevenson.
Natural Resources Lawyer, Vol 4, No 3, p 570-81, 1971.

Descriptors: *Regulation, *Exploitation, *Continental shelf, *International law, *Law of Sea, Political aspects, United States, Continental margin, Economics, Environment, Fishing, Manganese, Natural resources, Navigation, Oceanography, Oceans, Political constraints, Resource allocation, Jurisdiction, United Nations, Foreign countries, Exploration, Oil, Fuels.

Man has now developed the technology to exploit the mineral resources of the deep seabed. Simultaneously, a new trend of economic nationalism regarding control over ocean resources has appeared among the developing countries of the world. Because of its dependence on foreign sources for energy supplies, the United States government is attempting to replace the conflict with international cooperation by seeking to accommodate differences and reach agreements among nations in widely different geographic and economic situations. The American proposal to the United Nations Committee on the Deep Seabed would divide the oceans into two areas. The first would consist of a territorial limit for coastal states of twelve miles and beyond to the point where the high seas reach a depth of 200 meters. The remaining high seas would be regulated by an international regime. The regime would be governed by a council consisting of six industrial countries and eighteen developing nations; a majority of either group would have veto power. The complexity of the American proposal and the weighted voting structure have been criticized. Nonetheless, the United States believes it has offered an equitable solution to a complex problem. (Jordan-Florida)
W78-02830

UNITED STATES SEABED MINERALS POLICY,
N. Ely.
Natural Resources Lawyer, Vol 4, No 3, p 597-621, 1971.

Descriptors: *Law of the Sea, *Political aspects, *Continental shelf, *Resources, *Jurisdiction, International commissions, Federal government, International law, Oceans, Legal aspects, Water law, International waters, Treaties, Governments, Foreign countries, United Nations, Oil, Natural resources, Petroleum, Continental slope, Continental margin, United States, Administrative decisions, Oil industry.

In 1970 the Nixon administration proposed a new international treaty to govern the development of seabed minerals. Although the author of this article commends the treaty's goals he believes the interests of the United States are better served by the policy established by the Truman administration in 1945. That doctrine, adopted by the 1958 International Convention on the Continental Shelf, maintains that a coastal nation has exclusive jurisdiction over offshore mineral resources. It considers the continental shelf an extension of a nation's landmass, while the water above retains the status of 'high seas'. The proposed policy would create an International Seabed Area seaward of the 200-meter depth, which would include the continental margin and the deep ocean floor beyond. This area would be open to the use of all nations and controlled by an international commission. The author feels that the United States should retain the exclusive jurisdiction it possesses over the outer continental shelf, since the mineral resources there are the heritage of the American people. He maintains that the goals of international cooperation sought by the new policy could be achieved without sacrificing control of valuable mineral resources. (Malefatto-Florida)
W78-02831

HARD MINERAL DEVELOPMENT UNDER THE OUTER CONTINENTAL SHELF LANDS ACT--LEGAL AND ECONOMIC REQUIREMENTS OF THE INDUSTRY,
Covington and Burling, Washington, DC.
J. G. Laylin.
Natural Resources Lawyer, Vol 4, No 3, p 654-59, 1971.

Descriptors: *Exploration, *Mining, *Continental shelf, *Mineral industry, Coasts, Economic impact, Federal jurisdiction, Legal aspects, Foreign countries, Oceans, Offshore platforms, Economics, Compensation, State jurisdiction, Regulation, Exploitation.

Although commercial hard mineral operations are conducted off the coasts of many states from Alaska to Florida, no successful commercial hard mineral operations have been reported in the area governed by the Outer Continental Shelf Lands Act. The author suggests that this lack of activity results from the provisions of the Act and the regulations and administering practices under the Act. Consequently, changes in the Act could prove effective in developing hard mineral mining. The author recommends that prospectors not be required to disclose their discoveries and that mining licenses be easily obtained. Licenses should not be granted by competitive bidding and the only restrictions placed on offshore prospecting should be for environmental protection. As to licensing mining in areas beyond United States territorial jurisdiction, it is suggested the federal government issue licenses protecting abiding licensees from interference by nationals and other subject to the personal jurisdiction of the United States. These licenses would also be subject to multilateral treaties to protect licenses from foreign interference. The goal sought is increased offshore hard mineral mining with sure jurisdictional boundaries. (Spector-Florida)
W78-02832

MARINE RESOURCES COMMITTEE - ANNUAL REVIEW OF SIGNIFICANT ACTIVITIES - 1976,
For primary bibliographic entry see Field 5G.
W78-02833

WATER RIGHTS LAW: IS IT WORKING WELL ENOUGH,
D. Smith.
Western Water, p 3-6, July-August 1977.

Descriptors: *Water rights, *California, *Water allocation(Policy), *Planning, *Water management(Applied), Legal aspects, Water law, Prior appropriation, Riparian rights, Irrigation, Competing uses, Regulation, State jurisdiction, Water utilization, Water conservation, Water demand, Water supply, Groundwater, Water resources development, Political aspects, Equitable apportionment, Water policy, Prescriptive rights, Project post-evaluation.

Water rights law is a cornerstone of California's economy. For this reason many Californians are concerned with the work of the Governor's commission to review California water rights law. Established during California's recent drought, the commission has the responsibility for evaluating proposals for change and recommending those it deems valid. Topic areas being considered are: appropriative water rights, groundwater rights, legal aspects of water conservation, riparian rights, transferability of water rights, and instream water uses. There are those in California who feel its water rights law has not kept up with the changing needs of society and the economy. Critics point out that little has been done regarding water rights since 1913. Recent legal emphasis has centered on water quality. On the other hand, some have expressed concern about tampering with a system which has worked well. One water rights attorney has warned the commission against unnecessary change, reminding them that the state's economy depends upon the existing system, in which great sums of money have been invested. The commission's final report is due June 30, 1978. (Malefatto-Florida)
W78-02834

SEWERS, CLEAN WATER, AND PLANNED GROWTH: RESTRUCTURING THE FEDERAL POLLUTION ABATEMENT EFFORT.
For primary bibliographic entry see Field 5G.
W78-02835

UNITED TO PROTECT THE MEDITERRANEAN,
United Nations Environment Program, Geneva (Switzerland).
For primary bibliographic entry see Field 5G.
W78-02836

TOWARD BETTER USE OF COASTAL RESOURCES: COORDINATED STATE AND FEDERAL PLANNING UNDER THE COASTAL ZONE MANAGEMENT ACT,
M. Gendler.
Georgetown Law Journal, Vol 65, No 4, p 1057-78, April 1977.

Descriptors: *Resources development, *Conservation, *Governmental interrelations, *Coasts, *Project planning, Shoreline protection, Coastal engineering, Federal government, Economics, Federal jurisdiction, State governments, State jurisdiction, Inter-agency cooperation, Induced benefits, Project purposes, Multiple-purpose projects, Coordination, Oil industry.

Congress passed the Coastal Zone Management Act in 1972. Since the coastal zone is ecologically fragile, the legislation was designed for both preservation and development. Congress found state and local regulation arrangements inadequate. Therefore, the Act was designed to provide for management programs by the states with the full participation of federal agencies. Unfortunately, the desired coordination has yet to be realized. When agencies have initiated cooperative program-planning, the common result has been disagreement over individual authority. Although the Act offers economic inducements to the states, a better method might be to seek coordination and implementation of regulatory programs as the final objective. The office of Coastal Zone Management plays a supervisory role, evaluating and approving suggested state programs. Only the state of Washington has received approval and been granted funds for its program. That program uses a bilateral contact approach to state-federal coordination. The result has been misunderstandings, both in opinion and interpretation. A better approach might be to coordinate coastal resource programs through regional agencies with both state and federal involvement. Rhode Island is planning such a program at present. (Thomas-Florida)
W78-02838

AN HONORABLE DISCHARGE FOR THE BIGGEST POLLUTANT,
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-02839

WATER MANAGEMENT--THE FUTURE OF FLORIDA LEGAL IMPLICATIONS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
J. S. Wershow.
Florida Bar Journal, Vol 51, No 3, p 136-46, March 1977.

Descriptors: *Water management(Applied), *Florida, *Water permits, *Legislation, *Water control, Water, Water allocation(Policy), Water conservation, Water consumption, Water distribution, Water demand, Water districts, Water pollution sources, Water quality, Water resources, Water shortage, Water supply, Water utilization, Control, Controlled drainage, Local governments, Regulation.

Florida's geography and topography and the critical importance of water in the states's growth rate pose unique problems in the control and management of available water. The degree of water resource regulation in terms of availability, use, quality, and quantity is commensurate with its importance in Florida. Regulation on the state level is characterized by overlapping responsibilities of entities reflecting different interests and purposes in the control of water. The major source of conflict lies in the growing trend to centralize authority typified by the Florida Environmental Reorganization Act of 1975 contrasted with the local regulatory scheme found in the state's 'special districts'. In addition to the soil and water conservation and drainage districts, the confusion is especially prevalent in the unclear statutory responsibility of the water management districts. This defect is exemplified by a discussion of the dual requirements of the new Act and the local management districts in the area of consumptive water use permits. Also identified are the initial responses to the conflicts by involved agencies and the need for further reform of rethinking of the problems. (Steger-Florida)
W78-02840

TENSIONS AND CONFLICTS IN FEDERAL POLLUTION CONTROL AND WATER RESOURCE POLICY,
Environmental Defense Fund, New York. Eastern Water Resources and Land Use Program.
For primary bibliographic entry see Field 5G.
W78-02841

TIME-LIMITED WATER PERMITS: LEGAL AND ECONOMIC CONSIDERATIONS,
Oklahoma City Univ., School of Law.
For primary bibliographic entry see Field 3F.
W78-02842

TIDAL TITLE AND THE BOUNDARIES OF THE BAY: THE CASE OF THE SUBMERGED 'HIGH WATER' MARK,
Fordham Univ., Bronx, N.Y. School of Law.
J. A. Humbach, and J. A. Gale.
Fordham Urban Law Journal, Vol IV, No 1, p 91-128, Fall 1975.

Descriptors: *Tidal marshes, *Adjacent landowners, *Boundary disputes, *High water mark, *Ownership of beds, Vegetation, Tidal waters, Land tenure, Public lands, Shores, Sea level, Legal aspects, Water law Surfaces, Water rights, Legislation, Public rights, Plant groupings, Boundaries(Property), Constitutional law, Adverse possession.

The line between the shore and the sea, historically called the high water line, is very indefinite, thus inviting judicial scrutiny. In 1975, a New York court of appeals addressed the issue of the location of the high water line in Dolphin Lane Associates, Ltd. v. Town of Southampton where the boundary between private uplands and nonprivately owned lands under a tidal body of water was in dispute. The court adopted a line of vegetation test with the seaward edge of growth of cordgrass, a plant that needs tidal inundation twice daily, determined to be the boundary. This line was actually part of the bay bottom and had no connection with the average high water mark. No legal theory seems squarely to support adopting this test as a rule of property. Its adoption has effected a massive expropriation of the public's property by private upland owners. This may jeopardize attemps to conserve and manage these lands as they are no longer public property, and restrictions place thereon may now constitute an unconstitutional taking. Also, this rule may thwart systemized approaches to delineate shore boundaries at the actual high water line. (Hammersley-Florida)
W78-02843

THE LIABILITY OF A SALVOR RESPONSIBLE FOR OIL POLLUTION DAMAGE,
For primary bibliographic entry see Field 5G.
W78-02844

THE RIGHT TO A 200-MILE EXCLUSIVE ECONOMIC ZONE OR A SPECIAL FISHERY ZONE,
Oslo Univ. (Norway). School of Law.
C. A. Fleischer.
San Diego Law Review, Vol 14, No 3, p 549-83, April 1977.

Descriptors: *Fishing, *International law, *Law of the Sea, *United Nations, Commercial fishing, Legal aspects, Water law, Legislation, International commissions, Oceans, Bodies of water, Conferences, Marine fisheries, International waters, Foreign waters, Treaties, Foreign countries, Governments.

The right of a country unilaterally to establish a 200-mile fishing zone seems to have a fairly firm basis. However, landlocked and geographically disadvantaged states advance the view that acceptance of an exclusive economic zone is conditional upon an agreed solution on the right of those other states to fish and that such a zone may not be invoked until an agreement on fishing rights is reached. Notwithstanding this argument, the work of the United Nations Conference on the Law of the Sea gives strong support for the contentions of several coastal States that extension of their fishing zones up to a 200-mile limit is appropriate. The obligation to accord a right to other states to fish within the zone does not in itself have such standing in state practice that this special part of the Conference's Revised Single Negotiating Text can be regarded as an expression of general law. The extent of any possible obligation must depend on wide discretion on the part of the coastal state and on the outcome of its negotiations with other states. (Hammersley-Florida)
W78-02845

FARMERS INVESTMENT COMPANY V. BETTWY: A JUDICIAL RESTRICTION OF GROUND WATER WITHDRAWALS, COERCING THE ARIZONA LEGISLATURE TO ACT,
C. K. Atkinson.
Natural Resources Journal, Vol 17, No 2, p 345-55, April 1977.

Descriptors: *Arizona, *Groundwater availability, *Water allocation(Policy), *Judicial decisions, *Percolating water, Agriculture, Arid lands, Boundries(Property), Cities, Hydrology, Water management(Applied), Water demand, Imported water, Industries, Groundwater resources, Legislation, Legal aspects, Municipal waters, Political aspects, Regional economics, Water law.

Growth in population and industry in the southwest United States has created a water crisis with municipalities consequentlty attempting to expand their water rights and import water from other areas. Adding to the problem is the fact that agricultural endeavors use ninety to ninety-five percent of the water available in the southwest. While the state legislatures of the region have failed to adopt laws restricting ground water withdrawals and setting up some order of priorities for use of this limited resource, some courts have filled the gap. One such example of judicial activism is examined in this article. The Arizona Supreme Court rendered a decison limiting the water use of all municipalities and industries to water underlying their immediate boundaries. At issue was whether the doctrine of reasonable use permitted percolating waters to be used off of lands from which they are pumped if the practice would damage the common supply of others whose lands overlie that supply. Declaring that earlier use determines the better right, the court demonstrated a growing awareness of the importance of a reasonable and consistent system of water rights administration. (Spector-Florida)
W78-02846

FEDERAL COMMON LAW REMEDIES FOR THE ABATEMENT OF WATER POLLUTION,
J. D. Kakoullis.
Fordham Urban Law Journal, Vol 5, No 3, p 549-59, Spring 1977.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Common law, *Federal jurisdiction, Navigable waters, Judicial decisions, Interstate rivers, Water pollution control, Water pollution, Water law, Legal aspects, Legislation, State jurisdiction, Federal government, Discharge(Water), Constitutional law, Water quality, Water quality control.

The Supreme Court in Illinois v City of Milwaukee expressed the view that there is a federal interest in the abatement of pollution of interstate and navigable waters. When an intrastate controversy arises, the issue is not whether state law is sufficient for the resolution of such a dispute, but rather whether such disputes are of federal concern and if so, whether the federal courts must be available to complainants. The availability of federal common law remedies does not undercut a state's recognized primary role in water pollution control, but under the Illinois decision, pollution of interstate and navigable waters falls under federal law. It seems then that the effect of federal common law is to fill statutory gaps and to provide uniformity to the rules governing the interstate and navigable waters of the United States. Although even private citizens may avail themselves of the federal common law in federal courts, satisfaction of standing requirements, inherent problems in public nuisance actions, limitations on recovery of attorneys's fees, and class action requirements may all restrict the number of cases brought under federal common law. (Hammersley-Florida)
W78-02847

CANADA'S 200-MILE FISHING ZONE: THE PROBLEM OF COMPLIANCE,
British Columbia Univ., Vancouver. Inst. of International Relations.
B. Johnson, and D. Middlemiss.
Ocean Development and International Law Journal, Vol 4, No 1, p 67-110, 1977.

Descriptors: *Jurisdiction, *Canada, *International law, *International waters, *Fishing, Law of the Sea, Commercial fishing, Coasts, Aquatic productivity, Foreign waters, Marine fisheries, Oceans, United States, Foreign countries, Constraints, Induced benefits, Leases, Harbors, Costs.

On January 1, 1977, Canada implemented a unilateral 200-mile fishing zone. This step proceded the expected approval of 200-mile zones for all coastal states by the Third Law of the Sea Conference, and consequently raised problems of obtaining and maintaining compliance by other nations. As a result, Canada has been forced to

define both its jurisdictional and its compliance goals within this zone. This article addresses the problem of compliance and examines various enforcement possibilities. The authors list options based on positive sanctions (inducement) and negative sanctions (constraint) as well as combinations of the two. Positive sanctions include granting phase-out rights, fishing leases or licenses, port privileges, and access to surplus catches. Negative sanctions include the use of force, surveillance, and diplomatic pressures. After predicting the expected costs, probabilities of success and levels of conflict for each of seven enforcement strategies, the authors recommend a mix option of positive and negative constraints consisting of a low level of force plus considerable inducements. This option offers the best probability for success with low levels of conflict and medium costs. (Spector-Florida)
W78-02848

LOG FLOTATION AS EVIDENCE OF TITLE NAVIGABILITY,
Oregon Univ., Eugene. School of Law.
C. R. Schrader.
Oregon Law Review, Vol 56, No 1, p 107-23, 1977.

Descriptors: *Oregon, *Ownership of beds, *Public rights, *Navigable waters, *Flotation, Banks, Beds, Federal jurisdiction, Surface waters, Governmental interrelations, High water mark, River beds, Navigation, Streamflow, State jurisdiction, Natural flow, Natural streams, Navigable rivers.

Basically, states are vested with ownership of the beds and banks of rivers which were navigable for title purposes at the time of statehood. However, the present extent of a state's river ownership can be greatly affected by renewed attempts to determine the title navigability of its rivers. There are three types of navigability: navigability in the title sense, navigability for commercial clause or federal jurisdiction; and navigability in the rights of public use sense. This article analyzes log flotation as evidence of title navigability in Oregon. Title navigability is a question of fact to be determined in accordance with the federal test. This test vests ownership in the state if the river was susceptible in its natural state, at the time of statehood, to profitable commercial use. Susceptibility for use, rather than actual use, is the test. The author describes the log flotation test as a useful indication of navigability but warns that it is not wholly determinative. Significantly more evidence should be presented before a trier of fact is allowed to declare the existence of navigability in the title sense. (Spector-Florida)
W78-02849

EXPANSION OF THE RESERVATION OF WATER RIGHTS DOCTRINE,
Nebraska Univ., Lincoln. School of Law.
J. Spitzenberger.
Nebraska Law Review, Vol. 56, No. 2, p. 410-21, 1977.

Descriptors: *Reservation doctrine, *Federal-state water right conflicts, *Prior appropriation, *Groundwater, Nevada, Pumping, Wells, Federal government, State jurisdiction, Water sources, Water distribution(Applied), Unappropriated water, Preferences(Water rights), Water allocation(Policy), Indian reservations, Public lands, Jurisdiction, Judicial decisions, Water rights, Water law, Legal aspects.

The reservation of water rights doctrine says that when the federal government reserves land, it also reserves enough water to accomplish its purposes. Originally the doctrine applied only to Indian reservations, but it has since been expanded to include national forests and recreation areas. In Cappaert v. United States, the government sued to prevent the Cappaerts from pumping water from wells near Devil's Hole, which is on federal land. The pumping caused a decrease in the water level in Devil's Hole threatening the survival of the pupfish. The United States Supreme Court held that when the government withdrew the land known as Devil's Hole it had reserved enough appurtenant unappropriated water to maintain the level of the pool to preserve its scientific value. For the first time, the Court set forth all the attributes of the reservation doctrine as it applies to non-Indian land, thus adding more structure to the doctrine. The Court additionally recognized the hydrological relationship between surface and groundwater holding the reservation doctrine applied to groundwater as well. However, the Court has also increased uncertainty in the area of western water rights which will require Congressional solutions. (Maass-Florida)
W78-02850

THE WATER DEPLETION DEDUCTION IN KANSAS, ITS STATUS AND PROSPECTIVE USE,
D. Elkouri.
Kansas Law Review, Vol. 25, p. 453-61, Spring 1977.

Descriptors: *Kansas, *Withdrawal, *Irrigation water, *Groundwater, *Taxes, Consumptive use, Land tenure, Water policy, Prior appropriation, Water demand, Water law, Federal government, Legislation, Farm management, Irrigation practices, Legal aspects, Water management(Applied), Water rights, Groundwater availability, Water shortage.

A tax deduction for water depletion to compensate for loss of capital when the water level beneath an individual's land declines was recognized for Texas farmers in 1965 in United States v. Shubert. This deduction has not been allowed in Kansas because the Internal Revenue Service has taken the position that the Kansas landowner does not have a sufficient ownership right in groundwater to claim a depletable interest. The author feels that the Kansas irrigation farmer should be allowed the deduction, notwithstanding the variations in the ground water law of Kansas and Texas. To claim the deduction one must prove an economic interest in the water and show that the water deposit is exhaustible. Although the Kansas farmer does not own the water deposit, he does have the exlusive right to the deposit. This has been held sufficient to establish economic interest. In addition, the Kansas farmer has the burden of proving his water supply is exhaustible. A showing that the supply is being diminished in quality or quantity such that it eventually becomes economically impracticable to extract the water will qualify it as a wasting asset. (Maass-Florida)
W78-02851

SECTION 10 OF THE RIVERS AND HARBORS ACT: JURISDICTION SHOREWARD OF THE MEAN HIGH TIDE LINE,
For primary bibliographic entry see Field 5G.
W78-02852

THE MARSHLAND ISSUE: LEGISLATIVE COMPENSATION FOR LOSSES RESULTING FROM GOVERNMENTAL LAND USE REGULATIONS -- FROM INVERSE CONDEMNATION TO PRODUCTIVE USE,
B. Blinderman.
University of West Los Angeles Law Review, Vol. 9, p. 25-48, Spring 1977.

Descriptors: *Zoning, *Land use, *Compensation, *Land development, *Regulation, *Flood plain zoning, *Governments, Legislation, Penalties(Legal), Urbanization, Legal aspects, Land appraisals, Planning, Environmental control, Wetlands, Land tenure, Value, Land resources, Marshes, Eminent domain.

Land use regulation has generated much controversy over: (1) whether governmental restrictions ever impose such a burden on a landowner as to become a taking subject to an inverse condemnation action; and (2) whether the legislature should provide compensation for losses resulting from such restrictions even when not constitutionally mandated. Protection of the public and the environment requires a change in the basic philosophy behind land ownership and property rights. Property rights should be restricted to safeguard marshlands and wetlands, navigable waters, flood lands and hazardous hillsides from development and economic exploitation. Although fair standards of compensation are necessary such standards should recognize that there is no vested right to an anticipated use of land. When land use regulatons are adopted to prevent comulative damage to the environment, compensation should only be provided for losses suffered by those deprived of current, viable uses of their land rather than for those who deal in land as a commodity and claim a loss based on speculative values. (Maass-Florida)
W78-02853

FEDERAL COMMON LAW AND INTRA-STATE POLLUTION,
E. C. Pridgen.
Wake Forest Law Review, Vol. 13, No. 1, p. 246-259, Spring 1977.

Descriptors: *Federal jurisdiction, *Common law, *Water pollution control, *Law enforcement, *Pollution abatement, Water pollution, Jurisdiction, Judicial decisions, State jurisdiction, Legal aspects, Water quality control, Water quality standards, Navigable waters, Interstate waters, Bodies of water, Remedies, Water law, Standards.

Although the United States Supreme Court denied the existence of federal common law in Erie Railroad v. Tompkins, a federal common law of public nuisance to abate water pollution has since evolved. However, the Fourth Circuit Court of Appeals in Jones Falls Sewage System V. Train held that federal common law does not confer a right upon private citizens to enjoin intrastate water pollution which cannot be enjoined under the Federal Water Pollution Control Act Amendments of 1972. The court distinguished this case from the two instances where federal common law has been used: (1) the pollution of intrastate waters because neither state's law should necessarily govern; and, (2) the pollution of navigable waters when the United States complains because that is an exercise of sovereign authority to protect its proprietary rights. The author concludes that the 1972 amendments do preserve common law rights and that the courts contention that the use of federal common law cannot be sustained on the same basis as its use to abate interstate pollution ignored other justifications for applying federal common law including the need for uniformity of pollution standards. (Maass-Florida)
W78-02854

THE UNITED STATES-PERUVIAN 'FISHERIES' DISPUTE,
D. C. Loring.
Stanford Law Review, Vol. 23, No. 3, p. 391-453, February 1971.

Descriptors: *International law, *International waters, *Jurisdiction, *Fish conservation, Aquatic productivity, Coasts, Commercial fishing, Competition, Conservation, Continental shelf, Developed waters, Economic impact, Federal government, Foreign countries, Foreign waters, Governments, Marine fisheries, Pacific Ocean, South America, Law of the sea, Oceans, Political aspects, United States.

Since the early 1950's, the United States and Peru have been at odds over Peru's exercise of jurisdiction over fishing vessels within 200 miles of its

coast. Peru claims to be promoting conservation and fisheries development while acting within the scope of its sovereign powers. The United States claims the need for freedom of the seas has resulted in an International Law setting the jurisdictional limit for a coastal nation at 12 miles. The Peruvians have potlitcal, economic and psychological factors at stake in the dispute, while America's interests are mainly military and conservationists, as well as economic. This article analyzes the controversy by tracing the history and growth of the dispute, the legal arguments, the conflicting interests at stake, and governmental policies adopted to further those interests. Finally, the author suggests paths the United States could follow to reduce tension and produce a compromise solution. A hard reevaluaton of the United States' priorities followed by a bilateral legal settlement is recommended. (Spector-Florida)
W78-02855

THE CONFINED DISPOSAL PROGRAM FOR POLLUTED DREDGE SPOIL IN THE GREAT LAKES,
Eastern Michigan Univ., Ypsilanti. Dept. of Geography and Geology.
For primary bibliographic entry see Field 5G.
W78-02856

THE TAKINGS ISSUE IN A NATURAL SETTING: FLOODLINES AND THE POLICE POWER,
Tennessee Univ., Knoxville. School of Law.
For primary bibliographic entry see Field 6F.
W78-02857

WHO OWNS THE OCEANS,
Portuguese State Secretariat for Fisheries, Lisbon.
M. E. Goncalves.
UNESCO Courier, Vol 30, p 4-8, January 1977.

Descriptors: *Law of the Sea, *Water resources development, *International law, *United Nations, Exploration, Exploitation, Foreign countries, Governments, Coasts, Marine geology, Sea water, Shores, Oceans, International waters, Treaties, Natural resources, Resources development, Resources, Legal aspects, Jurisdiction.

Growing concern about the problem of protecting the sea's living resources while defending national sovereignty, particularly that of non-industrially developed nations, has led United Nations members to recognize the need for a legal framework to decide such questions. One suggestion is that the proposed International Seabed Authority would administer the exploitation of minerals in the seabed beyond the area of national jurisdiction for peaceful purposes only. Benefits would be shared equally among all members with emphasis on the needs of developing countries. A second proposal would adopt a 200-mile economic limit, thereby bringing on one third of the 'high seas' under coastal states' jurisdiction. Establishment of a New International Economic Order based on international cooperation is hampered by disputes regarding preferences given to developing countires, control of oceanographic research, payments expected for transfer of technology to developing nations, and the need for unified control standards to protect the marine environment. Final agreement will depend upon compromise and utilization of international means of settling disputes, including arbitration, the International Court of Justice at The Hague, and the new Law of the Sea Tribunal. (Mulligan-Florida)
W78-02861

ENVIRONMENTAL PROTECTION AGENCY'S VIEW OF PROJECTED OIL DRILLING ON THE CONTINENTAL SHELF,
Environmental Protection Agency, Washington, DC. International Affairs.
F. Green.
Sea Technology, Vol 17, No 10, p 10-13, 32, October 1976.

Descriptors: *Oil pollution, *Drilling, *Oil spills, *Continental shelf, Oil, Natural resources, Oily water, Oil industry, Water pollution sources, Chemical wastes, Water pollution, Oceans, Marine fish, Sea water, Coasts, Shores, Oil wastes, Water resources development, Wildlife, Transportation, Regulation, Exploitation.

Offshore oil and gas development should allow for the husbanding of the living resources of the sea and the safeguarding of onshore values such as recreational land, salt marshes, and human health. Since potential pollution from development of the Outer Continental Shelf would directly threaten the coastal zone, guidelines are offered to oil drillers to prevent ecological disasters. More research is needed before the full effects of seabed oil extraction, toxicity of petroleum compounds in the food chain, and oil leaks among marine organisms can be determined. Present Outer Continental Shelf policies are inadequate and must be reworked to include operating orders for new sites on the Atlantic Coast, Alaska, or southern California. Coordination and planning among responsible federal and state agencies must improve. Sophisticated detection equipment is recommended to track major oil spill prevention program is that regulations for transportation activities such as pipelines, railroads and trucks have not yet been formulated. Safety measures could also be bolstered by additional funding for the Coast Guard patrol and clean-up activities. (Mulligan-Florida)
W78-02862

DEPARTMENT REVIEWS DEVELOPMENTS IN INTERNATIONAL FISHERIES POLICY,
Department of State, Washington, DC. Office of Oceans and Fisheries Affairs.
R. L. Ridgway.
Department of State Bulletin, Vol 76, No 1966, p 175-78, February 28, 1977.

Descriptors: *Fish conservation, *Commercial fishing, *Jurisdiction, *Coasts, *Oceans, Aquatic animals, Aquatic environment, Aquatic production, International law, Atlantic Ocean, Pacific Ocean, Continental shelf, Economic life, Foreign waters, Fish, Fish management, Fisheries, Foreign countries, Governments, Marine fisheries, Seashores.

The United States is both a coastal fishing nation and a distant-water fishing nation. Foreigners fish our waters extensively and our fishermen frequent the coastal waters of other nations. The presence of large mechanized foreign fleets off our coasts has become commonplace since the 1950's, sparking protest from American fishermen. The Fishery Conservation and Management Act was passed in 1976 to protect our resources and preserve the livelihood of our fishermen. The federal government sought to strike a balance by giving the United States control over its coastal stocks, and providing for conservation and management of its fisheries resources while protecting the interests of its distant-water fishermen. The Act mandated negotiations with foreign nations to set out principles and procedures by which they may fish in United States waters. It also sought recognition of a 200-mile fisheries conservation zone off the United States coasts. This article lists nations which have signed the governing fishery agreements and those with whom negotiations are underway. The author discusses problems such as time lags between signing agreements and obtaining valid permits aboard foreign vessels. She offers suggestions to expedite the transitional process. (Spector-Florida)
W78-02863

DEPARTMENT DISCUSSES INTERNATIONAL APPROACHES TO PROBLEM OF OIL SPILLS FROM VESSELS,
Law of the Sea Conference, New York.
T. V. Learson.
Department of State Bulletin, Vol 76, No 1963, p 113-16, February 7, 1977.

Descriptors: *International law, Ships, *Oil spills, *Regulation, *Treaties, Water law, Oceans, Legal aspects, Governments, Law enforcement, Foreign waters, Harbors, Law of the Sea, Water pollution, Water pollution sources, Political aspects, International waters, Oil wastes.

Under international law, the degree of prevention and enforcement powers which the United States possess with regard to the vessel-pollution problem is determined by the location of the vessel. There are three zones of influence. In internal waters, including ports, a coastal nation may legislate and enforce pollution regulations without restriction. In territorial waters, a coastal-state has sovereignty to regulate subject to the right of vessels to innocent passage. Outside territorial waters a coastal-state may take necessary action to prevent grave and imminent danger. In addition to the rights of coastal states to regulate against vessel pollution, flag states are obligated to police vessels under their jurisdiction. Current Law of the Sea negotiations urge increased obligations on flag states and increased powers of enforcement for coastal-states and states with vessels in port. The current Administration wants to increase the powers of port-states to maintain freedom of the seas in the 200 mile economic zone and to allow port states to prosecute vessels for violations of international laws. The issue of liability for damage caused by oil spills is also discussed. (Curran-Florida)
W78-02864

HOW PEOPLE WHO REMEMBER CLEAN WATER ARE USING NEW LAWS TO BRING IT BACK,
National Wildlife, Vol 15, p 26-27, December 1976.
O. A. Houck.
National Wildlife, Vol 15, p 26-27, December 1976.

Descriptors: *Wildlife conservation, *Wetlands, *Drainage effects, *Legislation, *Water pollution control, Wildlife, Wildlife management, Habitat improvement, Marsh management, Land development, Swamps, Drainage practices, Land reclamation, Fish management, Fish conservation, Wildlife habitats, Environmental effects, Balance of nature, Federal Water Pollution Control Act, Aquatic habitats, Natural resources, Water quality, Water quality control.

Legislation is now available to aid citizens in resisting wetland development injurious to wildlife. The National Environmental Policy Act requires resource decisions to be open to public scrutiny and that the environmental impact be considered. The Fish and Wildlife Coordination Act demands that federal projects destroying wetlands provide replacement habitat. The 1972 Water Pollution Control Act covers chemical and sewage discharges, requiring a permit meeting state and federal standards for each discharge. Section 404 mandates notice in advance, criteria, and an opportunity for public hearings, and gives the permit responsibility to a former offender, the Corps of Engineers. Other destroyers of wetlands include the small watershed program of the Soil Conservation Service and the federal highway programs. The latter drains wetlands for highways and large interchanges. Section 4(f) of the Department of Transportation Act can help control such development by its prohibition of roads through refuges, parks, and recreation areas unless no feasible alternative exists. It is possible for concerned citizens to take a more assertive approach against offenders by utilizing available laws to their fullest. (Mulligan-Florida)
W78-02865

UNDERSEA RESOURCE AT STAKE AT U.N. CONFERENCE,
P. Lewis.

National Journal, Vol 8, No 9, p 249-54, February 28, 1976. 1 tad.

Descriptors: *Mineral industry, *Law of the Sea, *International law, *Negotiations, *Commercial fishing, United Nations, Oceans, Mining, Continental shelf, Navigation, International waters, Marine fish, Marine geology, Treaties, Water pollution, Resources development, Ships, Economics, Oil industry, Metals, Water law, Ownership of beds.

Because of the world's increasing use of the sea, existing international law has become outmoded. The third United Nations Conference on the Law of the Sea has attempted to draw up a new international treaty governing ownership and conservation of sea resources and restricting marine pollution. Conflicts between maritime powers and developing nations has prevented significant progress. Industrialized coastal nations wanted a 200-mile economic zone to tap seabed mineral resources. Developing nations and landlocked countries wanted deep-sea mining internationalized. Suppliers of minerals feared economic instability from new mining sources. The 200-mile limit for fishing also divided landlocked nations from those with lengthy coastlines. The Conference focused control of marine pollution on vessel-source pollution threatening those nations with outdated merchant fleets. Although fishing and pollution compromises appear likely, the author stresses seabed mining as the major problem area. Because the rich, technological countries, especially the United States, will be the primary beneficiaries, a serious wealthy/poor nation division will continue. Instead of creating a genuinely international code of law for the profit of all, the Conference appears to have sanctioned a massive carve-up of continental shelf riches. (Cocheu-Florida)
W78-02866

IMPLEMENTING THE DRINKING WATER ACT--A NEW APPROACH FOR EPA,
For primary bibliographic entry see Field 5G.
W78-02869

TOWARD REGIONAL ARRANGEMENTS FOR REGULATION OF MARINE POLLUTION: AN APPRAISAL OF OPTIONS,
Nairobi Univ. (Kenya). Inst. for Development Studies.
For primary bibliographic entry see Field 5G.
W78-02870

MEXICO'S UNILATERAL CLAIM TO A 200-MILE EXCLUSIVE ECONOMIC ZONE: ITS INTERNATIONAL SIGNIFICANCE,
Universidad Nacional Autonoma de Mexico, Mexico City.
A. Szekely.
Ocean Development and International Law Journal, Vol. 4, No. 2, p. 195-211, 1977.

Descriptors: *Mexico, *Law of the Sea Conference, *International commissions, *International law, Law of the sea, Fishing, Jurisdiction, Foreigh waters, Continental shelf, Legal aspects, Oceans, Negotiations, International waters, Treaties, Conferences, Commercial fishing.

The purpose of this work is twofold. First, to analyze the general significance, from an international point of view, of the unilateral establishment by Mexico of its 200-mile Exclusive Economic Zone, within the framework of, respectively, the present standing of the emerging rules of the new land of the sea, and the stage at which the Third United Nations Conference on the law of the sea finds itself after four seasons of negotiations. The arguments resorted to by Mexico in order to defend the legality and opportunity of its claim of establishment of the Exclusive Economic Zone is contrary to Mexico's traditional law of the sea practice, the practice consisting of a permanent policy by Mexico, throughout its independent life, of waiting for international agreements to be concluded, or for international customs to be definitely shaped, before proceeding to the unilateral delimitation of its marine zones. (Curran-Florida)
W78-02871

WETLANDS LEGISLATION IN NEW HAMPSHIRE,
M. B. Stusse.
New Hampshire Bar Journal, Vol 18, No 4, p 265-80, June 1977.

Descriptors: *New Hampshire, *Wetlands, *Legislation, *Dredging, Landfills, Legal aspects, Administration, Regulation, Water law, Freshwater marshes, Salt marshes, Tidal marshes, Drainage effects, Constitutional law, Penalties(Legal), Permits, Zoning, Swamps, Local governments, Drainage, Water pollution.

The failure to understand the value of wetlands has led to the dredging, filling and destruction of wetland resources. In the past, this misconception has resulted in such legislation as New Hampshire's Improvements of Swamp Lands Act which encourages townships to dredge and fill wetlands. This article examines five New Hampshire statutes which could theoretically apply to wetlands. Also examined are the sometimes conflicting penalties imposed for violation of the wetlands laws. The author suggests future legislation which could accurately reflect the value of wetlands. The existing New Hampshire laws affecting wetlands, which are considered in the article, deal with the placing of fill in both public waters and tidal waters, the excavating or dredging of land under public waters, and water pollution. Also discussed are the effects of local and federal regulation of wetland areas. The author recommends that New Hampshire enact a specific and comprehensive wetlands alteration law which insures due process, defines the land affected, identifies the purpose for which wetlands can be protected, provides for local control, minimizes the burden placed on the regulating body, and establishes uniform enforcement and penalties. (Curran-Florida)
W78-02872

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, DC. Environmental Quality Dept.
For primary bibliographic entry see Field 5G.
W78-02873

SAVING THE GREAT LAKES,
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5G.
W78-02875

BUILDING A BETTER SMALL WATERSHED PROGRAM,
For primary bibliographic entry see Field 4D.
W78-02876

TIDELANDS SEAWARD OF PUBLIC RECREATIONAL SITES; PERMITS; NOTICES.
Alas. Stat. secs 38.05.330, 38.05.345(d), (Supp. 1976).

Descriptors: *Alaska, *Recreation facilities, *Permits, *Land use, Land, Fisheries, Leases, Bodies of water, Ditches, State governments, Priorities, Easements, Right-of-way, Intertidal areas, Pipelines, Roads, Transmission lines.

The state of Alaska has enacted legislation that allows a municipality which accepts a public recreation facility from the state to apply for and receive by conveyance all state-owned land seaward of the facility between the mean high and low tide lines. Regulations may be promulgated providing for such conveyance. Certain interests relating to shore fisheries development and mineral exploration obtained before August 13, 1974, are affected by this legislation only on the date of their expiration or termination. Permits, rights of way or easements on state lands may be granted certain enumerated uses such as roads, pipelines, transmission lines and mineral production facilities. Uses of greatest economic benefit to the state will be preferred with first preference given to upland owner for the use of tideland and contiguous submerged land, seaward of the upland owner's property and needed for any permitted use. Public notice of the disposal of any interest in land adjacent to a body of water or waterway must state that a determination as to whether the water is navigable or public is to be made if it has not been previously determined. (Smith-Florida)
W78-02911

TANK VESSEL TRAFFIC REGULATION ACT.
Alas. Stat. secs 30.20.010 thru 30.20.070 (Supp. 1976).

Descriptors: *Oil pollution, *Oil spills, *Legislation, *Safety, *Alaska, Hazards, Oily water, Natural gas, Water pollution, Accidents, Wastes, Equipment, Fish conservation, Regulation, Water pollution effects, Shore protection, Law enforcement, Penalties(Legal), Natural gas, Transportation, Ships, Water pollution sources.

The legislature of Alaska was prompted by the state's irregular shoreline and its susceptibility to long-term damage from large oi discharges to pass the Tank Vessel Traffic Regulation Act in 1976. Thus, tankers and other carriers of crude oil, refined petroleum products or their by-products are required to have specific safety and maneuverability equipment or be escorted by tugs while in waters of the state. Such items as navigational systems, collision avoidance systems, and radar devices are mandatory. The Act also establishes authority in the Department of Environmental Conservation to enforce traffic regulations. Traffic regulatons shall be established, adopted, maintained, and administered with the consultation and cooperation of the United States Coast Guard. Violators of the Act's provisions, or of regulations adopted under its authority, are subject to fines ranging from $1,000 to $25,000 and/or a maximum prison term of one year upon conviction. Each day on which a violaton occurs may be considered a separate and additional offense. The governor may, upon approval by the state legislature or the United States Congress, enter into agreements with any other state or foreign government to implement the purposes of the Act. (thomas-Florida)
W78-02912

ABANDONED MINE DRAINAGE CONTROL ACT.
Md. Code Ann, sec 7-604 (1974), as amended, (Supp. 1976).

Descriptors: *Drainage programs, *Legislation, *Maryland, *Mining, *Pollution abatement, Loans, Financing, Land reclamation, Mine drainage, Government supports, Drainage effects, Land development, Conservation, Land use, Mine wastes, Economics, Strip mines, Land tenure, Cost repayment, Water pollution sources, Coal mine wastes, Water quality.

The state of Maryland has enacted legislation requiring that all proceeds from the state's Mine Reclamation and Water Quality Restoration Loan of 1970 be expended exclusively to finance the costs of acquisition, reconstruction, extension, and improvement of facilities in connection with the prevention, control, and abatement of pollution of the waters of the state from abandoned

deep or strip mines, including the prevention of drainage. However, the proceeds are not to be used to improve, rehabilitate or prevent drainage on any land not owned by the state or its political subdivisions unless the actual owner of the land contributes toward the cost of such improvements. After land has been improved through any of the above means, it may be sold, retained by the state, or transferred to a political subdivision. The state may accept gifts of land from private persons to accomplish the purposes of the Act. After improvement, such land is also subject to transfer. All proceeds from the sale of land acquired under this section are to be deposited in the 'Abandoned Mine Drainage Capital Fund'. (Thomas-Florida)
W78-02913

SURFACE MINING.
Md. Code Ann. secs 7-6A01 thru 7-6A31 (1974), as amended, (Supp 1976).

Descriptors: *Mining, *Permits, *Legislation, *Maryland, *Reclamation, Industrial wastes, Mine wastes, Waste disposal, Aquatic habitats, Balance of nature, Environmental effects, Fisheries, Wildlife, Planning, Land reclamation, Soil conservation, Economic justification, Stripmines, Regulation, Inspection.

The state of Maryland has enacted legislation to regulate surface mining. The legislature recognized that surface mining is vital to the economic well-being of the state but also realized the need to protect the health of its citizens from the harmful results of the mining. A permit system for surface mining is established with the Department of Natural Resources having the authority to grant, deny, and revoke mining permits. Permit applications may be denied if the proposed mining will constitute a danger to natural conditions or to human activities in a neighboring area. Permits are granted for any reasonable time not exceeding twenty-five years. Applications must be filed for permit modifications. Permit renewal is subject to the same procedures and standards as the initial permit application. Permits may be transferred, leased, or assigned with approval of the Department. A permit applicant must submit a mining and reclamation plan. Holders of permits must file an annual mining and reclamation progress reort and are subject to periodic inspections. The Department must make a final inspection when reclamation has be completed. If reclamation is satisfactory, the operator's performance bond will be released. (Thomas-Florida)
W78-02914

ALASKA OIL DISCHARGE PREVENTION AND POLLUTION CONTROL ACT (GENERAL AND MISCELLANEOUS PROVISIONS).
Alas. Stat. secs 30.25.290 thru 30.25.360 (Supp. 1976).

Descriptors: *Alaska, *Oil pollution, *Legislation, *Water pollution control, Environmental control, Oil spills, Interstate compacts, Discharge(Water), Facilities, Ships, Regulation, Administrative agencies, Cities, Navigable waters, Transportation.

Article Seven of the Alaska Oil Discharge Prevention and Pollution Control Act of 1976 contains general and miscellaneous provisions. One section grants the governor power to execute supplementary agreements, reciprocal arrangements, or compacts with other states or foreign governments. There is a provision requiring an annual report to the governor and the legislative from the Department of Environmental Conservation. Another section provides that the terms of this act or regulations of the department prevail over municipal ordinances and regulations. The Administrative Procedure Act is deemed inapplicable to the proceedings of the department under the Pollution Control Act subject to enumerated exceptions. The state is not liable for any act or omission arising out of the enforcement or implementation of the act. Also included are the definitions of the following terms: barrel; board; carrier; commissioner; deadweight tonnage; department; discharge; fund; municipality; crude oil; oil terminal facility; operate; transferred; tank vessel; and, waters of the state. (Howard-Florida)
W78-02915

OIL TERMINAL FACILITIES: TRANSFER OF CRUDE OIL, REFINED PETROLEUM PRODUCTS OR THEIR BY-PRODUCTS.
Alas. Stat. secs 30.25.010 thru 30.25.210 (Supp. 1976).

Descriptors: *Alaska, *Oil industry, *Oil spills, *Oil pollution, *Water pollution control, Compensation, Storage, Transportation, Inspection, Offshore platforms, Water pollution effects, Water pollution treatment, Environmental control, Oil wells, State governments, Seashores, Estuarine environment, Risks, Penalties(Legal), Coasts, Beaches.

The Alaska legislature has recognized the need to protect coastal and inside coastal waters and beaches from the spills, discharges and escapes of crude oil or refined petroleum that may occur as a result of procedures involved in the transfer and storage of these products. The statutes seek to exercise the police power of the state through the Department of Environmental Conservation to deal with the hazards posed by these transfers by requiring prompt removal of oil spills, compensation where damage occurs, and inspection and supervision of oil transfer activities. A provision is made for establishing a system of regulation by requiring the possession of a certificate of risk avoidance, payment of rish charges and proof of financial responsibility by owners or operators of oil terminal facilities. The statutes allow exemptions for some business from the proof of financial responsibility and certificate of risk avoidance requirements, and grant the governor emergency proclamation powers when a disaster arising from the discharge of oil products appears imminent. Criminal and civil sanctions are established for violations of the statutes. (Howard-Florida)
W78-02916

ALASKA LAND ACT (DEFINITIONS OF NAVIGABLE WATERS AND PUBLIC WATERS).
Alas. Stat. sec 38.05.365 (Supp. 1976).

Descriptors: *Alaska, *Navigable waters, *Inland waterways, *Legislation, Rivers, Streams, Lakes, Ponds, Bays, Estuaries, Straits, Oceans, Sounds, Inlets(Waterways), Canals, Lumbering, Public benefits, Recreation, Fish migration, Wildlife habitats, Aquatic habitats.

For the purposes of the Alaska Land Act navigable water are defined as 'any water of the state forming a river, stream, lake, pond, slough, creek, bay, sound, estuary, inlet, strait, passage, canal, sea or ocean, or any other body of water or waterway within the territorial limits of thestate or subject to its jurisdiction, that is navigable in fact for any useful public purpose, including but not limited to water suitable for commercial navigation, floating of logs, landing and takeoff of aircraft, and public boating, trapping, hunting waterfowl and aquatic animals, fishing or other public recreational purposes'. Public waters are defined as 'navigable water and all other water, whether inland or coastal, fresh or salt, that is reasonably suitable for public use and utility, habitat for fish and wildlife in which there is a public interest, or migration and spawning of fish in which there is a public interest'. (Curran-Florida)
W78-02917

LIMITATION ON OIL AND GAS LEASES IN CERTAIN AREAS, AND REACQUISITION OF LEASES.
Alas. Stat. secs 38.05.184 (Supp. 1976).

Descriptors: *Alaska, *Bays, *Oil pollution, *Leases, *Natural resources, Oil drilling, Drilling, Oil, Currents(Water), Natural gas, Crabs, Shellfish, Water law, Commercial shellfish, Water pollution, Commercial fishing, Fish, Marine fisheries, Water pollution effects, Negotiations, Eminent domain.

The Alaskan legislature found that oil and gas development in the Kachemak Bay presents an undue hazard to commercial fisheries and decided to limit future leasing in the bay area. Recent information disclosed that even minute quantities of oil released into the marine environment may be harmful to the larval forms of crabs and other marine life and that the existence of gyral currents within the bay may increase the likelihood of oil coming into contact with these valuable commercial fish and shellfish. Because of these findings no additional oil and gas leases are to be issued for the exploration for, or the development or production of, oil and gas on state-owned land in the bay area. The state is to enter into negotiations to reacquire by purchase or credit offsets outstanding interests in oil and gas leases in the prescribed area. For a period of one year there are to be no drilling activities in the bay area. During this moratorium, the state is to develop plans to protect the marine resources. Any leases not acquired during the moratorium period may be the subject of eminent domain proceedings. (Curran-Florida)
W78-02918

COASTAL PROTECTION FUND.
Alas. Stat. secs 30.25.220 thru 30.25.280 (Supp. 1976).

Descriptors: *Alaska, *Risks, *Protection, *Oil spills, *Coasts, Estimating, Oil, Research and development, Legal aspects, Penalties(Legal), Oil pollution, Oil spills, Docks, Management, Costs, Safety, Legislation, Shore protection.

The state of Alaska has enacted legislation creating a coastal protection fund. This fund is established as a revolving fund whose proceeds are to be used to carry out the purpose of the act by the appropriate department. The fund is to be supplied and maintained from annual risk charges to carriers and terminals covered by the act. The amount of the risk charge required of a carrier transporting crude or refined petroleum products will be determined by the presence of safety or maneuvering capabilities and if the vessel is 40,000 deadweight tons or more by the presence of gas inerting systems, the capacity of segregated ballast tanks and prior risk experience. Money in the fund may be disbursed for administrative expenses; for all cost involved in the abatement, containment or removal of pollution related to the discharge of oil products; and for research and development. If excess disbursements occur, the fund will be maintained by pro rata charges to carries and terminals covered by the act. Oil terminals facilities and carriers are held strictly liable for all violations. (Curran-Florida)
W78-02919

CIVIL ACTION FOR POLLUTION; DAMAGES; INJUNCTIONS; CRIMINAL PENALTIES.
Alas. Stat. secs 46.03.760 thru 46.03.790 (Supp. 1976).

Descriptors: *Alaska, *Penalties(Legal), *Assessments, *Legislation, Permits, Water law, Regulation, Administration, Law enforcement, Civil law, Damages, Abatement, Control, Water pollution, Costs, Investigation, Pollution abatement.

The state of Alaska has established fines for persons who violate Alaska's water conservation laws, administrative orders or conditions for a permit. The sums assessed under this statute are not to be used for punitive purposes but are to include the reasonable compensation for any adverse en-

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vironmental effects caused by the violation, the cost incurred by the state in detection, investigation and correctig the violation and the economic savings realized by the person in not complying with the requirements for which a violation is charged. The superior court can grant an injunction to enjoin a violaton without a showing of physical irreparable harm. A person who violates the water conservation law, administrative orders or conditions for a permit may also be charged with a criminal misdemeanor punishable by a fine. A person who willfully violates these laws may be imprisoned in addition to a fine. (Curran-Florida)
W78-02920

MONROE CONTRACTORS EQUIPMENT, INCORPORATED V. STATE (LIABILITY IN DIVERTING WATER COURSES).
395 N.Y.S 2d 829-31 (App. Div. 1977).

Descriptors: *New York, *Flood damage, *Culverts, *Road construction, *Negligence, Water, Water level, Elevation, Surfaces, Overflow, Flow, Floods, Legal aspects, Water law, Water flow, Surface water, Runoff, Channels, Pipes, Highway effects, Highways, Roads.

Claimant landowner successfully mantained a suit against the state for damages caused by flooding of the claimant's land which adjoined state property. Prior to state acquisition of the property, a natural ditch ran across the property and along a road bordering the claimant's land. At some previous time, a pipe had been laid under the road. Although the pipe had gradually filled with silt and no longer carried water away from the claimant's land, there had been no flooding of the land before the state constructed a highway adjacent to it. The state contended that it was not liable because it merely changed the elevation of the land and that only surface water flowed onto claimant's property. The state did admit: (1) observing the ditch and the moving water before starting construction; and (2) not making a careful search for the source of the water. The Appellate Division of the New York Supreme Court held that the state negligent in blocking the long-existing water course passing through a culvert near claimant's property and liable for the resulting flood damage. (McPherson-Florida)
W78-02921

COX V. CAMBRIDGE SQUARE TOWNE HOUSES, INC.
236 S.E.2d 73-75 (Ga. 1977).

Descriptors: *Damages, *Georgia, *Sewers, *Storm drains, *Drainage systems, Erosion, Storms, Streams, Storm runoff, Surface waters, Drainage, Surface drainage, Bank erosion, Rainfall intensity, Legal aspects, Judicial decisions, Water law, Trespass.

Appellant landowner brought suit against appellee apartment complex owner claiming that the installation of a storm drain system by the appelle greatly increased the flow of surface waters across the appellant's land. The appellant contended that because of the sewer system, whenever heavy rains fall, great quantities of water were emptied into a creek running through appellant's backyard, thus causing erosion of the banks of the creek and slowly washing away the appellant's property. The appellant sought both actual and punitive damages and a permanent injunction. The appellee moved to dismiss the suit claiming that it was barred by the four-year statute of limitation of realty. The Supreme Court of Georiga, in reversing the lower court's dismissal, adopted the approach used by the Restatement of Torts in dealing with continuing nuisances. Under this rule the appellant has the right to elect to treat the nuisance as temporary and sue for all damages which have occurred within the last four years or he may elect to sue for all future damages as well. The statute of limitations only precludes recovery for damages suffered more than four years before the suit was filed. (Petruff-Florida)
W78-02922

PPG INDUSTRIES, INCORPORATED V. ENVIRONMENTAL PROTECTION AGENCY.
365 N.E.2d 1325-29 (Ill. Ct. App. 1977).

Descriptors: *Illinois, *Suspended solids, Effluents, *Cooling water, *Permits, Regulation, Ponds, Water pollution, Water pollution sources, Treatment, Industrial wastes, Industrial water, Solid wastes, Discharge(Water), Storm runoff, Judicial decisions, Legal aspects, Water law, Standards.

Appellant glass manufacturer sought review of the denial of its petition for a variance from a suspended solids requirement by the Illinois Pollution Control Board. The variance was sought for a cooling pond constructed by appellant on its property. No natural watercourses enter the pond, but it does have an outlet into state waters. The appellant obtained a permit from the Environmental Protection Agency (EPA) which authorized discharge into the pond. However, the permit was subject to certain conditions including a limit on the concentration of suspended solids. Upon testing, the EPA discovered that the concentration of solids fluctuated and often exceeded this standard. Although the parties agreed that the excessive concentration of solids was attributable to the effects of storm runoff, animal action, and fish action in stirring up the sediment in the pond, the Board refused to grant the appellant a variance. In upholding the denial of the variance, the court found that since the appellant was solely responsible for the presence of the pond, it was not unreasonable to hold it responsible for the quality of the water leaving the pond and entering state waters. (Petruff-Florida)
W78-02923

SKEEN V. TEXAS (INVERSE CONDEMNATION ACTION FOR FLOOD DAMAGE FROM INADEQUATELY DRAINED STATE HIGHWAY).
550 S.W.2d 713-16 (Tex. Civ. App. 1977).

Descriptors: *Texas, *Eminent domain, *Runoff, *Flood damage, *Damages, Water, Elevation, Overflow, Routing, Judicial decisions, Real property, Value, Flood waters, Water levels, Property values, Constitutional law, Highways, Environmental effects, Highway effects, Drainage, Drainage effects, Legal aspects.

Plaintiff property owner brought an inverse condemnation action for water damage to her property caused by the water runoff from an elevated highway. The defendant state and State Highway Department filed for and received a judgment on the jury verdict based upon the jury finding that the construction of the home in a low area was a producing cause of the property damage. The Court of Civil Appeals of Texas reversed and entered judgment for the plaintiff for damages under the Texas Constitution which provides that 'no person's property shall be taken, damaged or destroyed for or applied to public use without compensation'. The court found that the damage complaned of was for a public use. In addition, the jury found the the elevation of the highway caused the overflow of water and injured the plaintiff's real and personal property. Therefore, under the State Constitution the plaintiff was entitled to damages for inverse condemnation. The court said that the location of the plaintiff's home in a low-lying area was immaterial to the question of inverse condemnation. (Kastner-Florida)
W78-02924

PLAISANCE V. UNITED STATES (FEDERAL INCOME TAX LIABILITY ON THE HIGH SEAS).
433 F. Supp. 936-39 (E.D. La. 1977).

Descriptors: *Taxes, *International waters, *United States, *Continental Shelf, *Jurisdiction, Federal government, Governments, Governmental interrelations, Foreign countries, Income, Natural resources, Exploration, Exploitation, Government finance, Tax rates, International law, Oceans, Political aspects, Law of the Sea, United Nations, Boats, Ships.

The plaintiff, a United States citizen domiciled in Louisiana, worked as a tugboat captain during the years 1967 an 1968. Within that two-year period he spent at least 510 full days of a consecutive eighteen-month period either on the tug in the North Sea or in a contiguous country. In his income tax returns, the plaintiff claimed to be within a foreign country' and therefore entitled to an exclusionary income tax provision. The plaintiff received deficiency notices from the Internal Revenue Service for the years 1968 and 1969. He paid the alleged deficiencies and is now seeking a refund for the amount paid in 1968. In finding that the plaintiff was not within the jurisdiction of a foreign country, the court relied on the Convention on the Continental Shelf adopted by the Law of the Sea Conference. This convention defines the continental shelf and grants coastal states sovereign rights over the shelf for purposes of mineral exploration and exploitation. The convention makes it clear, however, that the high seas are not under the dominion of any single nation. Accordingly, the court rejected the plaintiff's claim for a tax refund. (Steger-Florida)
W78-02925

UNITED STATES V. CALIFORNIA (FEDERAL COMPLIANCE WITH STATE PERMIT REQUIREMENT).
558 F2d 1347-54 (9th Cir 1977).

Descriptors: *Water permits, *Governmental interrelations, *Unappropriated water, *Federal reclamation law, *Legal aspectsm, Permits, Governments, State governments, State jurisdiction, Federal jurisdiction, Water rights, California, Appropriation, Water law, Legislation, Reclamation, Prior appropriation, Judicial decisions, Priorities, Administrative agencies.

The plaintiff federal government sought a declaratory judgment that the United States could appropriate unappropriated water for use in a federal reclamation project in California without applying for a state permit. The state contended that Section 8 of the 1902 Reclamation Act required the plaintiff to apply to the state board for such a permit. When the Act was adopted, California did not require permits. The Ninth Circuit Court of Appeals found that reading the act as requiring compliance with laws that did not then exist would be contrary to prior court decisions. Such compliance could only be required where the language of the Act was more specific. On petition for rehearing the state explained that two applications in this case were filed by a state agency and assigned to the plaintiff. The state contended that since the agency would have been bound by the state's conditions, plaintiff assignee should similarly have been bound. The court held that the plaintiff, as assignee of an applicant, is no more subject to the imposition of conditions by the state than it is as an original applicant. (Beamer-Florida)
W78-02926

MOORE V. HAMPTON ROADS SANITATION DISTRICT (OYSTER BED DAMAGE FROM SEWAGE DISCHARGE NOT WITHIN FEDERAL ADMIRALTY JURISDICTION).
557 F.2d 1030-39 (4th Cir. 1977).

Descriptors: *Sewage disposal, *Oysters, *Tidal waters, *Damages, *Jurisdiction, Virginia, Sewage, Wastes, Sewage treatment, Water pollution, Water pollution sources, Tidal streams, Shellfish farming, Commercial shellfish, Coliforms, Sewage bacteria, Water quality,

Ownership of beds, River, Cities, Local governments.

Plaintiff lessees of oyster beds brought an action against the city and the sanitation commission alleging that their oyster beds had been destroyed as the result of the improper operation of a sewage disposal system by the city and the commission. The plaintiffs alleged negligence, nuisance and taking of their property without just compensation against the city and unjust taking against the commission. The commission had operated sewage treatment plants in the area before and during the time of the leases. They contended the oystermen took their leases subject to the risk of closure due to lawful discharges. The city claimed governmental immunity. The district court directed a verdict in favor of the commission and granted the city's motion for judgment not withstanding the verdict. The United States Fourth Circuit Court of Appeals originally affirmed the judgment for the commission and reversed for the city. On rehearing the court affirmed for both holding that damage to the leaseholds from sewage discharges was not related to the maritime aspects of the oystering industry and therefore not within the admiralty jurisdiction of the federal courts. (Beamer-Florida)
W78-02927

PUGET SOUND POWER AND LIGHT CO. V. F.P.C. (LICENSING JURISDICTION OVER REPAIRS TO HYDROELECTRIC PROJECT).
557 F.2d 1311-16 (9th Cir. 1977).

Descriptors: *Federal jurisdiction, *Federal power act, *Hydroelectric plants, *Hydroelectric project licensing, *Repairing, Construction, Dam construction, Diversion dams, Electric generators, Electric power, Electric power industry, Electric power production, Electric power plants, Generators, Hydroelectric power, Jurisdiction, Legislation, Non-navigable waters, Power system operation, Projects, Regulation, Rivers, Judicial decisions.

Petitioner, electric power company, sought a determination that respondent, Federal Power Commission, had no licensing jurisdiction over a hydroelectric project originally built in 1904 on a non-navigable stream. The project had undergone extensive repair and restoration following a landslide in 1936. The Commission contended that such repairs were sufficient to bring the project within its jurisdiction under the provisions of the 1935 amendments to the Federal Power Act. Those amendments required parties intending to construct dams or other projects on non-navigable streams to file a license application with the Commission. The Ninth Circuit Court of Appeals held that the mandatory licensing requirements of the Federal Power Act were not to be applied retroactively. Furthermore, the court held that the repair work undertaken by the petitioner did not constitute construction within the meaning of the 1935 amendments. Although the repairs involved were substantial, they merely restored the project to its original specifications with no changes in capacity or physical plants. (White-Florida)
W78-02928

HOMEOWNERS, EMERGENCY LIFE PROTECTION COMMITTEE V. LYNN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT FOR DAM PROJECT).
432 F. Supp. 1334-38 (C.D. Cal. 1977).

Descriptors: *California, *Reservoir construction, *Environmental control, *Dam construction, Judicial decisions, Government, Federal government, Local governments, Environment, Dams, Environmental effects, Legislation, Legal aspects, Flow control, Water storage, Water utilization, Water supply, Water supply development, Reservoirs.

Plaintiff environmental committee brought action for declaratory and injunctive relief to prohibit defendant city and federal government from acting on a proposed Los Angeles dam and reservoir. The plaintiff contended that the National Environmental Policy Act of 1969 requires filing of an Environmental Impact Statement prior to commencement of construction. The defendants maintained that the project was under control of the city and not the federal government. Subsequent to filing of this action the project received federal funding and the city was enjoined by the Ninth Circuit Court of Appeals from further action relating to funding of the project. The Court of Appeals remanded to the district court to determine: (1) whether further construction should be enjoined pending determination of the adequacy of the Environmental Impact Statement; and, (2) whether the statement was adequate. The court held that the proposals set forth were sufficient to permit a reasoned choice of alternatives to the project and therefore the Environmental Impact Statement was adequate. Since the plaintiff failed to pursue the action and had stipulated prior to judgment that injunction was not sought, the complaint was dismissed. (Mulligan-Florida)
W78-02929

AMERICAN ASSOCIATION OF MEAT PROCESSORS V. COSTLE (STATUE OF LIMITATIONS FOR REVIEW OF EFFLUENT GUIDELINES).
556 F.2d 875-77 (8th Cir. 1977).

Descriptors: *Legal review, *Effluents, *Regulation, *Waste water(Pollution), Judicial decision, Wastes, Water pollution, Water law, Legal aspects, Equity, Water pollution sources, Discharge water, Sewage effluents, Waste water disposal, Administrative decisions, Food processing industry, Standards.

Plaintiff meat processors sought judicial review of the point source effluent guidelines for meat products promulgated by the Environmental Protection Agency (EPA) pursuant to the Federal Water Pollution Control Act Amendments of 1972 (FWPCAA). The EPA contended that review should not be granted because the plaintiff's application for review was untimely. The FWPCAA permits judicial review within ninety days after guidelines are promulgated, but limits review after such time to applications based on grounds which arose after the nineteenth day. The plaintiffs admitted their application was after the deadline but argued that the time limit should be extended because of the uncertainty that existed as to which court was the proper forum to seek review of the guidelines. The court of appeals acknowledged the existence of uncertainty but dismissed the plaintiffs' application for review. The court held that since the plaintiff had not sought review in any forum during the allotted time there was no prejudice from the uncertainty and therefore equity would not require an extension of the deadline. The court noted that late review was intended to allow challenges based on scientific information arising after establishment of guidelines. (Curran-Florida)
W78-02930

UNITED STATES V. WILSON (ADDITIONS TO RIPARIAN LAND BY ACCRETION).
433 F.Supp. 67-92 (N.D. Iowa 1977).

Descriptors: *Accretion(Legal aspects), *Missouri River, *Avulsion, *Boundary disputes, Iowa, Water law, Bank erosion, Land tenure, Erosion, Indian reservations, Banks, Silts, Soil types, Basins, Channel erosion, Thalweg, Legal aspects, Riparian land, Rivers, Sedimentation, River banks, Boundaries(Property).

Plaintiff reparian landowners sought quiet title to land situated adjacent to the Missouri River. The plaintiffs' claim to the disputed property rests on a treaty which established an Indian reservation with one boundary being the Missouri River. The plaintiffs contended that sudden periodic shifts in the river's course left identifiable reservation land adjacent to the opposite bank. The defendants argued that the disputed property was the result of gradual build-up of silt and was not identifiable as having once belonged to the plaintiffs. The district court, in a lengthy opinion held that the disputed property was the result of accretion and therefore rightfully in the possession of the defendants. The court noted that the central issue was the proper legal definition of and factual predicate for accretion and avulsion. The court held that avulsion was not determined by the location of the thalweg, that accretion did not require the absence of all surface water or uniform extension of the shoreline, and that when common sense shows that the land attached to the shoreline is a growth of the old shoreline, then that land is accreted land. (Curran-Florida)
W78-02931

SOUTHERN MINNESOTA RIVERS BASIN AREA II, GRANTS TO LOCAL GOVERNMENT.
Minn. Stat. secs 104.42 thru 104.50 (1976).

Descriptors: *Legislation, *Grants, *Minnesota, *Flood control, Planning, Financing, Participating funds, Project post-evaluation, South Dakota, Legal aspects, Flood plain zoning, Water conservation, Protection, Water control, Local governments, Flood plains, Rivers, Water law, Research priorities, Water resources development, Governments, Governmental interrelations.

The state of Minnesota has authorized a state grant-in-aid pilot program of providing financial assistance to units of local government located within the watersheds of rivers and streams that are southern tributaries of the Minnesota River for project and construction costs for the building of floodwater retarding and retention structures within a general plan for flood plain mangement. Grants may be made by the state soil and water conservation board in an amount not to exceed 75 percent of the total cost of each project. If federal funds are being used in the project, the state contribution shall not exceed 50 percent of the remaining non-federal costs. If the structure is located in South Dakota, however, the two states shall split the non-federal costs equally. The granting authority shall choose the receiving projects on the basis of data assembled by state and federal agencies. A local government seeking the grant shall submit a resolution including a list of federal and local funds available for the project, a general plan for the project, and an environmental impact statement. After the project has been operated for two years, the board and the staff engineer, shall submit a project report and evaluation to the legislature. (Hammersley-Florida)
W78-02932

PUBLIC WATERS INVENTORY AND CLASSIFICATION.
Minn. Stat. sec 105.391 (1976).

Descriptors: *Minnesota, *Legislation, *Classification, *Watersheds(Basins), *Watercourses(Legal aspects), Water management(Applied), State governments, Water districts, Public rights, Drainage, Grants, Water rights, Water zoning, Administrative agencies, Administration, Water policy, Watershed management, Drainage area, Financing.

Minnesota has enacted legislation requiring the commissioner of natural resources to inventory the waterbasins and watercourses of each county and designate which constitute public waters. A public hearing on the proper designation shall be held in the county where the waters to be designated are located. If a waterbasin has been designated public water, it may not be drained unless it is replaced by a waterbasin having equal or

greater public value. However, after a state waterbank program has been established, a waterbasin which has been designated public water and which is eligible for inclusion in the waterbank program may be drained without a permit and without replacement under certain conditions. The commissioner shall provide financial aid to counties to facilitate an inventory of all watercourses for the purpose of designating which are public waters and to recommend a managment classification for each watercourse. Provision is made for resolving disagreements between the commissioner and the county over the county's watercourse designations. The waters of Minnesota are considered public waters if they have been determined to be public waters or navigable waters by a district or appellate court. (Howard-Florida)
W78-02933

WATER BANK PROGRAM.
Minn. Stat. sec 105.392 (1976).

Descriptors: *Minnesota, *Wetlands, *Legislation, *Land management, *State governments, Water contracts, Water districts, Conservation, Payment, Developed waters, Land development, Land use, Federal project policy, Watersheds(Basins), Project planning, Administrative agencies, Comprehensive planning, Protection, Surface waters, Flood protection, Sedimentation, Planning.

The state of Minnesota has enacted legislation to provide for wetlands preservation and to promote comprehensive and total water management planning. The commissioner of natural resources is authorized to develop a program to promulgate rules and establish procedures and payment rates in order to supplement and complement the federal water bank program. The commissioner is authorized to enter into agreements with owners of wetlands eligible for inclusion in the waterbank program and to establish payment rates for the conservation of wetlands based on current land and crop values. In the agreement between the commissioner and an owner, the owner must agree: (1) to place in the program eligible wetland areas; (2) not to destroy the wetland character of such areas nor use it for agricultural purposes; and, (3) to effectuate the wetland conservation and development plan for his land in accordance with the agreement. In return, the commissioner will make an annual payment to the owner for his participation and will provide advice on conservation and development practices on the wetlands. (Howard-Florida)
W78-02934

HOMER V. DEPARTMENT OF NATURAL RESOURCES (STATE CONVEYANCE OF TIDELANDS UNDER ALASKA LAND ACT).
566 P.2d 1314-20 (Alas. 1977).

Descriptors: *Navigable waters, *Cities, *Land tenure, *Alaska, *Tidal marshes, Tides, Submerged lands, Claims(Contracts), Judicial decisions, Natural resources, Regulation, Legal review, Real property, Administrative decisions, Ownership of beds.

The Alaska Land Act authorizes the Department of Natural Resources to dispose of certain state property through operation of the Tidelands Act. The plaintiff city was denied a claim to certain tidelands in favor of an adverse claim by a private claimant. The city questioned whether the Department director's responsibility for formulating regulations for the filing and processing of applications for claims and adjudication of disputes had been carried out so as to guarantee due process to all claimants. The Supreme Court of Alaska rejected the claims of unreasonable procedures and arbitrary decision-making by the Department stressing that a single set of regulations for settling disputes among all types of claimants was promulgated, and saying that protection of merely contingent economic interests does not require a high degree of due process. Considering the state's fiscal and administrative interests, the Director's comprehensive point-by-point response to the city's claim protest was deemed to accord it sufficient due process. The Department's disposition of the property to the private claimant was upheld. (Spector-Florida)
W78-02935

MARINO PROPERTY COMPANY V. PORT OF SEATTLE (ENVIRONMENTAL IMPACT STATEMENT NOT REQUIRED FOR CHANGE IN OWNERSHIP).
567 P.2d 1125-32 (Wash. 1977).

Descriptors: *Washington, *Port authorities, *Piers, *Environmental effects, Judicial decisions, Legal aspects, State governments, Legislation, Parks, Expenditures, Harbors, Decision making, Property values, Public lands, Recreation facilities, Land tenure.

Plaintiff private property owners sought injunctive and declaratory relief to prevent defendant Port Authority from acquiring two piers in the Seattle harbor. The defendant had issued a Declaration of No Significant Environmental Impact claiming the harbor environment would not be significantly affected by the project. The plaintiffs claimed the issuance of the bonds, the reacquisition of the property and the taking over of the existing use of the property were major actions significantly affecting the environment and therefore required an Environmental Impact Statement under the State Environmental Policy Act. The Supreme Court of Washington ruled that neither the plans nor the proposed gift of a portion of the complex property to the city would have a significant effect on the environment. The court said that neither the plans nor the gift required an Environmental Impact Statement because the underlying legislative policy in the State Environmental Policy Act was directed toward environmental effects resulting from a change in use, not ownership. Whether or not previous changes in use significantly affected the environment was not at issue and not decided. (Easterbrook-Florida)
W78-02936

KOBAYASHI V. ZIMRING (OWNERSHIP OF SHORELINE EXTENSION CREATED BY LAVA FLOW).
566 P.2d 725-57 (Hawaii 1977).

Descriptors: *Hawaii, *Land forming, *Lava, *Accretion(Legal aspects), Public access, Coasts, Volcanoes, Boundaries(Property), Shores, Real property, Land tenure, Legal aspects, Littoral, Judicial decisions, State governments, Oceans.

Plaintiff state of Hawaii brought a quiet title action against the defendants who claimed to be the owners of property created in a previously submerged coastal area by a 1955 lava flow. The court ruled that a shoreline property owner does not acquire title to a lava-extended shoreline even if the pre-existing shoreline is completely destroyed by the extension so that the property no longer has access to the sea. Recognizing that the owner of contiguous land takes title to accreted land in Hawaii, the Supreme Court of Hawaii ruled that lava extensions are different from accretions. The court held that pre-exisiting legal boundaries are to be maintained when lava extensions create new contiguous land, and that the new land created is public land. One justice filed a lengthy dissenting opinion. He felt that allowing private ownership of the lava extensions would not have deprived the state of any rights since the public would still have access to the ocean. (Easterbrook-Florida)
W78-02937

RITTER V. STANDAL (FISH FARM PRECLUDED BY NAVIGABILITY OF ESTUARY).
566 P.2d 769-74 (Idaho 1977).

Descriptors: *Idaho, *Fish farming, *Navigation, *Public access, *Estuaries, Dams, Estuarine fisheries, Navigable rivers, Navigable waters, Public rights, Riparian rights, Riparian waters, State government, Water law, Water permits, Water rights, Watercourses(Legal aspects), Judicial decisions.

Plaintiff landowners sought to require defendent owners of land on an estuary of the Snake River to remove a fish farm that they had constructed in the estuary. The plaintiffs claimed that the fish farm at the mouth of the estuary closed off their access to the river. The plaintiffs also agreed that the Department of Water Administration did not and could not authorize an obstruction of the estuary and that the closing of the estuary as a public highway was a nuisance. The defendants contended that the estuary was not navigable. The Supreme Court of Idaho held that the estuary was navigable under the Idaho test since it could be used to float logs to market during the high water season. The court also held that the defendants' water license from the Department did not authorize the obstruction and that the Department could not authorize such an obstruction. Since the fish farm was held to be a public nuisance, the court upheld the trail court's order that the fish farm be removed. (Jordan-Florida)
W78-02938

WILLIAMS AND EBERLEY, INCORPORATED V. MACLEOD (ADEQUACY OF WATERS AND SEWAGE FACILITIES IN PROPOSED SUBDIVISION).
397 N.Y.S. 2d 262-66 (App. Div. 1977).

Descriptors: *New York, *Sewage disposal, *Water supply, *Environmental effects, *Land development, Administrative decisions, Administrative agencies, Judicial decisions, Modsquitos, Real property, Flood protection, Swamps, Wetlands, Land use, Land, Public health, Municipal water, Permits, Regulation, Standards.

Plaintiff landowner sought an order directing defendant county officials to approve a plan for a residential subdivision. A statute required subdivision plans to include adequate methods for supplying water. Regulations promulgated pursuant to the statute required the developer to show the effect on the subdivision of environmental pollutant or hazards either on the property or from surrounding areas resulting from, among other causes, swamps. On the basis of this regulation, the county denied approval of the plan saying that although the water facility was adequate, the entire subdivision faced potential flooding and mosquito infestation from a nearby swamp. The Appellate Division of the New York Supreme Court held that the hazards named in the regulation would only test the adequacy of the facilities, not constitute independent grounds for denial of subdivision approval. Similarly, the court held another statute requiring a plan for adequate sewage facilities did not authorize a denial other than for inadequacy of those facilities. No public emergency justified exercise of the Health Department's police powers. Securing safety from floods and mosquitos is a land use function exercised by means of zoning powers not delegated to the defendants. (Smith-Florida)
W78-02939

LOCAL GOVERNMENT FLOOD PLAIN COMMISSIONS.
Acts of Indiana, Public Law No. 192, H. 2002, Approved April 21, 1975, Ch. 4.5, p. 1044-53 (1975). 10 p.

Descriptors: *Indiana, *Flood plain zoning, *Legislation, *Regulation, Legal aspects, Zoning, Flood plains, Flood plain insurance, Flood protection, Flood control, Flood proofing, Land use, Local governments, Planning, Land management, State governments, Administrative agencies, State jurisdiction, Governmental interrelations, Structures, Non-structural alternatives.

The state of Indiana has enacted legislation to enable local governments which have not passed land use controls to meet the requirements of the national flood insurance act and Indiana state laws, by authorizing them to establish a single-purpose Flood Plain Zoning Commission. The three-person commission shall have the power to promulgate regulations for flood hazard areas. To assure the public health, safety, and convenience the commission shall prepare a proposed flood plain zoning ordinance which will include classification of all flood plain areas in the particular jurisdiction, and regulate land use in those areas. The proposed ordinance shall be presented to the local legislative body which shall hold public hearings before adopting the plan. Any proposed changes shall be studied by the commission before final action is taken. Flood plain district boundaries less extensive than those established by state or federal agencies may not be adopted. Penalties for violation of the final ordinance may be provided by the local government, which may also seek injunctions to restrain construction of or to remove violating structures. The removal of structures constructed in violation of the zoning ordinance shall be non-compensable. (Malefatto-Florida)
W78-02940

APPROPRIATION AND REGULATION OF GROUND WATER.
Mont. Rev. Code secs 89-2911 through 89-2936 (1947), as amended, (Supp. 1975).

Descriptors: *Montana, *Legislation, *Well regulations, *Groundwater, *Appropriation, Groundwater resources, Water sources, Regulation, Legal aspects, Well permits, Administrative agencies, Control, State governments, Water management(Applied), Management, Penalties(Legal), Permits, Water policy, Water rights, Water resources development, Adjudication procedure, Groundwater avilability, Administration, Water allocation(Policy).

The state of Montana has enacted legislation governing the appropriation and regulation of ground water. Controlled ground water areas may be designated or modified by the Department of Natural Resources and Conservation upon request of a percentage of the ground water users in a particular area. If the Department finds that the withdrawal of ground water exceeds the safe annual yield, it shall order the withdrawal decreased. Any person with ground water rights may initiate a department hearing to ascertain all existing rights in that area. A permit from the Department is required to appropriate ground water from a controlled area. An appropriator of ground water may change the location of his well in the area as long as others are not injured. It is illegal to waste or contaminate ground water. All wells which pollute or waste must be capped. The Department may conduct investigations, including entry upon a ground water user's property, to determine whether this provision is being followed. If violations are found the Department has enforcement powers with violators subject to fines. (Malefatto-Florida)
W78-02941

MONTANA WATER RESOURCES ACT.
Mont. Rev. Code secs 89-101.1 thru 89-142 (Supp. 1975).

Descriptors: *Montana, *Water resources development, *Optimum development plans, *Legislation, Comprehensive planning, Administration, Contracts, Appropriation, Research and development, Water rates, Water policy, Water resources, Water law, Water rights, Eminent domain, Regulation, Alternative planning, Conservation, Jurisdiction, State governments, Water allocation(Policy), Water utilization, Irrigation, Structures.

In recognition of the increased demands placed on the water resources of Montana, the state Department of Natural Resources and Conservation has been granted the authority to actively formulate and effectuate a 'state water plan'. The state water plan shall set out a progressive program for the conservation, development and utilization of the state's water resources and propose the most effective means by which these water resources may be applied for the benefit of the people, with due consideration of alternative uses and combinations of uses. The department's powers include the power of condemnation, the power to construct public works, the power to act beyond the jurisdiction of the state where permitted by law, and the power to construct irrigation works across streams and highways. The department is further authorized to issue bonds and provide financing for all necessary projects. The act grants the department power to enter into contracts for the sale and lease of water, water rights, and waterworks systems with individuals, incorporated users, counties, agencies, other states and the federal government. The department is authorized to negotiate with other states regarding interstate waters. (Curran-Florida)
W78-02942

COLUMBIA INTERSTATE COMPACT.
Mont. Rev. Code secs 89-3201 thru 89-3207 (1947).

Descriptors: *Montana, *Interstate compacts, *Governmental interrelations, *River basin commissions, *Columbia River, State governments, Water law, Administration, Legislation, Interstate, Planning, Water policy, Regulation, Interstate commissions, Interstate rivers, Equitable apportionment, Water resources development, Rivers, Wildlife management, Fish management, Pollution abatement.

The state of Montana has adopted and ratified the Columbia Interstate Compact entered into by Montana with Idaho, Washington, Oregon, Nevada, Utah and Wyoming. The purpose of this compact is to facilitate and promote the orderly, integrated and comprehensive development of the land and water resources of the Columbia River basin through intergovernmental cooperation. The compact provides for an equitable apportionment of the water and creates an interstate commission to consider various common problems with respect to the resources of the region. The compact also affirms the interest of the member states in cooperating in power development. The effects of the compact on state law and preexisting water rights are specified. The commission is granted specific powers to deal with the threat of water pollution, although each state has the primary obligation and responsibility to abate pollution of the Columbia River under its own laws. The commission shall also plan for the development of measures to prevent damage to and enhance the fish, wildlife and recreational resources of the river basin. Regulation of stream flows and pool levels must conform to sound fish and wildlife management practices. (Curran-Florida)
W78-02943

SAGE CREEK BASIN.
Mont. Rev. Code secs 89-3001, 89-3002 (1947).

Descriptors: *Montana, *Canada, *International waters, *Reservoirs, *Water storage, United States, Governments, Reservoir storage, Storage capacity, Water supply, Water distribution(Applied), Watershed management, Water delivery, Canals, Water demand, Storage coefficient, Water utilization, Diversion, Maintenance, Canal construction, Reservoir construction, Legislation, Salt Creek Basin(Mont).

The state of Montana has authorized the governor to assent on the state's behalf to an agreement between the governments of the United States and Canada regarding the waters of Sage Creek Basin. This basin forms the watershed of an international stream. The agreement shall provide for: (1) construction of a storage reservoir in Canada by a Canadian governmental agency; (2) construction of a supply canal to the United States to carry all of the stored water apportioned to Montana ranchers; (3) formation of a water storage society, composed of Canadian ranchers, with the responsibility of maintenance and operation of the apportionment and diversion works. Satisfactory supply canal maintenance is to be the responsibility of the Montana ranchers who will be permitted appropriate access for this purpose. A water apportionment formula is established which shall apply to water remaining in the reservoir at the beginning of the water year, together with season runoff impounded in the reservoir. The flow of water across the international boundary is not to be obstructed in Montana in a manner which causes damage in Canada. (Steger-Florida)
W78-02944

DRAINAGE DISTRICTS.
Mont. Rev. Code secs 89-2201 through 89-2218 (1947).

Descriptors: *Drainage districts, *Montana, *Legislation, *Drainage systems, Water law, State governments, Governments, Drainage area, Drainage programs, Drainage engineering, Legal aspects, Drainage, Ditches, Controlled drainage, Water management(Applied), Water control, Surface waters, Surface runoff, Drains, Public benefits, Land use, Cost-benefit analysis.

The state of Montana has enacted legislation governing the creation and management of drainage districts. Drainage districts are created by petition signed by landowners within the proposed district who desire to construct one or more drains, ditches, levees, waste ditches or other works across the lands of others. Districts may also be created to improve any natural, non-navigable stream or water course for the promotion of public health of welfare, for the drainage and removal of surface water from the lands, and for the repair and maintenance of previously constructed drainage systems. District territory need not be contiguous. However, if not, it must be so situated that the public health or welfare will be promoted by such drainage; the benefits of the proposed work in each part will exceed the damages from the costs of such work; and the work must be able to be done more cheaply as a single district than otherwise. Provisions for dissolution of drainage districts and other procedural requirements are also included in the statute. (Steger-Florida)
W78-02945

IRRIGATION DISTRICTS; RIGHTS OF WAY; USE AND APPORTIONMENT OF WATER.
Mont. Rev. Code secs 89-1601 thru 89-1617 (1947).

Descriptors: *Irrigation districts, *Montana, *Water rights, *Water utilization, *Legislation, Governments, Water distribution(Applied), Water shortage, Water policy, Irrigation water, Irrigation, Alternative water use, Irrigation programs, Surplus water, Diversion, Streamflow, Canals, Ditches, River flow, Water allocation(Policy), Public rights, State governments, Right-of-way.

The state of Montana has enacted legislation governing irrigation districts. Rights-of-way are established for the construction of irrigation works across highways, railways, canals and other watercourses. However, interference with navigation

and mining or agricultural water rights is forbidden. The diversion of water of any river, creek, stream, canal, or ditch to the detriment of any person having an interest in such watercourse is also proscribed. Guidelines are included concerning the leasing of works or water and the title to property of the district. The use of all water required for irrigation of any district, together with the rights-of-way, is declared to be a public use. Irrigation water is to be apportioned equitably among the lands in the district. Surplus water may be sold for the benefit of the district. The district has the right to substitute and replace district water with water from any watercourse crossed by the irrigation system. The distribution system is defined as the entire works and property of all irrigation districts and penalties for interference with its operation are established. (Steger-Florida)
W78-02946

CLARK FORK RIVER--IMPOUNDING OF WATER--APPROPRIATION.
Mont. Rev. Code secs 89-856 (1947).

Descriptors: *Dam construction, *Appropriation, *Montana, *Impoundments, *Legislation, Idaho, Damsites, Water utilization, Water law, Water users, Watershed management, Watershed(Basins), Dams, Hydroelectric power, Water level fluctuations, Alternative water use, Structures, Irrigation water, Irrigation, Impounded waters, Water distribution(Applied), Water requirements, Water supply, Water allocation(Policy).

The state of Montana has enacted legislation concerning impounding of the waters of the Clark Fork River within the state. Such impoundment or restraint may be permitted for a distance not exceeding twenty-five miles from the Idaho-Montana boundary line by a dam located in the state of Idaho. The dam may be constructed by any person, firm, partnership or corporation authorized to do business in the state of Montana. However, any present of future water appropriations for irrigation and domestic use above the dam in the watershed of the state of Montana shall have priority over water use for power generation at the dam. (Steger-Florida)
W78-02947

OWNERS OF WATER TO SELL SURPLUS; DUTY OF PURCHASER TO DIG DITCHES.
Mont. Rev. Code secs 89-823 thru 89-826 (1947).

Descriptors: *Montana, *Surplus water, *Water rights, *Legislation, Water law, Reservoir operation, Water users, Water utilization, Water supply, Water requirements, Water management(Applied), Water distribution(Applied), Water control, Water sources, Water demand, Payment, Water rates, Water delivery, Water shortage, Ditches, Reservoirs, Reservoir yield, Aqueducts, Damages.

The state of Montana has enacted legislation requiring any person having a surplus of water and the right to use, sell, or dispose of such water to convey and deliver such surplus water upon payment as long as the surplus exists. However, the purchaser must dig the necessary ditches to receive and convey the desired surplus water. Before compelling delivery, he must also pay an amount equal to the necessary cost of tapping any reservoir and putting in gates, gauges or other customary and necessary appliances. The purchaser is then entitled to maintain an appropriate action in law of equity of the enforcement of his right or the recovery of damages arising from a failure to deliver or a wrongful diversion of the water. The purchaser cannot sell his right to use the water nor may he prevent the original owner from retaking and selling it after the purchaser's use is discontinued. (Steger-Florida)
W78-02948

DAM INSPECTION.
Ky. Rev. Stat. Ann. secs 151.293 thru 151.297 (1975).

Descriptors: *Kentucky, *Dams, *Administration, *Inspection, Dam construction, Dam failure, Dam design, Rupturing, Foundation failure, Foundation investigations, Damsites, Barriers, Reservoirs, Retaining walls, Water control, Administrative decisions, Investigations, Administrative agencies, Control, Evaluation, On-site investigations, Regulation, Water level.

The state of Kentucky has enacted legislation governing the inspection of dams. The owner of an existing dam must submit an application for a certificate of inspection when requested by the department. The department must base the granting or denial of the application upon an on-the-ground inspection. The department must show that: (1) the proposed action adequately protects the public safety; (2) all information requested by the department has been provided; and (3) the change in the water level will not significantly interfere with a beneficial use by other water users. The department may categorize dams according to the hazards and impose different conditions on each category. The time periods for the certificate are limited to 5 years. The department may make regular inspection. If an owner fails to comply with the conditions of a certificate of inspection, or it life of property are or may be endangered, the governor may declare a state of emergency which empowers the department to seize control and take whatever steps necessary to render the dam safe. (Kastner-Florida)
W78-02949

IMPROVEMENTS, CONTROL OF WATER POWER.
Ky. Rev. Stat. Ann. sec 268.510 (Supp. 1976).

Descriptors: *Kentucky, *Drainage, *Flood protection, *Channel improvement, *Legislation, Hydroelectric plants, Navigable waters, Drainage systems, Drainage programs, Electric powerplants, Powerplants, Hydroelectric power, Condemnation, Easements, Right-of-way , Eminent domain, Conduits, Non-navigable waters, Navigable rivers, Regulation, Administration, Administrative agencies.

The state of Kentucky has enacted legislation to effect the drainage, protecion and reclamation of the land and other property in any district under this chapter subject to assessment. The board, acting for the district, is given the power to make any improvements deemed necessary to preserve and maintain any works which protected cities from overflow and promoted the public health or general welfare of the community. The board is authorized to hold, control and acquire by donation or purchase, or, if need be, condemn any land, easement, railroad right-of-way, sluice, conduit, sewer, holding basin or franchise in or out of district for any purpose under this chapter. In addition, the board is also given control over all water power created in the district including the power to construct and maintain any hydroelectric powerplants. However, the one restriction imposed is that construction or maintenance of any improvement must not be permitted to impair navigation upon an navigable stream in the state. (Kastner-Florida)
W78-02950

KING V. ADAMS (DUTY OF UPPER LANDOWNER TO PREVENT SURFACE WATER FROM FLOWING UPON LOWER LANDOWNER'S LANDS).
349 So.2d 611-16 (Ala. Civ. App. 1977).

Descriptors: *Surface runoff, *Drainage water, *Alabama, *Surface drainage, *Adjacent landowners, *Land, *Drainage, *Damages, Repulsion(Legal aspects), Compensation, Dams, Ponds, Watershed management, Water, Legal aspects, Penalties(Legal), Ditches, Judicial decisions, Natural flow.

Plaintiff lower landowner sought compensatory and punitive damages for the flooding of his property caused by defendant upper landowner having drained two ponds which had caught surface water falling onto the land or draining from other higher lands. The defendant claimed that when he broke the dams to improve his property, he merely restored the original status quo. The trial court awarded punitive damages and also ordered the defendant to reseal the two ponds. The Court of Civil Appeals found that Alabama does not follow the 'common enemy rule' which permits any landowner to control water on his property to protect same regardless of other injuries. The court held that an upper landowner in rural areas is free to interfere with the flow of surface water for the purpose of improving his property so long as he does not unduly burden a lower property by causing unnecessary damage or interfere with the lower landowner's possessory rights. The court said a breach of this duty is answerable only in damages; in no event must the upper landowner restore the status quo. (Smith-Florida)
W78-02951

KRUSE V. GROKAP, INCORPORATED (EFFECT OF SUBMERGENCE FOLLOWED BY ACCRETION ON OWNERSHIP OF LAND).
349 So.2d 788-92 (Fla. App. 1977).

Descriptors: *Land tenure, *Accretion(Legal aspects), *Florida, *Submergence, *Riparian land, Tides, Tidal waters, Tidal effects, Boundary disputes, Adjacent landowners, Water level fluctuations, Judicial decisions, Land, Real property, Riparian water loss, Riparian waters, Riparian rights, Navigable waters, Gulf of Mexico, Erosion, High water mark.

Plaintiff landowner brought a quiet title action claiming ownership of defendant landowners property. The defendant owned a lot which had gradually become completely submerged by the waters of the Gulf of Mexico. When the waters receded, the plaintiff claimed ownership as riparian owner through accretion. Under Florida law private ownership of land borderig on navigable tidal waters extends to ordinary or mean high tide; therefore, the plaintiff would have title if the mean high tide line had encroached on his property during the process of submergence and if the defendant's lot had undergone accretion. Reversing the trial court, the Second District Court of Appeal found that the mean high tide is determined by averaging the tides over a 19-year period, the duration of a complete tidal cycle. Since plaintiff's evidence covered at best only a five-year period, his ownership was not properly shown. The dissent argued that the rule requiring a 19-year period for averaging the tides had never previously been applied by Florida trial courts. On the basis of this dissent, the majority certified the question of whether the 19-year rule should apply to the Florida Supreme Court. (Smith-Florida)
W78-02952

MOZZETTI V. BRISBANE (DESIGN IMMUNITY AS A DEFENSE TO FLOOD DAMAGE FROM ROAD CONSTRUCTION).
136 Cal. Rptr. 751-59 (App. 1977).

Descriptors: *California, *Flood damage, *Surface drainage, *Storm runoff, *Road, Damages, Floods, Flood control, Rainfall, Runoff, Building codes, Flood protection, Silt, Urban runoff, Culverts, Surface runoff, Design standard, Design criteria, Road design.

Plaintiff landowners brought an action against the city and its engineer to recover damages suffered as a result of flooding of their property due to a road construction project. The plaintiffs owned

property bounded on two sides by roads which the city resurfaced and improved. Surface water from the roads ran into inadequate catch basins. The project design was also defective in other respects. The city claimed a defense of design immunity. The jury found for the plaintiffs and the defendant appealed claiming improper jury instructions on design immunity. The First District Court of Appeal held that the city was not entitled to the defense of design immunity where it was not shown that the city council had approved the specific plans, where is was shown that there were deviations from the original plan, and where part of the cause of the damage was not the result of design defect but rather improper maintenance. The court further held that the trial court did not err in refusing to take judicial notice of a disaster declaration covering the county since the jury had knowledge of the severity of the storm which caused the flooding. (Beamer-Florida)
W78-02953

DYE V. BURDICK (LIABILITY TO DOWNSTREAM LANDOWNERS FOR FLOOD DAMAGE FROM DAM FAILURES).
553 S.W.2d 833-42 (Ark. 1977).

Descriptors: *Arkansas, *Negligence, *Dam failures, *Flood damages, *Earth dams, Dams, Disasters, Floods, Dam foundations, Rupturing, Dam design, Storms, Spill ways, Streams, Legal aspects, Hazards, Risks, Water law, Streamflow forecasting, Runoff, Ravines, Acts of God.

The plaintiffs whose home was destroyed by flooding resulting from the bursting of a dam brought this action for damages against the owners of the property on which the dam was located. The plaintiffs contended that the dam was improperly and inadequately constructed, that the defendants were negligent in not repairing the dam and that the dam created an inherently dangerous condition because it was built in a deep ravine in a runoff area with knowledge of the plaintiffs' presence downstream. The defendants denied liability arguing that they did not construct the dam, that they did use reasonable care in its maintenance and that the dam burst because of an unforeseeably severe rainfall. The Supreme Court of Arkansas reversed the trial court's grant of summary judgement for the defendants. The court noted that landowners are responsible for structures on their property whether or not they constructed them. The court said there was sufficient evidence to submit the case to the jury on the question of negligence, both on direct evidence and res ipsa loquitur, but no basis for strict liability. (Curran-Florida)
W78-02954

ZONING COMMISSION OF SACHEM'S HEAD ASSOCIATION V. LENINSKI (RIGHT OF PRIVATE LANDOWNER TO OPEN BEACH TO PUBLIC USE).
376 A.2d 771-74 (Conn. C.P. 1977).

Descriptors: *Zoning, *Connecticut, *Beaches, *Land tenure, High water mark, Legal aspects, Regulation, Seashores, Low water mark, Jurisdiction, Water law, Legislation, Legal review, Judicial decisions, Public access, Land use, Law enforcement, Recreation, Recreation facilities.

Plaintiff zoning commission sought to enjoin defendant landowner from opening to the public an area of beach owned by him. The defendant's property included a narrow strip of land between the road and the water that was zoned for single family dwellings and for private parks, beaches and docks. The plaintiff contended that opening the beach to the public was a violation of the zoning ordinance. The ordinance did not define 'private' or differentiate it from 'public' nor did it define 'beach'. The Connecticut Court of Common Pleas held that a temporary injunction was not warranted because the meaning of the words 'public' and 'beach' were ambiguous as used in the ordinance. The court said that resolution of the terms must be done at a final trial on all the issues. The court also stated that the zoning commission had failed to prove that the persons using the beach at the landowner's invitation were, in fact, members of the public so that even if the ordinance were valid, the proof of the claimed violation was deficient. (Beamer-Florida)
W78-02955

GRAY V. HUDSON (TITLE TO LAND CREATED BY FILL OPERATION).
375 A.2d 1039-48 (Conn. Super. Ct. 1974).

Descriptors: *Connecticut, *Land tenure, *Landfills, *Boundary disputes, *Riparian land, Legal aspects, Real property, High water mark, Boundaries(Property), Riparian rights, Navigable waters, Permits, Boats, Bulkheads, Reclamation, Water law, Docks, Adjacent landowners, Adverse possession, Riparian waters.

The plaintiff brought this suit to eject the defendant from possession of a small peninsula. The plaintiff's claim to the property in dispute rests on the physical existence, or lack thereof, of the peninsula when the adjacent land was transferred in 1898. The defendant, who has resided in a vessel moored to the side of the peninsula for 26 years, argued that the peninsula did not exist in 1898 and therefore could not have been transferred. He claimed that the area was below the high water mark in 1898, that the peninsula was created by a bulkhead and fill operation in 1907 and that the plaintiff therefore had no claim to the peninsula on which to rest his ejectment suit. The court refused to eject the defendant because the plaintiff failed to prove that he had title to the peninsula. The court held that evidence of the 1907 permit from the secretary of war to dredge a channel and build a bulkhead had not been sufficiently rebutted by the plaintiff and that therefore the plaintiff did not have the requisite title on which to base his ejectment suit. (Curran-Florida)
W78-02956

IN RE LEGISLATIVE ROUTE (THE NECESSITY FOR STATE ENVIRONMENTAL IMPACT STATEMENT FOR BRIDGE REPAIRS).
375 A.2d 1364-69 (Pa. Cmwlth. 1977).

Descriptors: *Pennsylvania, *Bridges, *Environmental effects, *Scenic highways, *Repairing, Legal aspects, Eminent domain, Condemnation, Right-of-way, Roads, Highway relocation, Road construction, Scenery, Judicial decisions, Bridge construction, Legislation, Streams, Channels, Channel improvement, Stream improvement, Transportation.

The plaintiff sought to enjoin the state from repairing and replacing several small one-lane bridges and relocating the stream channel over which the bridges run. The plaintiff contended that the state did not comply with a statute which requires a determination of various social, aesthetic and environmental effects of any 'transporation route or program' requiring the acquisition of new or additional right-of-way. The state argues that it need not comply with the statutory requirements because the anticipated construction was essentially repair work and therefore did not constitute a 'transport route or program' within the meaning of the statute. The Commonwealth Court of Pennsylvania overruled the lower court and denied the petition to enjoin the state's activities. The court noted that the term 'transporation route or program' did not include every instance when the state has the power to condemn. The court held that since the social and economic impact of the project would be slight, and since the state had made reasonable efforts to reduce the environmental incursion to a minimum, the state need not comply with the statutory requirements. (Curran-Florida)
W78-02957

OXON HILL RECREATION CLUB, INC. V. WATER RESOURCES ADMINISTRATION (ISSUANCE OF CONDITIONAL PERMIT FOR BRIDGE CONSTRUCTION).
375 A.2d 567-70 (Md. Ct. App. 1977).

Descriptors: *Maryland, *Bridge construction, *Permits, *Administrative decisions, Flood plains, Channel erosion, Bridges, Streambeds, Stream erosion, Silts, Legal review, Sedimentation, Rivers, Streams, Stream stabilization, Administrative agencies, Deposition(Sediments), Public rights, Legal aspects, Flood damage, Banks, Discharge(Water).

Petitioner property owner sought review of respondent Water Resources Administration's issuance of a conditional permit to the county for construction of a new bridge over a creek. The bridge was made necessary by the relocation of a road. The permit was initially denied because the design of the new bridge would cause the stream bed to silt, necessitating constant maintenance and perhaps even the use of heavy equipment in the streambed. The property owner contended that the administration exceeded its authority when it issued a conditional permit. The Board of Review found that the proposed bridge would not affect the habitat, flooding, erosion, sedimentation and stability of the creek. The Maryland Court of Appeals affirming the decision of the Board of Review held that the evidence warranted a finding by the respondent that the conditions imposed by it in regard to its approval of the permit were sufficient to preserve public safety and promote public welfare. The court further held that the respondent had the authority to issue a conditional permit. (Beamer-Florida)
W78-02958

COMMONWEALTH V. BARNES AND TUCKER COMPANY (POWER OF THE STATE TO COMPEL A MINE OWNER TO PREVENT THE DISCHARGE OF UNTREATED ACID MINE WATER).
371 A.2d 461-68 (Pa. 1977).

Descriptors: *Acid mine water, *Mine drainage, *Pennsylvania, *Water pollution, Mine wastes, Eminent domain, Mine water, Mineral industry, Mine acids, Mining, Discharge(Water), Water treatment, Legal aspects, Streams, Coal mines, Coal mine wastes, Permits, Acidic water, Water pollution treatment, Water quality, Water pollution control, Pollution abatement, Economic impact.

Defendant mine owning company appealed a court order requiring it to prevent the discharge of acid mine water from its mine. The mine at issue was operated by the defendant for fifty years before it was sealed pursuant to an order under the Clean Streams Law. The defendant made numerous attempts to remedy the pollution problems which resulted from drainage of acid mine water. The company eventually abandoned the operation of the treatment facility which it had constructed. The Commonwealth of Pennsylvania sought to compel the defendants to assume the cost of its continued operation. The defendant contended that this would be an unreasonable exercise of police power and a 'taking' of property. He also insisted that a majority of the pollution was attributable to fugitive mine water. The Supreme Court of Pennsylvania held that the defendants were liable for the continued operation of the treatment facility since the Clean Streams Act is concerned with the source of offending discharge. The court also said the defendant is liable for abating the nuisance which it had created. (Quarles-Florida)
W78-02959

HYLAND V. BOROUGH OF ALLENHURST (NONRESIDENT FEE FOR MEMBERSHIP IN A MUNICIPAL BEACH FACILITY).
372 A.2d 1133-39 (N.J. Super. Ct. 1977).

Descriptors: *New Jersey, *Beaches, *Public access, *Recreation demand, *Assessments, Local governments, Access routes, Shores, Recreation, Natural resources, Atlantic Ocean, Swimming, Water sports, Recreation facilities, Public rights, Legal aspects, Cities, Swimming pools, Facilities, Taxes, Operating costs, Payment.

Defendant municipality contended that it had the right to charge nonresidents a higher fee than residents for membership in a municipal beach facility. The defendant also insisted that it was not obligated to provide for daily, as opposed to seasonal or half-seasonal use of the facility. The defendant municipality is a small community consisting almost completely of residential dwellings. The adjacent beach is small, especially those parts suitable for recreational use. The beach club at issue has limited facilities and charges higher rates for membership by nonresidents. Nonresidents were charged the same fee as residents for access to and use of the beach in the public trust area. The Superior Court of New Jersey, Appellate Division, held that a municipality may lawfully charge nonresidents a higher fee for membership in a municipal beach facility. The court based its holding on the fact that residents were already paying for club facilities as part of their tax bill while nonresidents were not. Because of the limited facilities of the club, the court rejected the plaintiff's insistence upon the availability of the club for daily use. (Quarles-Florida)
W78-02960

FEDERAL COMMON LAW OF NUISANCE AS A BASIS FOR RELIEF IN ENVIRONMENTAL POLLUTION CASES.
29 A.L.R. Fed 137-206 (1976).

Descriptors: *Water pollution, *Sewage treatment, *Waste disposal, *Judicial decisions, *Common law, Rivers and Harbors Act, Rivers, Streams, Legal aspects, Legal review, Water pollution control, River regulation, Watercourses(Legal aspects), Pollutants, Oil spills, Pesticides, Water pollution, Environment, Federal jurisdiction.

The existence of a federal law of nuisance seems universally accepted, but the scope of its application to environmental pollution cases is not clearly defined. This annotation contains a number of cases based on the nuisance theory. One case held such actions were not available to private party plaintiffs while another impliedly reached the opposite result by allowing private parties to appear as plaintiffs. It has been held that no federal common law nuisance action could be maintained without the prerequisite of interstate pollution. Emission of pollutants from ore-processing plants and smelters has been held to be an actionable federal common law nuisance, as has pollution of water by effluent from sewage disposal systems and by dumping of chemical byproducts without adequate pretreatment. Actions have succeeded against the petroleum industries and in cases asserting interstate pollution effects from agricultural pesticides and the disposal of garbage in such a way that it washed up onto the beaches. Federal common law nuisance action is available in appropriate circumstances, although the Supreme Court is reluctant to exercise its original jurisdiction in such actions. (Mulligan-Florida)
W78-02961

GREAT LAKES PROPERTIES V. CITY OF EL SEGUNDO (ATTORNEYS FEES PROPER FOR PREVAILING PARTY IN ACTION BROUGHT UNDER CALIFORNIA COASTAL ZONE CONSERVATION ACT).
561 P.2d 244-52 (Cal. Sup. Ct. 1977).

Descriptors: *California, *Law enforcement, *Coasts, *Penalties(Legal), Costs, Legal aspects, Judicial decisions, Legislation, Natural resources, Preservation, Conservation, Planning, Long-term planning, Permits, Zoning, Legal review.

Appellant corporation sought a ruling that Section 27428 of the California Coastal Zone Conservation Act of 1972 authorized the award of attorneys' fees only to successful plaintiffs and cross-complaintants. The appellant had been made a defendant in an action under the Act and had filed a cross-complaint against numerous public and private entities. When the cross-complaints were dismissed, the successful cross-defendants were awarded attorneys' fees. The lower court in construing the Act held that the term 'persons' applied both to plaintiffs and defendants, that the term 'shall' created a mandatory obligation. The Supreme Court of California affirmed this application of the plain meaning rule as state policy and cited its deterrent effect upon frivolous litigation. In a lengthy dissent the acting Chief Justice stressed the strong state legislative purpose to preserve the coast line which he felt required an interpretation of Section 27428 authorizing attorneys fees only to persons who successfully prosecuted an enforcement action. (Jones-Florida)
W78-02962

LOVELADIES PROPERTY OWNERS ASSOCIATION, INCORPORATED V. RAAB, (PROCEDURAL REQUIREMENTS FOR CITIZEN SUITS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
430 F. Supp. 276-82 (D.N.J. 1975).

Descriptors: *Rivers and Harbors Act, *Landfills, *Permits, *Federal Water Pollution Act, *Navigable waters, Sediment discharge, Legal aspects, Legislation, Judicial decisions, Federal government, Aesthetics, Administrative decisions, Legal review, Water quality, New Jersey, Water quality control, Water law, Federal jurisdiction, Water pollution, Environmental effects, Ecosystems.

Plaintiff taxpayers and property owners challenged the defendant's unauthorized landfill operations along Barnegal Bay. The defendant applied to the Corps of Engineers for an after-the-fact fill permit. The Corps found the operations to be beyond its statutory jurisdiction. After the Environmental Protection Agency refused to act against the defendant, the plaintiffs brought this action under the citizen suit provision in Section 1365 of the Federal Water Pollution Control Act Amendment. Although the United States District Court found the plaintiffs met the standing requirement, the court nonetheless dismissed the action because the plaintiffs did not obey the notice requirements of Section 1365. As jurisdictional alternatives, the plaintiffs brought suit under the Rivers and Harbors Act of 1899 and the Administrative Procedures Act, and also invoked federal mandamus jurisdiction. The court disposed of all three grounds saying the Rivers and Harbors Act did not authorize private civil actions; Administrative Procedure Act did not create an independent jurisdictional basis for suits challenging government agency actions; and mandamus was an extraordinary remedy not applicable to this fact situation. (Cocheu-Florida)
W78-02963

PARSELL V. SHELL OIL COMPANY (NO JURY TRIAL IN OIL SPILL DAMAGES SUIT UNDER FEDERAL ADMIRALTY JURISDICTION).
421 F. Supp. 1275-82 (D. Conn. 1976).

Descriptors: *Federal jurisdiction, *Oil spills, *Water pollution, *Navigable waters, Judicial decisions, Legal aspects, Accidents, Hazards, Constitutional law, Common law, Rivers and Harbors Act, Compensation, Water law, Connecticut, Damages, Jurisdiction, Harbors, Ships.

Private plaintiffs attempted to invoke federal jurisdiction in an action for damages arising out of a harbor oil spill. First the plaintiffs alleged jurisdiction under the Rivers and Harbors Appropriation Act of 1899. The United States District Court for Connecticut held that Congressional intent seemed to require enforcement of this Act by the Justice Department, rather than by private parties. The sole exception, not applicable in this case, is if the defendant has obstructed navigation. The plaintiff also based a claim on the federal common law of water pollution with an interstate effect. Although that was a legitimate cause of action, the court held the plaintiff did not demonstrate an interstate effect. The court found that the plaintiff could invoke federal jurisdiction in an admiralty action. However, in admiralty suits no trial by jury is allowed. Therefore, the court granted the defendant's motion to strike the jury trial demand. (Cocheu-Florida)
W78-02964

SAVE OUR SOUND FISHERIES ASSOCIATION V. CALLAWAY (AWARD OF ATTORNEY'S FEES IN ENVIRONMENTAL CITIZEN SUITS).
429 F. Supp. 1136-48 (D.R.I. 1977).

Descriptors: *Penalties(Legal), *Coasts, *Costs, *Waste disposal, Judicial decisions, Spoil banks, Legal aspects, Water law, Legal review, Dredging, Federal jurisdiction, Law enforcement, Water pollution, Water rights, Aquatic environment, Aquatic habitats, Project planning, Jurisdiction, Oceans, Environmental effects.

Plaintiff environmental interest group requested an award of attorney's fees expended to enjoin defendant federal agency from dumping dredged spoil at an ocean site off Rhode Island coastal waters. Defendant contended that the American Rule denying award of attorney's fees controlled. Plaintiff contended that since the original suit was brought pursuant to the Federal Water Pollution Control Act of 1972 (FWPCA), and the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA) the provisions in these acts which authorize attorney's fees in citizen suits are applicable. The court ruled that although FWPCA and MPRSA were not used by the trial court to obtain jurisdiction, they were properly pleaded and therefore were available as to the motion for award of attorney's fees. The court also ruled that the plaintiff's failure to provide the sixty-day notice required for citizen suit status was due to defendant's violation of several statutes. The court held that the plaintiff had constructively satisfied the sixty-day notice requirement. Finding no exceptional circumstances which could render the awards inappropriate, attorney fees competitive with prevailing rates in the community were awarded. (Brightman-Florida)
W78-02965

UNITED STATES V. KETCHIKAN PULP COMPANY (STANDARDS OF REVIEW FOR CHALLENGES TO FWPCA DISCHARGE PERMITS).
430 F. Supp. 83-88 (D. Alaska 1977).

Descriptors: *Alaska, *Discharge(Water), *Effluents, *Federal Water Pollution Control Act(FWPCA), Federal government, Legal review, Standards, Legal aspects, Water requirements, Water values, Public rights, Permits, Pulp wastes, Industrial wastes, Water pollution, Legal review, Judicial decisions.

The federal government brought an action alleging that defendant pulp company had failed to meet the effluent discharge requirements of a permit issued under the Federal Water Pollution Control Act. Two environmental groups were allowed to intervene in the action. The United States District Court in Alaska held that once the intervenors had been given an opportunity to object to a consent decree, they had their appropriate day in court and a judgment on consent could be entered. The court stated that the appropriate standard of review of the consent decree was whether the decree adequately protected the public interest and was in accord with the Congressional dictates. The court said that unless the intervenors could substantiate

a claim or show some apparent fault in the decree as illuminated by comments at the public hearings an evidentiary hearing should not be required in support of every decision reached by the government. The consent decree was therefore found to be reasonable. (Denker-Florida)
W78-02966

STATE WATER CONTROL BOARD V. HOFFMAN (LAKE DETERMINED NAVIGABLE AND SUBJECT TO FEDERAL PERMIT JURISDICTION).
427 F.Supp. 589-93 (W.D. Va. 1977).

Descriptors: *Permits, *Rivers and Harbors Act, *Navigable waters, *Jurisdiction, Virginia, Legislation, Rivers, Navigation, Regulation, State jurisdiction, Federal jurisdiction, Lakes, Impoundments, Dams, Piers, Legal aspects, Water law, Artificial lakes.

The Virginia Water Control Board, in an action for declaratory and injunctive relief, challenged the jurisdiction of the Corps of Engineers (Corps) over a certain man-made lake. The lake was created in 1964 for electric power generation by impoundment of a river. The Corps then instituted a program requiring permits for any construction affecting the lake pursuant to the Rivers and Harbors Act of 1899. The Corps' jurisdiction over the lake could only be upheld by the court if the lake was determined to be a navigable water of the United States. The United States District Court reviewed the criteria for navigability and held that: (1) the river was historically a navigable water so that the portion inundated retained its navigable status despite obstruction by dams; and, (2) that contemporary hydrological and survey evidence demonstrated that the river was navigable and that the backwaters of the lake were still navigable by small craft. The Water Resources Development Act of 1976, which excluded from the Corps' jurisdiction bodies of water located entirely within one state, was not applicable. Judgment was entered for defendants, re-affirming the Corps' jurisdiction over construction affecting the lake. (Jones-Florida)
W78-02967

ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. MORTON (FEDERAL AUTHORITY IN APPROVING WATER OPTION CONTRACTS FOR INDUSTRIAL USE).
420 F.Supp. 1037-50 (D. Mont. 1976).

Descriptors: *Montana, *Federal project policy, *Water contracts, *Resource allocation, *Water distribution(Applied), Water rights, Resource development, Competing uses, Irrigation programs, Industrial water, Federal-state water rights conflicts, Water delivery, Water policy, Water resources, Resources, Irrigation systems, Flood protection, Hydroelectric power, Silts, Agriculture, Flood control, Federal Reclamation Law.

Plaintiff environmental groups sought injunctive and declaratory relief to restrain defendant federal agency from undertaking any activities in connection with the contracting, sale, or disposition of water for industrial purposes from certain reservoirs in Montana. The plaintiffs claimed that Congress had authorized the reservoirs exclusively for agricultural irrigation, hydroelectric power, flood and silt control and supplementation of stream flow but not for industrial purposes. Therefore, the plaintiffs contended that the defendant could not divert water for industrial purposes without violating the Flood Control Act and Reclamation Act. The United States District Court held that the agency could approve water option contracts for industrial use under both acts as long as it determined that industrial water use would not impair the irrigation efficiency of the reservoirs. In addition, the court found that the plaintiffs had not property rights in the stored reservoir waters and that their action was premature since no injury had occurred. The court further held that no environmental impact statement was required and that industrial water marketing programs, water contracts and related activities did not violate the percentage allocation program in the Yellowstone River Compact Act. (Denker-Florida)
W78-02968

ROSE V. MITSUBISHI INTERNATIONAL CORPORATION (MARKETABILITY OF TITLE TO LAND BELOW HIGH WATER MARK).
423 F. Supp. 1162-67 (E. D. Pa. 1976).

Descriptors: *Pennsylvania, *Riparian land, *Navigable waters, *Boundaries(Property), Riparian rights, Tidal streams, High water mark, Low water mark, Ownership of beds, Banks, Easements, Legal aspects, Beds, Public rights, Right-of-way, Land tenure, Contracts.

Plaintiff sought damages for breach of contract by defendant corporation. The plaintiff had an option to purchase a deep-water port facility. The defendant had promised to provide funds for the exercise of the option and to participate with the plaintiff in a joint venture involving the deep-water port facilities. The defendant's financing obligation was subject to issuance of a title insurance policy indicating marketable title to the facility. The defendant contended that the title report excepting the property lying beyond the low water mark constituted a cloud on the title. The United States District Court held that the contract condition of clear and marketable title had not been satisfied since the evidence showed a portion of the premises to extend beyond the original low water mark of the river. The court noted that a riparian owner in Pennsylvania had absolute title only to the high water mark and had title between the high and low water marks subject to a navigational servitude. Title beyond the low water line lies with the state. (Capehart-Florida)
W78-02969

OHIO V. GASTOWN, INCORPORATED (STRICT LIABILITY FOR OIL SPILLS UNDER OHIO WATER POLLUTION LAW).
360 N.E.2d 970-73 (Perrysburg Mun. Ct. 1975).

Descriptors: *Ohio, *Oil spills, *Underground storage, *Penalties(Legal), Gasoline, Oil, Oil industry, Water pollution sources, Legal aspects, Oil pollution, Outlets, Water pollution, Water pollution control, Public health, Path of pollutants, Leases, Regulation, Streams, Outlets.

Defendant owner and lessor of an Ohio gasoline station was charged with polluting a public waterway by way of an oil spill emanating from an underground coupling. The resulting oil leakage flowed into a nearby public waterway. Once the oil source was discovered by Ohio environmental protection agents, the defendant, repaired the leak and began oil reclamation operations at his own expense. The defendant contended that it had no criminal liability since it lacked scienter and also because the lessee had control of the station rather than the owner. The state insisted that no criminal intent was required under the statute and that notice to the lessee was notice to the defendant. The court held that the statute is of a regulatory nature passed for the safety, health, and well-being of the community, and that it therefore places strict liability upon the accused and does not require scienter. Furthermore, the actions of the defendant in repairing the leak proved his control over the station rather than the operator, indicatig that the owner was ultimately responsible for the defect. (Quarles-Florida)
W78-02970

QUARLES PETROLEUM COMPANY, INCORPORATED V. UNITED STATES (SUBROGATION UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
551 F.2d 1201-08 (U.S. Ct. Cl. 1977).

Descriptors: *Insurance, *Compensation, *Federal Water Pollution Control Act, *Oil spills, Judicial decisions, Navigable waters, United States, Oil, Oil pollution, Water pollution, Water pollution sources, Federal government, Water law, Transportation, Reimbursable costs, Oil wastes, Cost repayment.

Plaintiff oil company owned a tanker which overturned as a result of another driver's negligence. The ensuing oil spill into navigable water was removed and the costs incurred were paid for by plaintiff's insurer. The plaintiff sought recovery under the Federal Water Pollution Control Act which requires: (1) a discharge of oil from a facility owned and operated by the plaintiff; (2) a discharge caused solely by an act or omission of a third party; (3) removal of the oil; (4) expenditure by the plaintiff of monies for removal. The government contended that since the plaintiff's insurance company had paid for the oil removal, the plaintiff had incurred no costs and was not entitled to recover. The Court of Claims held for the plaintiff thus allowing an insurer to recover under the doctrine of subrogation. The government also contended that sovereign immunity would prevent suit on behalf of a subrogee. The court rejected this argument saying that the Congressional intent to reduce water pollution as much as possible required encouraging insurance companies to insure by allowing subrogation. (Quarles-Florida)
W78-02971

UNITED STATES V. CALIFORNIA (FEDERAL-STATE WATER RIGHTS CONFLICTS UNDER THE RECLAMATION ACT).
550 F.2d 1239-44 (9th Cir. 1977).

Descriptors: *Federal reclamation law, *Federal-state water rights conflicts, *Appropriation, *State jurisdiction, California, United States, Permits, Reclamation, Reclamation states, Legal aspects, Water law, Water rights, State governments, Governmental interrelations, Reclaimed water, Clean Air Act, Prior appropriation, Judicial decisions.

The United States government sought to appropriate unappropriated water for federal reclamation projects within the state of California without applying to the state Water Resources Control Board and sought a declaratory judgment that it could take such action. The state contended that the federal government must apply to the state board for a permit and comply with conditions contained in it. The federal government insisted that the Reclamation Act of 1902 did not subject federal projects to state permit requirements. The United States Court of Appeals, Ninth Circuit, held that federal installations are subject to state regulation only when and to the extent that Congressional authorization is unambiguous. The court cited leading cases involving similar questions regarding a state's right to regulate federal institutions under the Clean Air Act and the Federal Water Pollution Control Act. Both of these contain broad language that could have been construed as subjecting federal instrumentalities to state laws, but instead were interpreted otherwise. The court also points out that the Reclamation Act was adopted before California's permit requirement existed. (Quarles-Florida)
W78-02972

PACIFIC NORTHWEST BELL TELEPHONE V. UNITED STATES (SOVEREIGN IMMUNITY UNDER THE PUBLIC VESSELS ACT AND SUITS IN ADMIRALTY ACT).
549 F.2d 1313-17 (9th Cir. 1977).

Descriptors: *Rivers and Harbors Act, *Damages, *Channel improvement, *Negligence, Washington, Navigable waters, Lake beds, United States, Legal aspects, Jurisdiction, Permits, Navigation, Channels, Legislation, Lakes, Buoys, Federal jurisdiction, Water law, Judicial decisions.

LIBRARY OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Plaintiff telephone company sought to collect for damages to one of its submarine cables resulting from defendant federal government's actions in maintaining navigable waters. The cable was laid in accord with a permit issued by the defendant that relieved the United States of any liability for damage caused by operations undertaken by defendant for conservation and improvement of navigation. Although the cable at issue was damaged as a result of such an operation, the plaintiff insisted that the waiver of liability language in the permit was invalidated by the waiver of sovereign immunity by the Public Vessels Act and the Suits in Admiralty Act. The Ninth Circuit Court of Appeals remanded the case holding that in the absence of a more explicit indication of legislative intent, the power of the federal government must remain unimpaired to deny permits or, in granting them, to impose conditions relevant to the regulatory purpose. Although the Public Vessels Act and Suits in Admiralty Act constitute consent by the government to be sued, they do not constitute consent to judgment in all cases. (Quarles-Florida)
W78-02973

TRI-STATE MATERIALS V. UNITED STATES (THE EXTENT OF A SOVEREIGN'S NAVIGATIONAL SERVITUDE IN A CONDEMNATION ACTION).
550 F.2d 1-9 (U.S. Ct. Cl. 1977).

Descriptors: *Navigable rivers, *Eminent domain, *Water table, *Flooding, *Mining, Ohio River, Compensation, Dams, Floodwater, Drainage, Subsurface drainage, Watersheds(Basins), Property values, Navigable waters, Streambeds, Beds, Riparian rights, Riparian waters, Adjacent landowners, Condemnation, Groundwater movement, Gravels, Quarries.

The plaintiffs, owners of a sand and gravel business located beyond the boundaries of the Ohio River bed, sought damages from defendant federal government whose project on the navigable river resulted in a rise in the water table thereby flooding plaintiffs' mine. The court held that defendant's action was a compensable taking. The defendant had contended that it was not liable under several alternative theories arguing that the subterranean flooding from the project was temporary and that the presently offending water was not from the federal project. The Court of Claims dismissed this argument as irrelevant since the flooding was a permanent effect of governmental actions that raised the water table and prohibited the land's previous unimpaired drainage. The court also rejected defendant's argument based on the sovereign's navigational servitude which allows the government to invade property rights within a stream bed without paying compensation when the purpose is to aid navigability. This argument failed because the land at issue was beyond the bed of a navigable stream. Furthermore, the value claimed to have been taken was not derived from access to or use of a navigable stream. (Quarles-Florida)
W78-02974

NEVADA WATER POLLUTION CONTROL LAW.
Nev. Rev. Stat. secs 445.131 through 445.354 (1975).

Descriptors: *Legislation, *Nevada, *Water pollution control, *Water pollution, Pollutants, Abatement, Water pollution treatment, Water quality control, Water treatment, Toxicity, Permits, Water resources development, Water law, Planning, Discharge(Water), Pollution abatement wastes, Water pollution effects, Administrative agencies regulation, Land development.

Nevada public policy is to restore and maintain the integrity of waters, to reduce and eliminate pollution and to plan the development of land and water resources. Powers and duties of the state environmental commission and procedures governing its operation are set forth. Water quality standards and effluent limitations are to be established by the commission. The department of human resources is the state water pollution control agency; guidelines for the department director are given. The department regulates the discharge of pollutants from any point source into state waters through a permit program. Conditions, terms, restrictions and fees for permits are described, as well as procedures for revocation or suspension of permits. A state water planning process consistent with federal requirements regarding effluent limitations, compliance schedules, and waste management plans shall be conducted by the department. It will also regulate the discharge of radioactive and toxic wastes and may require monitoring and recording of pollutant discharges. Violations of these statutes may be remedied by the director through compliance orders, injunctive relief, or by requesting civil or criminal penalties. (Mulligan-Florida)
W78-02975

LAROSE V. CAMPBELL (LIABILITY FOR INTERRUPTION OF MERE SURFACE DRAINAGE).
363 N.E.2d 1330-33 (Mass. Ct. App. 1977).

Descriptors: *Massachusetts, *Watercourses(Legal), *Floods, *Surface waters, *Drainage effects, Drainage, Surface runoff, Drainage area, Surface waters, Water sources, Water law, Legal aspects, Riparian rights, Judicial decisions, Negligence, Adjacent landowners, Flood damage, Damages, Runoff.

Plaintiff landowner brought suit against a neighboring landowner claiming that the defendant had interrupted the surface drainage across the plaintiff's land. The Appeals Court of Massachusetts held that no natural watercourse came into existence until the surface waters had flowed from the plaintiff's land across a non-party's land and onto the land of the defendant. The court refused to expand the definition of natural watercourse to include surface water on the plaintiff's land. In addition, the court held that no action would lie against a landowner for interruption of mere surface drainage from neighboring lands. The rule is different where an owner discharges the water onto his neighbor's land by a definite artificial channel or where he artificially retains the water in such a way that it is deflected upon other land. However, there was no such finding in the present case of any such artificial channeling or retention by individual defendants. The court also held that no prescriptive easement of drainage over anothers land can arise where the water leaving the upland is mere unchanneled surface water. (Maass-Florida)
W78-02976

DELANO V. COLLINS (REASONABLE ALTERATION OF NATURAL RUNOFF PATTERNS BY LANDFILL FOR IMPROVEMENT OF RESIDENTIAL PROPERTY).
364 N.E.2d 716-21 (111. Ct. App. 1977).

Descriptors: *Illinois, *Boundaries(Property), *Adjacent landowners, *Runoff, Legal aspects, Surface drainage, Drainage systems, Storm runoff, Storm drains, Floods, Judicial decisions, Land development, Land fills, Land use, Topography, Diversion, Alteration of flow, Flood damage.

Plaintiff landowner sought to restrain defendant landowner from allowing natural runoff to enter the plaintiff's property and to require restoration of the defendant's property to its previous condition. The defendant owned property which adjoined the plaintiff's property on two sides. Since the natural runoff pattern of the area was generally northeast to southwest, runoff from the defendant's property drained directly onto the plaintiff's property causing flooding during periods of intense rainfall. In developing the defendant's parcel, 116 truckloads of landfill were spread on the property to improve drainage for the construction of a home. The plaintiff alleged that the defendant had altered the natural runoff condition by the addition of the fill dirt, increasing the runoff onto the plaintiff's land. Applying the rule in Illinois which allowed for a reasonable interference with the natural flow of water to enhance farmland 'in the interest of good husbandry', the Illinois Appelate Court held for the defendant. The court expanded the Rule of Reasonableness to include the improvement of property for the construction of a home, and stated that the acts of the defendant had not been proved unreasonable. (Yawn-Florida)
W78-02977

GROUND WATER AND WELLS.
S.D. Comp. Laws Ann. secs 46-6-3 thru 46-6-6.2 (Supp. 1977).

Descriptors: *South Dakota, *Water allocation(Policy), *Wells, *Appropriation, *Water shortage, Water conservation, Water policy, Water resources, Water sources, Hydrologic data, Domestic water, Industrial water, Water rights, Permits, Water control, Water supply, Groundwater, Administration, Irrigation wells, Administrative agencies, Legal aspects, Legislation, Subsurface waters, Beneficial use.

Subject to vested rights, any person desiring to appropriate any ground water in South Dakota must give notice to the water rights commission specifying such information as the proposed beneficial use, the well location, and the amount of water desired. No application is required for most domestic use although domestic users must give notice of their intent to drill. However, large domestic users such as municipalities must file an application. The commission is authorized to adopt rules and regulations to assist in the collection, preservation and publication by the state geological survey of hydrologic data. The commission is further authorized to regulate the location and capacity of irrigation, industrial, municipal and other large capacity wells to ensure water for reasonable domestic use without the necessity of requiring maintenance of artesian head pressure in a domestic use well. The rules and regulations shall also provide standards for construction and operation of wells. When a shortage of ground water exists the commission shall require a reduction in output, based on the degree of contribution to the shortage, of all large capacity wells in the area. The commission shall penalize noncompliance by fines. (Beamer-Florida)
W78-02978

SOUTH DAKOTA CONSERVANCY DISTRICT.
S.D. Comp. Laws Ann. secs 46-17-1, 46-17-3 (Supp. 1977).

Descriptors: *South Dakota, *Water conservation, *Water supply, *Water resources, *Water districts, Conservation, Wildlife conservation, Fish conservation, Erosion control, Beneficial use, Water utilization, Water quality control, Water yield improvement, Water resources development, Legislation, Administration, Administrative agencies, Supply, Water yield, Planning, Water demand, Water policy, Recreation.

South Dakota recognizes the limited supply of and increasing demand for water for agricultural and other beneficial uses and the need for more effective development and utilization of land and water resources. In order to make the fullest use of waters available and promote prosperity and the general welfare, the state has created the South Dakota Conservancy District. The district will begin the construction of water resource facilities

for the conservation, storage, distribution and utilization of water. The district will also encourage, promote and assume responsibility for the development of water resources by providing state water resources planning. The district will conserve, regulate and control the waters of the state by providing for flood protection, recreation, municipal and industrial water supply, water quality enhancement, scenic rivers, navigation, beautification, fish and wildlife benefits, and erosion control. It will protect and improve water quality wherever possible. The district has the responsibility for preparing and submitting a statewide water plan for development of a state water resources development system. This plan must be supplemented yearly and updated at least every four years. (Beamer-Florida)
W78-02979

OAHE IRRIGATION PROJECT.
S.D. Comp. Laws Ann. secs 46-17A-3.1 thru 46-17A-3.3. (1967), as amended, (Supp. 1977).

Descriptors: *South Dakota, *Irrigation programs, *Irrigation, *Legislation, Irrigation engineering, Conservation, Soil management, Channeling, Water supply, Supply, Environmental effects, Wildlife, Habitat improvement, Wildlife conservation, Administration, Administrative agencies, Governments, Management, Soil environment, Federal government.

South Dakota has enacted supporting continuation and completion of the Oahe irrigation project. Funding for the project will be appropriated by the Congress and the President of the United States. A state Oahe unit task force, consisting of seven members is created. The task force is composed of the governor, two members of the Oahe conservancy subdistrict board chosen by that board and four members chosen from the state legislature. The task force is to monitor and examine the Oahe unit as outlined in the construction schedule of the bureau of reclamation and report to the legislature annually on the progress of the project. Where appropriate, the task force is to pursue or assist in pursuing modification and improvement of the project in the areas of canal side irrigation, soil preservation, channelization, public access to project data, municipal, rural and industrial water supply, beneficial economic and environmental purposes and wildlife mitigation and enhancement. (Beamer-Florida)
W78-02980

WILD, SCENIC AND RECREATIONAL RIVERS.
S.D. Comp. Laws Ann. secs 46-17A-20, 46-17A-21 (1967), as amended, (Supp. 1977).

Descriptors: *South Dakota, *Wild rivers, *Natural resources, *Preservation, Recreation, Rivers, Streams, Legislation, Parks, Conservation, Water resources, Protection, Natural flow, State government, Governments, Administration, Scenery, Fish, Wildlife, Water conservation, Wildlife conservation, Public benefits, Value, Aesthetics.

The board of natural resource development, with help of the game, fish and parks commission, is to consider the designation of certain South Dakota rivers or sections of rivers as 'wild, scenic and recreational rivers'. No development detrimental to the natural and scenic beauty of the designated rivers will be allowed. The board must also designate certain 'wild scenic and recreational river areas' as part of the preservation of the diminishing resource of free flowing rivers and streams in the state. Areas with free flowing rivers and streams that posses unique natural scenic beauty, water conservation, fish, wildlife and outdoor recreational values are to be recommended by the board for this designation. The purpose of this designation is to preserve these areas for the present and future benefit of the people of the state. (Beamer-Florida)
W78-02981

BELLE FOURCHE RIVER COMPACT.
S.D. Comp. Laws Ann. secs 46-30-1, 46-30-2 (1967).

Descriptors: *South Dakota, *Interstate compacts, *Interstate rivers, *Water allocation(Policy), Equitable apportionment, State governments, Federal government, Federal-state water rights conflicts, Water rights, Rivers, Diversion structures, Reservoir storage, River basins, Dams, Conduits, Tributaries, Legislation, Flood control, Irrigation, Canals, United States, Appropriation, Gaging stations, Wyoming.

The state of South Dakota has ratified the Belle Fourche River Compact. The compact, between Wyoming and South Dakota, allocated 90% of the unappropriated waters of the Belle Fourche River Basin and its tributaries to South Dakota and 10% to Wyoming, exclusive of Wyoming's right of unrestricted use of the waters for domestic and stock purposes. Each state may store or temporarily divert any of the other's unused portion. Each state shall have the right to acquire property rights in another state, to construct and use storage and diversion works to protect its allocated water, and to regulate and conserve the other state's allocated water. Certain restrictions are imposed on size and use of reservoirs. Suitable water gauging stations shall be constructed to ensure compliance with the compact. Appropriations are adjudicated in the state of storage or diversion and confirmed and recorded in the other state assuming it uses all or a portion of the water. The rights and powers of the United States in and to the waters are unimpaired, but it shall give due consideration to the compact's objectives when exercising those rights. (Smith-Florida)
W78-02982

FLOOD CONTROL AND STREAM IMPROVEMENT.
S. D. Comp. Laws Ann. secs 9-36-1 thru 9-36-17 (1967).

Descriptors: *Stream improvement, *Legislation, *Flood control, *Condemnation, *South Dakota, Easements, Flood protection, Streams, Rivers, Floods, Jurisdiction, Dam failure, Bulkheads, Docks, Levees, Dams, Breakwaters, Real property, Land tenure, Navigation, Assessments, Costs, Damages, Engineering structures.

The state of South Dakota has enacted legislation granting municipalities the power to establish, define, and improve the boundaries of rivers and streams within their corporate limits. A survey and plat of proposed lines must be filed and notice of the proposed boundaries must be given. Property owners affected by these boundaries may file objections and appeal an adverse decision. A municipality may acquire land or perpetual easements within the new boundaries, improve the boundary line with walls, walks, and driveways, and, if needed for said improvements, acquire land outside of the boundaries. In addition, a municipality may make navigation and flood control improvements along or across the river. Owners of abutting property may be required to construct and maintain such improvements at their own cost. An owner who neglects this duty is liable for damages his neglect causes except for dam breakings or unusual torrential floods. Any municipality may join with other governmental units to prevent flooding. (Smith-Florida)
W78-02983

REFUSE IN PUBLIC PLACES AND STREAMS.
S.D. Comp. Laws Ann. sec 9-32-10 (1967).

Descriptors: *Domestic wastes, *Legislation, *South Dakota, *Municipal water, Bodies of water, Streams, Pollutants, Water pollution sources, Water pollution, Water quality, Water pollution control, Regulation, Abatement, Wastes, Cities.

The state of South Dakota has enacted legislation granting a municipality the power to regulate and prevent the placing of refuse in any body of water or stream within the boundary of the municipality. (Smith-Florida)
W78-02984

OVERFLOW AND FLOODING FROM WELLS AND DISTRIBUTION WORKS.
S.D. Comp. Laws Ann. secs 46-9-1 through 46-9-4 (1967).

Descriptors: *South Dakota, *Artesian wells, *Irrigation systems, *Flood damage, Water quality, Water wells, Irrigation, Water pollution, Irrigation practices, Irrigation operation and maintenance, Irrigation ditches, Irrigation canals, Canals, Ditches, Irrigation effects, Drainage effects, Flooding, Runoff, Overflow, Floodwater, Runoff, Damages, Waste water disposal.

The state of South Dakota has enacted legislation making any person or irrigation district who owns any canals, laterals or ditches, or irrigation works civilly liable for any damage caused from the neligent discharge of waste water or from overflow. The person claiming damages must notify the owner as promptly as possible depending upon the circumstances, but in all cases at least thirty days before commencing an action. The action itself must be brought within sixty days after the infliction of the injury. In the event of water overflowing from an artesian well and obstructing a public highway, the person owning, or having control of, such well will be given written notice of the violation. If theowner does not act within ten days of receiving notice, the governing body, board, or officer may care for or remove the water causing the obstruction, damage or interference. The governmental unit may then seek to recover the amount expended from the owner in the proper court. (Kastner-Florida)
W78-02985

TECHNOLOGY IS NOT ENOUGH: THE PROVISION AND MAINTENANCE OF APPROPRIATE WATER SUPPLIES,
For primary bibliographic entry see Field 6B.
W78-03059

NATURAL RESOURCES POLICY 1975-1985,
New Mexico Univ., Albuquerque. Dept. of Economics.
A. V. Kneese.
Journal of Environmental Economics and Management, Vol 3, No 4, December 1976, p 253-288. 2 tab.

Descriptors: *Natural resources, *Federal government, Taxes, Economics, Exploitation, Competition, Institutions, Water policy, Governmental interrelations, *National policy, Extractive industries, Governmental reorganization.

An alternative natural resources policy for the U.S. is offered to replace what is described as a policy which is inconsistent, often outdated, and grossly overdependent on direct regulation vis-a-vis adjustments in the defective system of economic incentives. It is also argued that present policy fails to recognize the web of interdependences among all resource problems, including those of environmental resources. Chief elements in the alternative proposal are reduced reliance on direct regulation, increased reliance on economic incentives, measures to cancel unfavorable distributive effects, measures to improve the competitiveness and performance of the natural resource industries, and reorganization of both legislative and administrative branches of government. Included in federal government reorganiza-

tion would be creation of a department of natural resources with strong analytical capability and oriented toward viewing resource policy problems as interdependent and requiring integrated government action. Also endorsed is a modified committee structure in Congress. Among tax policies proposed would be an end to special tax treatment for extractive industries and an increase in the severance tax on extractive activities. (Coyle-Wisconsin)
W78-03083

6F. Nonstructural Alternatives

THE MARSHLAND ISSUE: LEGISLATIVE COMPENSATION FOR LOSSES RESULTING FROM GOVERNMENTAL LAND USE REGULATIONS -- FROM INVERSE CONDEMNATION TO PRODUCTIVE USE,
For primary bibliographic entry see Field 6E.
W78-02853

THE TAKINGS ISSUE IN A NATURAL SETTING: FLOODLINES AND THE POLICE POWER,
Tennessee Univ., Knoxville. School of Law.
Z. J. Plater.
Texas Law Review, Vol. 52, No. 2, p. 201-56, January 1974.

Descriptors: *Flood damage, *Flood plain insurance, *Flood plain zoning, *Permits, Floods, Flood control, Flood recurrence interval, Real property, Property values, Land tenure, Flood plains, Flood protection, Regulations, Social impact, Costs, Public benefits, Legislation, Constitutional law, Legal review, Legal aspects.

Unchecked development of flood plain areas based on private property rights inevitably leads to public financial losses, federally-funded flood insurance, expensive clean-up and restoration of public services, expensive but only partially successful flood control efforts. Three governmental options exist for resolving the flood problem: continuing the present system of supporting private floodplain development both before and after floods as a common burden, conquering the rivers so that they threaten neither lives nor property, or ceasing to fight with nature over the floodplain. To avoid waste and prohibitive expense, governments should move toward the principle that the only acceptable development of floodplains should provide benetifs exceeding all true costs. Outright purchase of all flood plains is a financial impossibility, and floodplain restrictions have often been voided because they appear to be a taking of property without just compensation. The answer to legally supportable restrictions lies in a diminution-balancing test which recognizes public losses but incorporates fair treatment for private individuals. This could be accomplished by realistic flood plain regulation under a permit system. (Jones-Florida)
W78-02857

6G. Ecologic Impact Of Water Development

BIBLIOGRAPHY OF STRIP MINE ECOLOGY,
Iowa State Univ., Ames. Energy and Mineral Resources Research Inst.
For primary bibliographic entry see Field 5G.
W78-02744

NEW RIVER (HEARINGS ON S. 158, WHICH PROVIDE FOR DESIGNATION OF A SEGMENT OF THE NEW RIVER WITHIN THE NATIONAL WILD AND SCENIC RIVERS SYSTEM).
For primary bibliographic entry see Field 6E.
W78-02819

DESIGNATION OF MISSOURI RIVER SEGMENT AS A WILD AND SCENIC RIVER (HEARINGS ON S. 1506).
For primary bibliographic entry see Field 6E.
W78-02820

TO AMEND THE WILD AND SCENIC RIVERS ACT AND TO DESIGNATE CERTAIN LANDS AS WILDERNESS (HEARINGS ON S.3613, 3788, AND 2708).
For primary bibliographic entry see Field 6E.
W78-02821

DESIGNATION OF OBED RIVER SEGMENT AS A WILD AND SCENIC RIVER (HEARINGS ON H.R. 13067 AND 13303).
For primary bibliographic entry see Field 6E.
W78-02822

SOME RESULTS OF COMPARING THE ECOLOGICAL SCALES OF RAMENSKII, ELLENBERG, HUNDT AND KLAPP, (IN RUSSIAN),
Leningrad State Univ. (USSR). Biological Inst.
Yu. I. Samoilov.
Bot Zh. 58(5), p 646-655, 1973.

Descriptors: *Ecology, *Ecological distribution, Water quality, *Aquatic plants, *Classification Alopecurus-pratensis, Angelica-sylvestris, Carex-gracilis, Carex-humilis, Carex-inflata, *Ecological scales, Germany, Koeleria-gracilis, *Meadow, Medicago-falcata, Phleum-phleoides, Ranunculus-repens, Sphagnum-dusenii, Stipa-capillata, Stipa-pennata, Trifolium-montanum, USSR.

Since ecological scales are quite useful in geobotanical investigations and their use is being held up by the absence of narrow regional scales, the existing scales were compared to estimate the errors possible when using these scales beyond the limits of the regions for which they were compiled. A comparison of the Ramenskii ecological scale for evaluating the water supply of plants in the USSR with the Ellenberg, Hundt, and Klapp scales complied for the southern and central regions of East and West Germany, which differ from the center of the European part of the USSR in climate, set of species (Medicago falcata, koeleria gracilis, Phleum phleoides, Ranunculus repens, Carex gracilis, C. humilis, C. inflata, Sphagnum dusenii, Stipa capillata, S. pennata, Trifolium montanum, Alopecurus pratensis, Angelica sylvestris), soil rechness and degree of cultivation of meadows, showed that the amplitudes of the same plant species (more than 200) according to all these scales coincide completely sufficiently for any of them to be used for characterizing the confinement of communities to a certain water supply. This conclusion was checked by ranking a number of meadow associations with the use of the indicated scales.--Copyright 1974, Biological Abstracts, Inc.
W78-02874

BUILDING A BETTER SMALL WATERSHED PROGRAM,
For primary bibliographic entry see Field 4D.
W78-02876

RISK ANALYSIS METHODS FOR DEEPWATER PORT OIL TRANSFER SYSTEMS,
Transportation Systems Center, Cambridge, MA.
For primary bibliographic entry see Field 5C.
W78-03098

STUDIES AND INVESTIGATIONS OF THE FATE AND EFFECT OF THE SHELL OIL SPILL, PLATFORM B, BLOCK 26, SOUTH TIMBALIER BAY (DECEMBER 1, 1970 - NOVEMBER 30, 1971),
Resources Technology Corp., Houston, TX.
For primary bibliographic entry see Field 5C.
W78-03106

MOVEMENT OF SPILLED OIL OVER THE BEAUFORT SEA SHELF - A FORECAST,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5B.
W78-03108

7. RESOURCES DATA

7A. Network Design

DESIGN OF REPRESENTATIVE AND KEY RAINGAUGE STATIONS NETWORK FOR FLOOD FORECASTING IN YAMUNA AND DAMODAR RIVERS,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 2B.
W78-02797

7B. Data Acquisition

A COMPUTER-AIDED AERIAL PHOTOGRAPHIC ANALYSIS OF FIRE ISLAND INLET GEOMORPHOLOGY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4A.
W78-02761

HOW MUCH RAIN DOES A RAIN GAGE GAGE,
Agricultural Research Service, Sidney, MT. Northern Plains and Water Research Center.
For primary bibliographic entry see Field 2B.
W78-02786

STUDY ON THE ESTIMATE OF PRECIPITATION WITH THE HELP OF S-BAND AT RADAR CALCUTTA,
Regional Meteorological Center, Calcutta (India).
For primary bibliographic entry see Field 2B.
W78-02795

TESTING THE EFFICIENCY OF ALGORITHMS AND STRATEGIES FOR AUTOMATIC CALIBRATION OF RAINFALL-RUNOFF MODELS,
Papua and New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography.
For primary bibliographic entry see Field 2A.
W78-02798

POSSIBILITY OF IDENTIFYING PRECIPITATION FROM MICROWAVE MEASUREMENTS FROM SATELLITES,
For primary bibliographic entry see Field 2B.
W78-02803

ESTIMATE OF THE ACCURACY OF VARIOUS METHODS FOR COMPUTING TOTAL EVAPORATION IN THE MOUNTAINS OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
For primary bibliographic entry see Field 2D.
W78-02804

LEACHATE TESTING TECHNIQUES SURVEYED,
Mitre Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 5A.
W78-02816

FLOW MEASURING METHOD AND APPARATUS,
TRW Inc., Redondo Beach, CA. (Assignee).
R. G. Morrison.

U.S. Patent No. 4,015,470, 10 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 67, April 5, 1977.

Descriptors: *Patents, *Flow, *Closed conduit flow, *Measurement, Instrumentation, Acoustics, Sound waves, Velocity, Density, Temperature, Sonic velocity.

An improved acoustic method and instrument is provided for measuring certain variables of a fluid flowing through a conduit. These variables are flow velocity, mass flow rate, sonic velocity (i.e. velocity of sound in the fluid), compressibility, temperature, and density. The fluid variables are measured by transmitting acoustic pulses through the conduit wall and fluid stream along transmission paths normal to and oblique to the conduit axis between acoustic transducers located externally of the conduit, measuring the transit times of the pulses along the two paths, and combining these transit times with certain conduit and transducer parameters according to predetermined mathematical relationships to obtain the values of the variables. One feature of the invention resides in the fact that the transit times of the acoustic pulses along the oblique transmission path are measured in both directions of pulse transmission along the path to cancel out the effect of temperature on the flow measurement. (Sinha-OEIS)
W78-02889

SPHERICAL ELECTROMAGNETIC WATER CURRENT VELOCITY SENSOR WITH PROTRUDING ELECTRODES,
Marsh-McBirney, Inc., Rockville, MD. (Assignee).
L. B. Marsh.
U.S. Patent No. 4,015,471, 6 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 67, April 5, 1977.

Descriptors: *Patents, *Flowmeters, *Instrumentation, *Currents(Water), Measurement, Equipment, Electrodes, Electromagnetic flowmeters, Magnetic fields.

This invention relates to an improved electromagnetic flowmeter which is particularly suitable for measuring water currents, both vertical and horizontal, in oceans, lakes, and other natural bodies of water, as well as in various man-made reservoirs and containers in which there is water motion. An electromagnetic fluid current velocity sensing apparatus is provided including a spherical non-ferromagnetic probe body adapted to be submerged in the fluid current. A first coil is mounted in the spherical probe body for establishing a first magnetic field in the fluid. Circumferentially spaced pairs of diametrically arranged electrodes are contained in a common first plane normal to the magnetic axis of the first coil. Two-axis response is achieved through the use of a single coil for producing a magnetic field the axis of which is normally vertical, first and second orthogonally arranged pairs of diametrically opposed electrodes being provided, which are contained in a plane normal to the magnetic axis of the first coil. Three-axis response is achieved by providing a second coil for producing a second magnetic field the axis of which is contained in the first plane and which bisects the diameters of the first and second pairs of electrodes. A third pair of diametrically arranged electrodes are provided which are contained both in the first plane and in a second plane normal to the axis of the second magnetic field. The first and second coils are alternately energized and de-energized in opposite senses, respectively. (Sinha-OEIS)
W78-02890

UNDERWATER SAMPLER,
Benthos, Inc., N. Falmouth, MA. (Assignee).
For primary bibliographic entry see Field 2J.
W78-02903

APPLICATION OF REMOTELY SENSED LAND-USE INFORMATION TO IMPROVE ESTIMATES OF STREAMFLOW CHARACTERISTICS,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-03136

7C. Evaluation, Processing and Publication

LAKE-LAND PRECIPITATION RELATIONSHIPS USING NORTHERN LAKE MICHIGAN DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2B.
W78-02807

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME I. USERS MANUAL.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02882

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME II. IRIS TABLES. THESAURUS, SOURCE CODE TABLE AND SOURCE NAME TABLE.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02883

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME III. IDENTIFICATION NUMBER MASTER REPORT.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02884

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME IV. SUBJECT INDEX.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02885

SURFACE-WATER AVAILABILITY, CALHOUN COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
J. R. Harkins.
Alabama Geological Survey, University, Map 128, 1972. 11 p, 5 fig, 1 tab, 13 ref.

Descriptors: *Available water, *Surface waters, *Streamflow, *Water quality, *Alabama, Flow rates, Water yield, Low flow, Hydrology, Rainfall-runoff relationships, Hydrologic data, Water temperature, Potential water supply, Maps, Calhoun County(Ala).

On the average Calhoun County in Alabama receives about 1,500 million gallons of precipitation each day. Of this, about 950 million gallons is evaporated or transpired to the atmosphere. Thus, the average daily streamflow within the county from precipitation is about 550 million gallons. An average of about 110 million gallons enters the county daily by way of streams flowing from areas north and east of the county. Hence, the average volume of water available daily from the small streams of the county is about 660 million gallons, a volume 33 times greater than the present average daily use of 20 million gallons. In addition, large quantities of water are available from the Coosa River which has an average flow of 6,200 mgd or about 300 times greater than the present rate of use. The water in streams in Calhoun County is generally of good chemical quality. Total dissolved solids in general are less than 160 mg/liter, although the hardness ranges from soft to hard. Water temperature ranges from about 3 degrees C (38 degrees F) in January to 28 degrees C (82 degrees F) in July and August. (Woodard-USGS)
W78-03113

SURFACE WATER, BULLOCK COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
J. F. McCain, and P. O. Jefferson.
Alabama Geological Survey, University, May 129, 1972. 3 p, 3 ref.

Descriptors: *Available water, *Surface waters, *Streamflow, *Water quality, *Alabama, Flow rates, Water yield, Low flow, Hydrology, Rainfall-runoff relationships, Hydrologic data, Potential water supply, Maps, Bullock County(Ala).

Stream gaging by the U.S. Geological Survey was begun in Bullock County, Alabama, September 30, 1947, with the establishment of a low-flow partial-record station on Johnson Creek near Midway. The largest stream in the county is Pea River which has an average discharge of 145 million gallons per day at the southeast corner of the county. The surface-water availability map for Bullock County shows by width of color pattern the approximate long-term average flow, in million gallons per day, of streams in the county. The average flow from the county is about 0.80 million gallons per day per square mile. The chemical quality of water from streams in the county is relatively uniform and the water is suitable for most uses. The surface-water availability map shows the areal distribution of the sampling sites and the range of each chemical parameter determined at the site. (Woodard-USGS)
W78-03114

WATER AVAILABILITY AND GEOLOGY OF HALE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
M. E. Davis, T. H. Sanford, Jr., and P. O. Jefferson.
Alabama Geological Survey, University, Map 136, 1975. 51 p, 6 fig, 3 plates, 6 tab, 16 ref.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Alabama, Water yield, Streamflow, Water wells, Aquifers, Hydrologic budget, Hydrogeology, Well data, Chemical analysis, Potential water supply, Hydrologic data, Maps, Evaluation, Hale County(Ala).

Geologic units that underlie and crop out in Hale County, Alabama, include the Tuscaloosa Group, Eutaw Formation, and Selma Group of Late Cretaceous age, and terrace deposits and alluvium of Quaternary age. Potential sources of large supplies of ground water are major aquifers in the Coker, Gordo, and Eutaw Formations; expected yields are 1.5 mgd (million gallons per day) per well. The average annual runoff originating in Hale County is about 17 inches or 0.82 mgd per square mile. The Black Warrior River, largest potential source of surface water in the county, has an average flow of 5,800 mgd at the gaging station near Eutaw. Elliotts, Fivemile, Big Brush, and Big Prairie Creeks also are potential sources of surface water. These creeks have average flows ranging from 35 to 210 mgd. Water from most streams in the county contains less than 10 mg/liter chloride and ranges from soft to hard. The mineral content

of water from Big Brush Creek is affected by salty water from a flowing well. Ground water from the major aqifers contains less than 250 mg/liter chloride, except in the extreme northwestern and west-central parts of the county, and ranges from soft to very hard. Water from the aquifers generally contains iron in excess of 0.3 mg/liter except in the southern part of the county. Water use in Hale County in 1968 was about 3.9 mgd, most of which was ground water. Less than 1 percent of the potential water resources is being utilized. (Woodard-USGS)
W78-03115

WATER AVAILABILITY OF RANDOLPH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
G. C. Lines, and R. V. Chandler.
Alabama Geological Survey, University, Map 137, 1975. 29 p, 10 fig, 4 tab, 11 ref.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Alabama, Water yield, Streamflow, Water wells, Aquifers, Hydrologic budget, Hydrogeology, Well data, Chemical analysis, Potential water supply, Hydrologic data, Maps, Evaluation, *Randolph County(Ala).

Large quantities of surface water are available for use in Randolph County, Alabama. Supplies of 50 mgd (million gallons per day) or more are available from the Tallapoosa and Little Tallapoosa Rivers. Supplies of 2 mgd or more are available during most years without storage from 16 other streams throughout the county. Only small quantities of ground water are available from wells that penetrate igneous and metamorphic rocks in the county. Some wells may yield more than 100 gpm (gallons per minute), but most wells yield 15 gpm or less. Surface water in the county is of excellent chemical quality. Water in streams is soft and contains less than 50 mg/liter dissolved solids. Ground water is generally of good chemical quality and, except for excessive iron content in some areas, is suitable for most uses. Ground water is generally soft and rarely contains more than 200 mg/liter total dissolved solids. Total water use in Randolph County in 1969 was estimated to be about 1.4 mgd, which is less than 1 percent of the water available for use. Estimated surface-water withdrawal was about 590,000 gallons per day and estimated ground-water withdrawal was about 810,000 gallons per day. (Woodard-USGS)
W78-03116

WATER AVAILABILITY, ELMORE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, AL. Water Resources Div.
G. C. Lines.
Alabama Geological Survey, University, Map 138, 1975. 40 p, 6 fig, 2 plates, 5 tab, 10 ref.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Alabama, Water yield, Streamflow, Water wells, Aquifers, Hydrologic budget, Hydrogeology, Well data, Chemical analysis, Potential water supply, Hydrologic data, Maps, Evaluation, Elmore County(Ala).

Elmore County, in east-central Alabama, has large quantities of water of good chemical quality available from both surface-water and groundwater sources. The largest potential sources of water in the county are the Alabama, Coosa, and Tallapoosa River, which have average flows of 14,900 mgd (million gallons per day), 10,500 mgd, and 4,200 mgd, respectively. Seventeen smaller streams in the county have average flows of more than 10 mgd. Surface water in the county is of excellent chemical quality. The water is low in dissolved solids and not appreciably affected by industrial or domestic waste effluent. Large quantities of ground water (as much as 1.0 mgd per well) are available from individual wells tapping sand and gravelly sand beds in the Coker and Gordo Formations of Late Cretaceous age in the southwestern part of the county. Another potential source of large quantities of ground water is alluvium in the flood plains of the Alabama, Coosa, and Tallapoosa Rivers. Yields of wells that tap the Coker Formation in the west-central and southeastern parts of the county range from 0.1 to 0.5 mgd. Ground water in the county is of good chemical quality; however, the iron content is objectionable in some areas. (Woodard-USGS)
W78-03117

AVAILABILITY AND CHEMICAL CHARACTERISTICS OF GROUND WATER IN CENTRAL LA PLATA COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. E. Brogden, and T. F. Giles.
Water-Resources Investigations 76-69 (open-file report), May 1976. 1 sheet, 14 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water yield, *Water quality, Water wells, Water utilization, Water supply, Chemical analysis, Groundwater movement, Groundwater availability, Colorado, Maps, La Plata County(Colo).

The central part of La Plata County, Colo., has undergone rapid population growth in recent years. This growth has resulted in an increased demand for information for additional domestic, industrial, and municipal water supplies. A knowledge of the occurrence of ground water will permit a more efficient allocation of the resource. Aquifers in central La Plata County include: alluvium, Animas Formation of Quaternary and Tertiary age, Fruitland Formation, Pictured Cliffs Sandstone, three formations of the Mesa Verde Group, the Mancos Shale, Dakota Sandstone, Morrison Formation of Cretaceous and Jurassic age, and undifferentiated formations. Well yields generally are low, usually less than 25 gallons per minute. However, higher yields, 25 to 50 gallons per minute may be found locally in aquifers in the alluvium and the Animas Formation. The quality of water from the aquifers is dependent on rock type. Most of the water is a calcium bicarbonate type. However, aquifers that are predominantly fine-grained or contain interbeds of shale may contain sodium bicarbonate type water. The dissolution of minerals in the coal beds, which are present in the Mesa Verde Group and the Dakota Sandstone, can contribute high concentrations of iron, sulfate, and chloride to ground water. (Woodard-USGS)
W78-03118

AVAILABILITY AND CHEMICAL QUALITY OF GROUND WATER IN THE CRYSTAL RIVER AND CATTLE CREEK DRAINAGE BASINS NEAR GLENWOOD SPRINGS, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
R. F. Brogden, and T. F. Giles.
Water-Resources Investigations 76-70 (open-file report), May 1976. 2 sheets, 16 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water yield, *Water quality, Water wells, Water utilization, Water supply, Chemical analysis, Groundwater movement, Groundwater availability, Colorado, Maps, West-central Colorado, *Glenwood Springs area(Colo).

Parts of the Crystal River and cattle Creek drainage basins near Glenwood Springs, Colo., have undergone rapid population growth in recent years. This growth has resulted in an increased demand for information for additional domestic, industrial, and municipal water supplies. A knowledge of the occurrence of ground water will permit a more efficient allocation of the resource. Aquifers in the two drainage basins include: alluvium, basalts, the Mesa Verde Formation, Mancos Shale, Dakota Sandstone, Morrison Formation, Entrada Sandstone, Maroon Formation, Eagle Valley Evaporite, and undifferentiated formations. Except for aquifers in the alluvium, and basalt, well yields are generally low and are less than 25 gallons per minute. Well yields form aquifers in the alluvium and basalt can be as much as several hundred gallons per minute. Water quality is dependent of rock type. Calcium bicarbonate is the predominant type of water in the study area. However, calcium sulfate type water may be found in aquifers in the Eagle Valley Evaporite and in the alluvium where the alluvial material has been derived from the Eagle Valley Evaporite. Concentrations of selenium in excess of U.S. Public Health Service standards for drinking water can be found locally in aquifers in the Eagle Valley Evaporite. (Woodard-USGS)
W78-03119

FLOODS IN OHIO--MAGNITUDE AND FREQUENCY,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-03120

WATER QUALITY OF SELECTED STREAMS IN THE COAL AREA OF SOUTHEASTERN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03121

WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1976.
Geological Survey, Anchorage, AK. Water Resources Div.
Water-Data Report AK-76-1, September 1977. 401 p, 2 fig.

Descriptors: *Alaska, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Alaska consist of records of stage, discharge, and water quality of streams; stage and water quality of lakes; and water levels and water quality in wells and springs. This report contains discharge records for 102 gaging stations, stage only records for 2 gaging stations, water quality for 71 stations, and water levels for 24 observation wells. Also included are 91 crest-stage partial-record stations and 28 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements of discharge, lake stage, or water quality. These data represent that part of National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alaska. (Woodard-USGS)
W78-03122

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1976.
Geological Survey, Tucson, AZ. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 306, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report AZ-76-1, August 1977. 674, 7 fig, 1 tab.

Descriptors: *Arizona, *Hydrologic data, *Surface waters, *Groundwater, *Water quality,

Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for 1976 water year for Arizona consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of observation wells. This report contains discharge records for 237 gaging stations, 81 crest-stage partial-record stations, and discharge measurements at 48 miscellaneous sites; stage records at 3 gaging stations; stage and contents records for 10 lakes and reservoirs; 15 supplementary records, included with gaging-station records, consisting of monthend or monthly stage, contents, and evaporation of lakes and reservoirs, diversions, and return flow; water-quality records for 69 continuous-record stations, 5 partial-record stations, and 46 miscellaneous sites; and water levels for 89 observation wells. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal and State agencies of Arizona. (Woodard-USGS)
W78-03123

RISING GROUND-WATER LEVEL IN DOWNTOWN LOUISVILLE, KENTUCKY, 1972-1977,
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03124

GROUND-WATER RESOURCES OF DESOTO AND HARDEE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03125

WATER QUALITY OF TAMPA BAY, FLORIDA: WET-WEATHER CONDITIONS, OCTOBER 1971,
Geological Survey, Tampa, FL. Water Resources Div.; and Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03128

GEOLOGY AND GROUND WATER IN WESTERN SANTA CRUZ COUNTY, CALIFORNIA, WITH PARTICULAR EMPHASIS ON THE SANTA MARGARITA SANDSTONE,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. P. Akers, and L. E. Jackson Jr.
Water-Resources Investigations 77-15 (open-file report), July 1977. 4 fig, 3 tab, 13 ref.

Descriptors: *Groundwater potential, *Aquifer characteristics, *Groundwater availability, *Water quality, California, Hydrogeology, Test wells, Evaluation, Saline water intrusion, Santa Cruz County(Calif), Santa Margarita sandstone.

The water-bearing potential of the geologic formations in the western part of Santa Cruz County, Calif., is evaluated. Most of the sedimentary formations in this area are fine-grained rocks of Tertiary age that have been folded and faulted. These rocks, in general, yield supplies of water sufficient only for individual domestic supplies. The Lompico and Santa Margarita Sandstones, however, are coarser grained and have the potential to yield moderate quantities of water (50-100 gallons per minute). Areas where the Lompico Sandstone might warrant explorations are (1) near and on the west side of the Ben Lomond fault, (2) near and south of the outcrop of the Lompico Sandstone between Ben Lomond and Felton, and (3) in the area near Bald Mountain School. The Santa Margarita Sandstone should be explored by test drilling in the area between Davenport and Bonnie Doon. The quality of ground water is generally good, although saline water occurs in the San Lorenzo Formation near Redwood Grove and Riverside Grove. (Woodard-USGS)
W78-03129

COMPUTER SIMULATION OF TWO-DIMENSIONAL UNSTEADY FLOWS IN ESTUARIES AND EMBAYMENTS BY THE METHOD OF CHARACTERISTICS--BASIC THEORY AND THE FORMULATION OF THE NUMERICAL METHOD,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-03130

DRAINAGE AREAS OF THE GUYANDOTTE RIVER BASIN, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
M. V. Mathes, Jr.
Open-file report 77-801, September 1977. 56 p, 1 fig, 1 tab.

Descriptors: *River basins, *Drainage area, *West Virginia, Reach(Streams), Sites, Watersheds(Basins), *Guyandotte River basin(W Va).

This report, prepared in cooperation with the West Virginia Office of Federal-State Relations (now the Office of Economic and Community Development), lists in tabular form 435 drainage areas for basins within the Guyandotte River basin of West Virginia. Drainage areas are compiled for sites at the mouths of all streams having drainage areas of approximately five square miles or greater, for sites at U.S. Geological Survey gaging stations (past and present), and for other miscellaneous sites. (Woodard-USGS)
W78-03135

8. ENGINEERING WORKS

8A. Structures

IMPERIAL BEACH, CALIFORNIA, DESIGN OF STRUCTURES FOR BEACH EROSION CONTROL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02768

NAVIGATION CONDITIONS AT COLUMBUS LOCK AND DAM, TOMBIGBEE RIVER, MISSISSIPPI AND ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02781

QUEUING MODELS FOR MULTIPLE CHAMBER LOCKS,
California Univ., Berkeley. Operations Research Center.
C. R. Glassey, and S. M. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 767, Price codes: A03 in paper copy, A01 in microfiche. Report ORC 76-27, September 1976. 31 p, 1 fig, 4 tab, 6 ref, 1 append. Submitted to Army Research Office, Triangle Park, N.C. ARO DAAG29-76-G-0042.

Descriptors: *Rivers, *Locks, *Navigation, *Model studies, *Mississippi River, Mathematical models, Queueing theory, Barges, Management, Optimization, Operations, *Waterway locks, Lock operation, Queueing models.

Several models for predicting mean waiting times of river traffic at a multiple chamber lock were developed and tested. Mean waiting times predicted by the M/G/1 model differed significantly from observed times. Analysis of possible causes of failure of this model suggested a limited queue length M/G/1 model for one chamber, from which more accurate predictions were derived. For the two-chamber system and M/G/1 model with random batch size was developed. This model yields a lower bound for mean waiting time. These last two models can be used to predict system performance under various operating conditions. (Sims-ISWS)
W78-02817

FLOOD CONTROL SYSTEM FOR A DAM,
Hitachi Ltd. (Japan). (Assignee).
K. Matsumoto, J. Hatakeyama, and M. Okamoto.
U.S. Patent No 4,036,023, 12 p, 8 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1030, July 19, 1977.

Descriptors: *Patents, *Control systems, *Flood control, Dams, *Water level fluctuations, Flow control, Water levels.

A flood control system for a dam is capable of promptly reacting so as to maintain the water level of the dam within a predetermined range. It is also capable of accurately controlling the water level of a dam. The invention is characterized by providing a system comprising means for setting a reference water level for the dam, means for measuring the actual water level of the dam, means for calculating the deviation between the reference water level and the actual water level, means for effecting proportional-position control which generates a first control signal proportional to the measured deviation, integration means for generating a second control signal corresponding to the integration result of the measured deviation, differentiation means for generating a third control signal corresponding to the differentiation result of the inflow determined by the measured deviation, means for calculating the outflow to be discharged in response to the sum of the first, second, and third control signals, and means for calculating the angle of gate to produce the required outflow. (Sinha-OEIS)
W78-02905

UNDERWATER ANCHORING APPARATUS,
Department of Industry, London (England). (Assignee).
R. A. Nixon.
U.S. Patent No. 4,036,161, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1076, July 19, 1977.

Descriptors: *Patents, *Structures, *Anchors, Underwater, Suspended solids, Underwater anchoring structures.

An apparatus for establishing an anchorage in a body of water comprises essentially a substantially hollow structure into which solids from the body of water are induced as solids in liquid suspension. When the apparatus is being used as an anchoring device the design is such that as solids from the body of water are induced into the hollow structure they fill or partially fill the structure which then proceeds to bury itself into the bed of the body of water thereby establishing an anchorage. The hollow structure includes a lower platform region with a series of intake passageways arranged so that solids are induced into the structure. A vent passageway acts as an air-lift pump for the extraction of air/water form within the interior of the structure. (Sinha-OEIS)
W78-02906

8B. Hydraulics

GUIDELINES FOR MONITORING AND REPORTING DEMONSTRATION PROJECTS; SECTION 32 PROGRAM, STREAMBANK EROSION CONTROL EVALUATION AND DEMONSTRATION ACT OF 1974,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 4D.
W78-02754

EFFECT OF LOSS OF VALLEY STORAGE IN THE CANNELTON POOL ON OHIO RIVER FLOOD HEIGHTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
B. H. Johnson, and P. K. Senter.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 670, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-7, June 1977. 33 p, 6 fig, 4 tab, 9 pl, 5 ref.

Descriptors: *Mathematical models, *Flood control, Flood waves, *Ohio River, *Open channel flow, *Storage coefficient, *Valleys, *Cannelton Pool(Ohio).

A mathematical model called SOCHMJ (Simulation of Open Channel Hydraulics in Multi-Junction Systems) has been employed to determine the effect of valley storage loss in the Cannelton Pool on flood heights along the Ohio River. Three levels of storage loss have been investigated. The first level was the complete removal of valley storage and was accomplished by assuming the placement of levees along the banks throughout the Cannelton Pool. The second level of storage loss was arrived at through the placement of levees halfway from the bank to the maximum lateral encroachment of the 1945 flood throughout the Cannelton Pool. The third level consisted of assuming levees along the bank of the lower 58 miles of the Cannelton Pool. It was concluded from the model results that neither a complete loss of valley storage nor substantial variation of Manning's n in the Cannelton Pool appreciably influenced flood heights as far downstream as Evansville, Indiana. (WES)
W78-02760

PRESSURE TESTS IN FLOOD-CONTROL CONDUIT, MELVERN DAM, KANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. L. Fagerburg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 291, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-5, May 1977. 28 p, 7 fig, 6 pl, 5 ref, append.

Descriptors: *Conduits, *Flood control, Pressure, *Prototype tests, Kansas, Dams, Testing, *Melvern Dam(Kan).

Prototype tests were conducted at Melvern Dam, Kansas, to determine pressures on the flood-control conduit walls and to obtain the hydraulic (piezometric) grade lines of the system. No critical pressures were observed during the operation of the tests. Resistance coefficients and intake losses were also obtained: The findings were comparable to those obtained from tests at similar projects. (WES)
W78-02762

A NUMERICAL HINDCAST MODEL FOR WAVE SPECTRA ON WATER BODIES WITH IRREGULAR SHORELINE GEOMETRY; REPORT 1, TEST OF NONDIMENSIONAL GROWTH RATES,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. T. Resio, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-044 051, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-9, August 1977 (Report 1 of a series). 53 p, 13 fig, 41 ref.

Descriptors: *Mathematical models, *Waves(Water), *Growth rates, Model studies, *Water wave generation.

These results indicate that growth with fetch in the present model is much closer than those of previous numerical models to the observed in recent field experiments. The growth with nondimensional time is much mofe difficult to assess, but the proposed model appears to give reasonable results for these situations as well. Report 2 of this series will document an extensive set of ral-time tests of the new model at several gage sites on the Great Lakes. A numerical model for wave generation in water bodies of arbitrary shape is described. The new model is a variation of a model previously developed by Barnett (1968). Important differences are the numerical technique, slightly modified source terms and the incorporation of a variable equilibrium range of spectral density. Results for ideal, homogeneous generation situations for growth with nondimensional time and nondimensional duration are examined and compared to those from some previous models. (WES)
W78-02764

DETAILED DESIGN FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. R. Palermo, and T. W. Ziegler.
Technical Report D-77-13, October 1977. 217 p, 24 fig, 2 tab, 14 ref, 5 append.

Descriptors: *Potomac River, *Marshes, Virginia, Design criteria, Design, Dredging, Sediments, *Dredged material.

Results of detailed engineering studies regarding use of dredged material to expand an existing marshland area are presented. Sampling and testing programs are described that allowed determination of the suitability of channel sediment for use as marsh substrate. Foundation studies indicated conditions at the demonstration site are adequate for construction of a containment facility. A methodology for correlation of in situ channel sediment volume and containment area volume is presented. The methodology incorporates basic principles of containment area volumetric sizing and accounts for consolidation of the newly placed marsh substrate. Laboratory tests using a full height column were performed to simulate the sedimentation phase of the dredging process. Conventional consolidation tests were then performed on samples taken from the column for evaluation of the consolidation phase. Evaluations were made regarding containment sizing for retention of suspended solids, containment area operation, and procedures for placement of dredged material. (WES)
W78-02765

GEOMETRIC PARAMETERS THAT INFLUENCE FLOODPLAIN FLOW,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
M. James, and B. J. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 641, Price codes: A07 in paper copy, A01 in microfiche. Research Report H-77-1, June 1977. 141 p, 9 fig, 1 tab, 8 photo, 30 pl, 3 append, 10 ref.

Descriptors: *Flood plains, *Overflow, Testing, *Laboratory tests, Flumes, Channel flow, Resistance, *Resistance coefficient.

Laboratory tests were conducted in a tilting flume to study the effects of overbank flow on the resistance coefficient. Testing was accomplished on a straight and meandering main channel for a symmetrical and asymmetrical floodplain of various widths. Results indicated that a correction must be applied to the resistance formula for shallow-flow depths over the overbank, and the correction factors are presented graphically. (WES)
W78-02767

IMPERIAL BEACH, CALIFORNIA, DESIGN OF STRUCTURES FOR BEACH EROSION CONTROL; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. R. Curren, and C. E. Chatham.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-044 108, Price codes: A08 in paper copy, A01 in microfiche. Technical Report H-77-15, August 1977. 157 p, 12 tab, 88 photo, 12 pl, 16 ref.

Descriptors: *Beach erosion, *Breakwaters, Erosion control, Groins(Structures), *Hydraulic models, Waves(Water), California, *Imperial Beach(Calif).

A 1:75-scale (undistorted) hydraulic model, reproducing approximately 2.6 miles of shoreline and sufficient offshore area to permit generation of the required test waves, was used to investigate the arrangement and design of alternative proposed structures for prevention of erosion of the Imperial Beach shoreline. Several conclusions from model test results were: (1). Existing conditions are characterized by strong rip currents and longshore currents for most wave conditions with considerable onshore-offshore movement of sand. (2). The original improvement plan for Imperial Beach (i.e., the authorized five-groin plan) is ineffective in trapping tracer material and, in fact, contributes to the offshore movement.(3). The originally proposed breakwater plan (Plan 1) is not adequate for full protection of the beach. Raising the crown elevation of the Plan 1 structure to a sufficient height will make this plan effective from a functional standpoint; however, a substantial cost increase results due to greatly increased volume of rock required. (WES)
W78-02768

DESIGN WAVE INFORMATION FOR THE GREAT LAKES; REPORT 4, LAKE HURON,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. T. Resio, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 414, Price codes: A08 in paper copy, A01 in microfiche. Technical Report H-76-1, September 1977 (Report 4 of a series). 153 p, 22 fig, 9 tab, 6 append, 65 ref.

Descriptors: Great Lakes, *Lake Huron, *Waves(Water), Design criteria, Winds, Data collections, *Design wave.

This report contains hindcast wave information that is applicable to many planning and design purposes on Lake Huron. Historical wind data from stations along Lake Huron served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 20-, 50-, and 100-yr return periods. These results are provided in tabular form for 28 points along the Lake Huron shoreline. The mean significant period for each of these wave heights is also given. Information is provided for four seasons of the year (January-March, April-June, July-September, and October-December) and is separated into three approach directions relative to shore. (WES)
W78-02769

TSUNAMI-WAVE ELEVATION FREQUENCY OF OCCURRENCE FOR THE HAWAIIAN ISLANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. R. Houston, R. D. Carver, and D. G. Markle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 023, Price codes: A06 in paper copy, A01 in microfiche. Technical Report H-77-16, August 1977. 109 p, 14 fig, 1 tab, 44 pl, 1 append, 41 ref.

Descriptors: *Finite element analysis, *Flood frequencies, *Hawaii, *Mathematical models, *Tsunamis.

An investigation was undertaken to establish frequency-of-occurrence curves for tsunami-wave elevations near the shoreline for the Hawaiian Islands. A hybrid finite element numerical model was used to supplement historical data in determining the ten largest tsunami elevations from 1837 to 1976 at locations along the coastline of the islands. The numerical model was verified by comparing tide gage recordings at various locations in the Hawaiian Islands during the 1960 and 1964 tsunamis with numerical model calculations. Frequency-of-occurrence curves were established using data from the ten largest tsunami-wave elevations along the Hawaiian coastline. Figures and the table presented in the report can be used to calculate tsunami elevations 200 ft shoreward of the coastline of the Hawaiian Islands (except the coast of the uninhabited U.S. Navy target island of Kahoolawe). Runup nearly equals tsunami elevation at the shoreline for some of the coastline of the islands, but not for areas where flooding is substantial. A recommendation is given for development of a method to calculate land flooding during a tsunami. (WES)
W78-02770

REAERATION TESTS, OUTLET WORKS, BELTZVILLE, DAM, POHOPOCO CREEK, PENNSYLVANIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-02771

POWERHOUSE INTAKE GATE CATAPULT STUDY, BIG BEND DAM, SOUTH DAKOTA, AND STOCKTON, HARRY S. TRUMAN, AND CLARENCE CANNON DAMS, MISSOURI: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8C.
W78-02772

MARYSVILLE LAKE HYDROTHERMAL STUDY; REPORT 1, 900-MW PROJECT; HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. G. Fontane, M. S. Dortch, C. H. Tate, and B. Loftis.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-042 556, Price codes: A06 in paper copy, A01 in microfiche. Technical Report H-77-5, April 1977 (report 1 of a series). 76 p, 7 fig, 2 tab, 12 pl, 8 ref, 2 append.

Descriptors: *Hydraulic models, *Mathematical models, *Pumped storage, *Water temperature, California, Lakes, Pre-impoundment, *Marysville Lake(Calif).

This study was conducted to determine if the proposed Marysville Lake pumped-storage hydropower (900-MW) project could satisfy downstream water temperature objectives. A one-dimensional numerical model was used for simulation and prediction of temperatures within and downstream of Marysville Lake. A physical hydraulic model was used for study and description of the hydrodynamic response of the project to pumped-storage hydropower operations. The physical model, constructed to a distorted scale of 1:1600 horizontally and 1:160 vertically, simulated the dynamic, unsteady-stage, density-stratified flows through Marysville Lake and the afterbay or reregulating pool. Information from the physical model was used to modify existing algorithms and to develop new ones for the mathematical model. (WES)
W78-02773

MATHEMATICAL MODEL OF ESTUARIAL SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-02774

PUMPING STATIONS FOR DRAINAGE DISTRICT NO. 17, MISSISSIPPI COUNTY, ARKANSAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8C.
W78-02775

RED RIVER WATERWAY, LA., TEX., ARK., AND OKLA., MISSISSIPPI RIVER TO SHREVEPORT, LA., REACH, LOCK AND DAM NO. 1; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
N. R. Oswalt.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 642, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-77-13, June 1977. 60 p, 6 fig, 2 tab, 14 photo, 21 pl.

Descriptors: *Hydraulic models, *Riprap, *Spillways, *Stilling basins, Louisiana, *Red River Waterway(La).

Tests were conducted on a 1:36-scale model of the Red River Spillway No. 1 to develop a conventional jump-type stilling basin and plans of riprap that would provide adequate protection of the approach and exit channels for emergency (single-gated flows) and normal operating conditions. During the course of study, approach elevations of 6, 8, and 11 ft were tested to reveal the effects on the spillway efficiency and tests were conducted with runaway barges to determine if a loose barge loaded to a 9-ft draft could be flushed through the stilling basins. Tests to determine the minimum riprap protection for the exit channel bottom indicated a 300-ft length of protection is required downstream of the basin. A series of tests to determine discharge characteristics revealed that data from a previous model investigation could be used to obtain the discharge coefficients of the Red River spillways, and comparison plots are provided in this report. (WES)
W78-02778

SPILLWAY VIBRATION, PRESSURE, AND VELOCITY MEASUREMENTS, OZARK LOCK AND DAM, ARKANSAS RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. A. Pugh.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 132, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-77-6, April 1977. 51 p, 16 fig, 3 tab, 15 pl, 10 ref, append.

Descriptors: Overflow, *Spillways, *Vibrations, Velocity, Measurement, Pressure, Arkansas, *Arkansas River, Gate vibration, *Ozark Lock and Dam(Ark).

Tests were conducted in bay 8 of the low-overflow spillway at Ozark Dam, Arkansas River, Arkansas, in September 1974 to study vibrations and pressure fluctuations as related to flow through the spillway. Pressures were measured on the spillway sill to determine whether fluctuations are correlated with structural vibrations. Velocity distributions were measured to study boundary layer development and to determine an equivalent roughness for the spillway surface. Gate vibrations were measured to attempt to confirm model results. Pressure fluctuations on the low overflow spillway did not exhibit a root-mean-square (RMS) value large enough to be considered as a source of excitation of spillway vibration. The structure appeared to be vibrating at a natural frequency of 2.7 cps. Structural vibration amplitude was relatively small. Gate vibrations appeared to be independent of opening. The equivalent sand grain roughness Ks determined for the Ozark spillway (0.0061 ft) supplements previous data. Theoretical boundary layer thicknesses agree with the measured velocity profiles. (WES)
W78-02779

WATER-QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W78-02780

NAVIGATION CONDITIONS AT COLUMBUS LOCK AND DAM, TOMBIGBEE RIVER, MISSISSIPPI AND ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. J. Franco, and L. J. Shows.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 027, Price codes: A00 in paper copy, A01 in microfiche. Technical Report H-77-11, May 1977. 83 p, 14 fig, 9 tab, 10 photo, 28 pl.

Descriptors: *Hydraulic models, *Locks, Alabama, Mississippi, Navigation, *Columbus Lock and Dam(Ala), *Navigation conditions, *Tombigbee River(Miss).

The Columbus Lock and Dam will be the third navigation structure proposed as part of the development of the Tennessee-Tombigbee Waterway for navigation. The structure will be located in a bypass canal about 370 miles above the mouth of the Mobile River at the foot of Government Street in Mobile, Alabama, or just downstream from the confluence of the Tombigbee and Tibbee Rivers and about 4 miles northwest of Columbus in Lowndes County, Mississippi. The structure is designed to maintain a minimum upper pool during low flows extending upstream to the proposed Aberdeen Lock and Dam at mile 408 and will include one lock with clear chamber dimensions of 110 by 600 ft, a five-gate spillway section of the dam located in the bypass canal on the left overbank, and a fixed overflow section along the left overbank to high ground. A fixed-bed model reproducing about 4.5 miles of the Tombigbee River channel, upper and lower lock approaches, the lock approach canal, and the adjacent overbank areas to an undistorted scale of 1:120 was used to determine the adequacy of the proposed plan and to develop modifications required to eliminate any adverse conditions indicated. (WES)
W78-02781

TOPOLOGICAL PROPERTIES OF SOME TRELLIS PATTERN CHANNEL NETWORKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
S. J. Mock.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 824, Price codes: A04 in paper copy, A01 in

microfiche. CRREL Report 76-46, December 1976. 54 p, 17 fig, 35 tab, 27 ref, 1 append.

Descriptors: *Geologic control, *Networks, Hydrology, *Trellis, *River systems, Streams, Channels, Analysis, River basins, Channel morphology, *Stream order, *Stream magnitude, River basin morphology.

The topological properties of ten stream networks were analyzed and compared with those predicted by the topologically random model. The topologically random model states that, in the absence of geological controls, all topologically distinct channel networks having the same number of sources are equally likely, and, in an infinite topologically random network, all topologically distinct sub-networks occur with equal frequency. The ten stream networks have moderately- to well-developed trellis drainage patterns which have formed in response to differential erosion acting on sequences of folded and tilted sedimentary rocks. Testing procedures included examining the frequency of occurrence of topologically distinct channel networks, ambilateral classes, and sets of Strahler stream numbers for sub-networks up to magnitude 10. Deviations from predictions of the topologically random model occur in the magnitude-4 networks and are attributed to preferential development of minor tributaries flowing in the down-dip direction of the local rocks. The only other deviation from predicted frequencies occurs in the magnitude-10 stream number sets and is not obviously explicable as a response to geologic controls. The observed departures from the expectations of a topologically random model are related to geological factors, but the deviations are subtle and not observed in the streams having less well developed trellis patterns. The topologically random model serves as a very useful standard with which to compare real channel networks. Also, the presence of strong geological controls, which affect the channel network patterns, has only minor effects on the topological properties. (Adams-ISWS)
W78-02818

WAVE MOTOR COMPRISED OF A SUBMERGED FLOATING NETWORK OF CHAMBERS FORMED BY WALLS PERMITTING VARIABLE GEOMETRY,
R. E. A. Tornkvist.
U.S. Patent No 4,036,563, 9 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1214, July 19, 1977.

Descriptors: *Patents, *Waves(Water), Ocean waves, *Energy, *Energy conversion, Shore protection, Breakwaters, Deformation, Electrical equipment.

A wave energy transformer makes it possible to obtain the primary power out of a wave movement by braking the water masses over wave width and down to a certain depth so that the water particles are substantially still after the transformer. This is achieved by means of a wave energy transformer which is characterized in that the transformer of an in and under water floating space network of chambers filled with water and constituted by walls whose dimensions and/or shape can be deformed and which are pivotally connected to each other, and that at least two of the deformable walls in each chamber are connected to at least one pumping means. The invention is based on the idea that the chambers of the network are made of mutually pivoted deformable walls, and the deformations of the chamber walls produced by the waves are successively braked by a system of pump cylinders which produce a water pressure in the pipe system. The water pressure is utilized for the operation of water turbines for the production of electric current or for other use. One purpose of the invention is to produce a breakwater which is generally independent from stationary underwater constructions and that is based on the reduction in wave energy due to the effect of the transformer. (Sinha-OEIS)
W78-02909

RESONANT SCATTERING BY A HARBOR WITH TWO COUPLED BASINS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
C. C. Mei, and U. Unluata.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 025, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Journal of Engineering Mathematics, Vol 10, No 4, p 333-353, October 1976. 6 fig, 19 ref. ONR- N00014-76-C-0214.

Descriptors: *Harbors, *Estuaries, Waves(Water), *Incident waves, *Resonant scattering, Scattering, Harbor oscillations.

A harbor with two coupled rectangular basins is subjected to periodic incident waves. Ignoring friction the scattering problem is solved by the method of matched asymptotics for narrow junctions. The example of two identical basins is analyzed in detail for the resonant spectrum and response. It is shown that for certain modes the inner basin is less shielded. (Sinha-OEIS)
W78-03088

HYDRAULIC ANALYSIS, MAD RIVER AT STATE HIGHWAY 41, SPRINGFIELD, OHIO,
Geological Survey, Columbus, OH. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-03134

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-03137

8C. Hydraulic Machinery

TRANSMISSION LINE RIGHTS-OF-WAY MANAGEMENT,
Mississippi State Univ., Mississippi State. Dept. of Wildlife and Fisheries.
For primary bibliographic entry see Field 6B.
W78-02730

POWERHOUSE INTAKE GATE CATAPULT STUDY, BIG BEND DAM, SOUTH DAKOTA, AND STOCKTON, HARRY S. TRUMAN, AND CLARENCE CANNON DAMS, MISSOURI: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. F. George, and G. A. Pickering.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 876, Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-77-8, April 1977. 72 p, 11 tab, 32 pl.

Descriptors: *Electric powerplants, *Gates, *Hydraulic structures, *Intake structures, South Dakota, Missouri, *Big Bend Dam(SD), *Stockton Dam(Mo), *Clarence Cannon Dam(Mo), *Harry S. Truman Dam(Mo).

Tests were conducted to determine the range of gate openings and hydraulic conditions at which the service gates at Big Bend, Stockton, and Clarence Cannon powerhouses can be used for watering-up the scroll case area. The test data should also be applicable to Harry S. Truman powerhouse. Measurements of gate catapult heights, uplift forces, discharge coefficients, and pressures throughout the system were made for various gate openings and pool elevations. The discharge coefficients that were measured for flow underneath the gate were about as expected. However, the discharge coefficients for the back-of-gate orifices were considerably higher than had been expected. The back-of-gate orifice is actually a submerged, vertical short tube. There is not a plentiful supply of data concerning discharge coefficients for a vertical orifice, but the limited amount of information that is available indicates that the coefficients determined in this study are not unreasonable.
W78-02772

PUMPING STATIONS FOR DRAINAGE DISTRICT NO. 17, MISSISSIPPI COUNTY, ARKANSAS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
P. E. Saunders.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-042 892, Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-77-12, May 1977. 50 p, 1 tab, 8 photo, 13 pl, 13 ref.

Descriptors: *Hydraulic models, *Pumping plants, *Open channel flow, *Vortices, Arkansas, Model studies.

This report describes a hydraulic model investigation of an existing pumping station and a 700-cfs-capacity pumping station proposed to provide additional flood protection for Drainage District No. 17, Mississippi County, Arkansas. A 1:12-scale model the proposed pumping station, the existing pumping station, and the approach channel was used to determine flow patterns and velocities in the approach channel and to determine pressure fluctuations and vortex action within the pump sumps of the proposed station. The model investigation indicated a large eddy in the approach channel that caused air-entraining vortexes within the sumps and large pressure fluctuations at the pump intakes. These problems were relieved by adding an earth berm separating the two stations, round pier noses, and cylindrical quadrant walls at the proposed station, by raising the baffle wall behind the pumps at the proposed station, and by adding transverse, vertical baffle walls within the sumps in the proposed station. (WES)
W78-02775

SPILLWAY VIBRATION, PRESSURE, AND VELOCITY MEASUREMENTS, OZARK LOCK AND DAM, ARKANSAS RIVER, ARKANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02779

CONSTRUCTION AND LAUNCH BARGE AND METHOD OF PRODUCING AND INSTALLING OFFSHORE STRUCTURES,
Lin Offshore Engineering, Inc., San Francisco, CA. (Assignee).
P. Y. Chow.
U.S. Patent No. 4,015,554, 11 p, 15 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 957, No 1, p 95, April 5, 1977.

Descriptors: *Patents, *Engineering structures, *Offshore platforms, Coasts, Concrete structures, Barges, Construction, Construction equipment.

A major concrete offshore structure may be constructed directly on a barge embodying this invention and then later transported to the operating site and launched, without the offshore structure having to leave this construction vessel until the moment is is actually launched. The barge serves as a shallow draft construction dock, as a barge for transporting the object to be constructed to the operating site, and also as a mechanism for launching the offshore structure by submerging the barge and then moving it out from beneath the offshore structure. The barge, made of steel or of

prestressed concrete, has ballast compartments below deck level, the offshore structure being constructed on the deck level, and the ballast compartment is equipped with control for both ballasting and blowing the tanks. Column stabilizers and their location close to the corners of the barge provide the heavily loaded barge with the needed stability when the barge is completely submerged. The column stabilizers must be of sufficient area and height and must be so located that the metacenter of the barge, plus its load and its ballast, is maintained above the center of gravity at all times, thereby insuring the needed stability, during towing, construction, and launching. (Sinha-OEIS)
W78-02891

ADJUSTABLE FLOW FLOATING WEIR ASSEMBLY,
For primary bibliographic entry see Field 5D.
W78-02892

WATER SCREEN,
For primary bibliographic entry see Field 3F.
W78-02896

WAVE MOTOR COMPRISED OF A SUBMERGED FLOATING NETWORK OF CHAMBERS FORMED BY WALLS PERMITTING VARIABLE GEOMETRY,
For primary bibliographic entry see Field 8B.
W78-02909

8D. Soil Mechanics

RED RIVER WATERWAY, LA., TEX., ARK., AND OKLA., MISSISSIPPI RIVER TO SHREVEPORT, LA., REACH, LOCK AND DAM NO. 1; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02778

8F. Concrete

CONSTRUCTION AND LAUNCH BARGE AND METHOD OF PRODUCING AND INSTALLING OFFSHORE STRUCTURES,
Lin Offshore Engineering, Inc., San Francisco, CA. (Assignee).
For primary bibliographic entry see Field 8C.
W78-02891

8G. Materials

PRESSURE TESTS IN FLOOD-CONTROL CONDUIT, MELVERN DAM, KANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W78-02762

8I. Fisheries Engineering

IMPACTS OF POWER PLANT INTAKE VELOCITIES ON FISH,
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 5C.
W78-02731

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

DISSOLVED ATMOSPHERIC GAS SUPERSATURATION OF WATER AND THE GAS BUBBLE DISEASE OF FISH,
Environmental Information Services, Inc., Mercer Island, WA.
For primary bibliographic entry see Field 5C.
W78-02707

COASTAL WATER RESEARCH PROJECT, ANNUAL REPORT 1975,
Southern California Coastal Water Research Project, El Segundo, CA.
For primary bibliographic entry see Field 2L.
W78-02740

ECOLOGICAL AND DISEASE STUDIES OF DEMERSAL FISHES IN PUGET SOUND NEAR METRO-OPERATED SEWAGE TREATMENT PLANTS AND IN THE DUWAMISH RIVER,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5A.
W78-02741

A SELECTED BIBLIOGRAPHY ON RAINBOW TROUT, SALMO GAIRDNERI RICHARDSON, WITH PARTICULAR REFERENCE TO STUDIES WITH AQUATIC TOXICANTS,
Environmental Protection Service, Halifax (Nova Scotia). Environmental Services Branch.
For primary bibliographic entry see Field 5C.
W78-02742

BIBLIOGRAPHY OF STRIP MINE ECOLOGY,
Iowa State Univ., Ames. Energy and Mineral Resources Research Inst.
For primary bibliographic entry see Field 5G.
W78-02744

THE TOXICITY OF URANIUM AND PLUTONIUM TO THE DEVELOPING EMBRYOS OF FISH,
Oak Ridge National Lab.
For primary bibliographic entry see Field 5C.
W78-02747

EFFECTS OF WASTEWATER AND COOLING WATER CHLORINATION ON AQUATIC LIFE,
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-02749

LITERATURE SURVEY AND PRELIMINARY EVALUATION OF STREAMBANK PROTECTION METHODS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2J.
W78-02776

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME I. USERS MANUAL.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02882

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME II. IRIS TABLES. THESAURUS, SOURCE CODE TABLE AND SOURCE NAME TABLE.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02883

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME III. IDENTIFICATION NUMBER MASTER REPORT.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02884

WATER QUALITY INSTRUCTIONAL RESOURCES INFORMATION SYSTEM. VOLUME IV. SUBJECT INDEX.
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-02885

PRECIPITATION SCAVENGING (1974).
Department of Energy, Oak Ridge, TN. Technical Information Center.
For primary bibliographic entry see Field 05A.
W78-02886

A BIBLIOGRAPHY ON OCEAN WASTE DISPOSAL, SECOND EDITION,
Interstate Electronics Corp., Anaheim, CA. Environmental Engineering Div.
For primary bibliographic entry see Field 05E.
W78-03087

BASELINE STUDY PROGRAM, NORTH PUGET SOUND. BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL I - TEXT,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 05C.
W78-03104

OIL SPILL IDENTIFICATION BIBLIOGRAPHY,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 05A.
W78-03105

A REVIEW OF THE STATE OF THE ART, (TREATMENT FACILITIES).
For primary bibliographic entry see Field 05D.
W78-03197

10F. Preparation Of Reviews

DISSOLVED ATMOSPHERIC GAS SUPERSATURATION OF WATER AND THE GAS BUBBLE DISEASE OF FISH,
Environmental Information Services, Inc., Mercer Island, WA.
For primary bibliographic entry see Field 05C.
W78-02707

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 8
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 8
APRIL 15, 1978

W78-03201 -- W78-03700

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

ON THE SMOOTHING OF OSCILLATIONS IN FINITE-PERIOD UNIT HYDROGRAPHS DERIVED BY THE HARMONIC METHOD,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 2E.
W78-03243

CAMBRIAN STRATIGRAPHIC NOMENCLATURE AND GROUND-WATER PROSPECTING FAILURES ON THE HUALAPAI PLATEAU, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology; and Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W78-03445

2B. Precipitation

DEUTERIUM IN HAILSTONES COLLECTED ON 29 NOVEMBER 1972,
National Physical Research Lab., Pretoria (South Africa).
D. v. d. S. Roos, H. Schooling, and J. C. Vogel.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 438, p 751-767, October 1977. 8 fig, 3 tab, 19 ref.

Descriptors: *Hail, *Africa, *Deuterium, *Cloud physics, Hailstorms, Storms, Weather, Tracers, Heavy water, Isotope studies, Data processing, Analytical techniques, Meteorology, *Deuterium, *Hailstones, *South Africa.

The deuterium content of more than 400 samples cut from 34 hailstones was determined. These hailstones came from three storms, the structures of which were studied by radar. The range in values of deuterium excess (dD) of about 60 parts per thousand (extending as low as -86 parts per thousand) was compatible with the moist adiabatic model only if a significant increase in dD of atmospheric vapor occurred at some stage. Individual growth layers were concluded isotopically uniform. Opaque ice was associated with relatively low dD, especially for the bulk of the hailstones beyond the embryo stage. The correlation found between dD and crystal size was used to derive the relationship between dD and ambient temperature. Hence, it was concluded that embryos mostly grew between 6 and 7 km above ground level. Hailstones of all sizes acquired most of their mass between 7 and 8 km (-20 to -25C) during the early stages of the severe storms when radar echo tops reached up to 16 km. However, during later stages most of the growth occurred during descent. Hailstones from places no more than a few kilometers apart in one storm were concluded to have grown in very different conditions; while some hailstones must have experienced updraughts in which the speed in the environment of the hailstones increased steadily with time and others encountered an updraught that pulsated with a period of about 8 min. Updraught maxima often occurred at about 7.5 km, approaching values of 40 m/s. (Sims-ISWS)
W78-03246

THE EFFECT OF IRRIGATION ON PRECIPITATION IN THE GREAT PLAINS,
Illinois State Water Survey, Urbana.
P. T. Schickedanz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 921, Price codes: A06 in paper copy, A01 in microfiche. Report No. NSF/RA-760460, November 1976. 111 p, 29 fig, 9 tab, 30 ref. NSF GI-43871.

Descriptors: *Irrigation, *Precipitation(Atmospheric), *Irrigation effects, *Kansas, *Nebraska, *Texas, *Great Plains, Rainfall, Weather, Effects, Irrigated land, Climates, Water utilization, Weather modification, Data processing, Analytical techniques, Meteorology, Climatology, Climatic changes.

This research addressed the question of whether the extensive irrigation in the Great Plains has had an appreciable effect on the climate of the region. The primary objectives of the research were to examine for a rainfall anomaly due to irrigation and to measure the magnitude of the effect. Another objective was to investigate other associated weather variables for supportive relationships which also could be used to help explain the physical causes. The basic study region included the states of Kansas, Nebraska, and a large portion of the state of Texas. In addition, some data rom the states of Colorado, New Mexico, Wyoming, Iowa, Missouri, and South Dakota were used for extra-area control purposes. The analysis of rainfall trend maps, the factor analysis, the analysis of convariance, and the ratio comparison patterns produced strong evidence for irrigation effects in Nebraska during June, in Texas and Kansas during July, in Kansas during August, and in all three states during summer, (Sims-ISWS)
W78-03486

2C. Snow, Ice, and Frost

SNOW ACCUMULATION AND MELT IN SPRAYED AND UNDISTURBED BIG SAGEBRUSH VEGETATION,
Rocky Mountain Forest and Range Experimentation Station, Collins, CO.
For primary bibliographic entry see Field 4C.
W78-03320

THERMAL REGIME OF PRAIRIE SNOWCOVER,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
R. J. Granger, D. S. Chanasyk, D. H. Male, and D. I. Norum.
Soil Science Society of America Journal, Vol. 41, No. 5, p 839-842, September-October 1977. 6 fig, 1 tab, 8 ref.

Descriptors: *Snowpacks, *Snow cover, *Melting, *Energy budget, On-site investigations, Instrumentation, Winds, Temperature, Humidity, Soil temperature, Air temperature, Solar radiation, Heat transfer, Energy transfer, Data processing, Analytical techniques, Snow, Infiltration, *Prairie snowcover, *Thermal regime.

An energy budget approach was used to study the melting of a shallow prairie snowpack. In the analysis, all the terms of the energy for the melt was the net radiation flux. Over a continuous snowcover, the contribution of sensible heat to the melt could not be represented by a simple low-level temperature index but was dependent on the energy content of the air mass. The latent heat flux responded to the radiation flux, with daytime evaporation and nighttime condensation; however, the net daily flux was evaporative. Nighttime refreezing of the snowpack limited the runoff, with approximately 40% of the daily meltwater being retained or refrozen in the snowpack. Beneath the melting snowcover, the diurnal cycle of soil heat flux was almost completely eliminated. Monitoring of soil moisture changes during the melt period showed that very little infiltration occurred until the soil had thawed. (Sims-ISWS)
W78-03460

WINTER SNOW-COVER MAPS OF NORTH AMERICA AND EURASIA FROM SATELLITE RECORDS, 1966-1976,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 7C.
W78-03482

2D. Evaporation and Transpiration

MODELING OF OIL EVAPORATION IN AQUEOUS ENVIRONMENT,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
W. C. Yang, and H. Wang.
Water Research, Vol. 11, No. 10, p 879-887, 1977. 14 fig, 3 tab, 10 ref.

Descriptors: *Oil, *Evaporation, *Weathering, *Model studies, Mathematical models, Numerical analysis, Thin films, Laboratory tests, Aquatic environment, Interfaces, Hydraulic models, Oil-water interfaces, Boundary processes, Wind velocity, Oil evaporation, Oil-air interfaces.

A numerical model was developed to predict the changes of oil characteristics, specific gravity, percentage weight remain, and percentage volume remain of oil on water through evaporation known to dominate the early stage of weathering. The model was based on the assumption that oil, though complex, can be considered as a chemical compound of individual fractions of distinguishable chemical and physical characteristics. The major driving forces for evaporation considered included air temperature, wind speed, and size of slick. Laboratory experiments were conducted using No. 2 fuel oil, Migerian Crude, and Venezuelan Crude to calibrate the numerical model and to gain physical insight of theoil evaporation process. Based on the laboratory results, empirical relationships were proposed for determining the diffusion coefficient described in the first-order decay formula. Laboratory results revealed that the first-order decay law of a unique diffusion coefficient cannot adequately cover the total range of decay. Both numerical and laboratory results seemed to indicate that the effect of temperature on oil weathering is significant in the very early stage of weathering, but diminishes at a later time. The effect of wind speed is more uniform throughout the time duration being tested. (Humphreys-ISWS)
W78-03244

TEST OF A SOIL WATER MODEL UNDER FIELD CONDITIONS,
Goettingen Univ. (West Germany). Inst. Soil Science and Forest Nutrition.
For primary bibliographic entry see Field 2G.
W78-03251

EVAPOTRANSPIRATION FROM A SATSUMA MANDARIN ORCHARD DETERMINED BY ENERGY BALANCE METHOD, (IN JAPANESE),
Ministry of Agriculture and Forestry, Hiroshima (Japan). Fruit Tree Research Station.
Y. Machida, Y. Hase, T. Maotani, K. Yamatsu, and T. Yamasaki.
Bull Fruit Tree Res Stn (Minist Agric For) Ser E (Akitsu) 1, p 37-50, 1976.

Descriptors: *Evapotranspiration, Orchards, *Energy balance method(Plants), Citrus crops, *Measurement, Plant evapotranspiration, Albedo, *Citrus-unshiu, Leaf, Solar radiation, Temperature.

Determination of evapotranspiration from a satsuma mandarin (Citrus unshiu Marc.) orchard was made in 1973-1974 by the energy balance method. Twelve-year old trees were planted at 2.6 x 2.6 m

spacing. Net radiation and short-wave reflection were measured at the height of 4 m, solar radiation at 1 m, and wet- and dry-bulb temperatures at 0.3 and 2 m above the canopy surface. Albedo and the ratio of effective long-wave radiation to short-wave radiation (F/(Q + q)) remained fairly constant during July-Sept. In Oct., however, they increased simultaneously and the resultant decrease in the ratio of net radiation to solar radiation (S/(Q + q)) occurred. Average daily evapotranspiration in Aug., Sept., Oct., and Nov. were 3.94, 2.61, 1.72 and 1.44 mm, respectively, in 1973, and those in July and Aug. were 3.55 and 4.03 mm in 1974. Average of the ratio of actual evapotranspiration to Penmans potential evapotranspiration (E/Eo) were 0.83, 0.82, 0.91 and 0.97 in Aug., Sept., Oct., and Nov., respectively, in 1973, and 0.87 and 0.76 in July and Aug. in 1974. The ratio E/Eo increased with increase of the soil water due to rainfall or irrigation and decreased gradually with time. The regression line of latent heat flux on net radiation during the daytime was determined; latent heat flux on solar radiation was also determined. Leaf water potentials were determined with a pressure chamber before irrigation in each year.--Copyright 1978, Biological Abstracts, Inc.
W78-03262

THERMAL REGIME OF PRAIRIE SNOWCOVER,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 2C.
W78-03460

2E. Streamflow and Runoff

ROUTING OF FLOODS IN RIVER CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Nordic Hydrology, Vol. 8, No. 3, p 163-170, 1977. 3 fig, 3 ref.

Descriptors: *Flood routing, *Streamflow, *Storage, *Optimization, Graphical analysis, Equations, Streamflow forecasting, Routing, Channel flow, Approximation method, Mathematical studies, Least squares method, Regression analysis, Parametric hydrology, Muskingum method, Data analysis.

An objective method of determining the constants of the Muskingum type linear equation was described. In situations where the relationship between storage and the weighted flow is non-linear, an approximate method of analysis was proposed. The methods were explained by solving typical examples. (Visocky-ISWS)
W78-03240

FEASIBILITY OF ELECTROMAGNETIC STREAMFLOW MEASUREMENTS USING THE EARTH'S FIELD,
Petro Canada Engineering Ltd., Calgary (Alberta). Dept. of Transportations and Operations.
H. Ryckborst, and R. O. Christie.
Hydrological Sciences Bulletin, Vol. 22, No. 2, p 241-255, 1977. 11 fig, 12 ref.

Descriptors: *Streamflow, *Measurement, *Instrumentation, *Canada, Velocity, Analog models, Electromagnetic waves, Magnetic studies, Data collections, Equations, Numerical analysis, Electrical studies, *Fraser River(British Columbia), *British Columbia, Electromagnetic induction, Earth's magnetic field.

Experimental work on electromagnetic streamflow measurements on the tidal Fraser River in British Columbia showed that the method of using the earth's magnetic field has two advantages: it gives an instantaneous value of the water velocity integrated over the entire cross section of the river, and it is independent of temperature. In the Canadian climate both factors are important. The instrumentation is relatively inexpensive, and it consists of a digital to analog converter, strip chart recorder, cable, and silver electrodes. The instrumentation is essential for noise filtering and signal amplification. However, the final interpretation of the measured signal is quite difficult; it requires measurements from an electronic analog of the river cross set section, resistivity of the ground below, conductivity of the water, and a numerical hydrodynamic model. The flow velocities obtained from the measurements of induced potentials, caused by the Fraser River flowing across the earth's magnetic field, compared favorably with velocities computed from a proven hydrodynamic numerical model. (Visocky-ISWS)
W78-03242

ON THE SMOOTHING OF OSCILLATIONS IN FINITE-PERIOD UNIT HYDROGRAPHS DERIVED BY THE HARMONIC METHOD,
Imperial Coll. of Science and Technology, London (England).
M. J. Hall.
Hydrological Sciences Bulletin, Vol. 22, No. 2, p 313-324, June 1977. 4 fig, 11 ref.

Descriptors: *Unit hydrographs, *Fourier analysis, *Frequency, Hydrograph analysis, Hydrographs, Hydrology, Equations, Mathematical studies, Foreign research, Rainfall, Runoff, Algorithms, *Harmonic method, Finite-period unit hydrographs, Instantaneous unit hydrograph.

The application of many of the well-known methods of inversion to rainfall excess and direct runoff data often produces finite-period unit hydrographs whose ordinates are distorted by high frequency oscillations. A simple extension of the basic algorithm for the harmonic method of deriving the finite-period unit hydrograph provided a means of smoothing such oscillations. The modified method has computational advantages over the use of moving average smoothing schemes applied to the derived unit hydrograph. (Lee-ISWS)
W78-03243

FINITE ELEMENT SIMULATION OF OVERLAND AND CHANNEL FLOW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
B. B. Ross, D. N. Contractor, and V. O. Shanholtz.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 4, p 705-712, July-August 1977. 6 fig, 3 tab, 32 ref. OWRT A-062-VA(4).

Descriptors: *Watersheds(Basins), *Overland flow, *Channel flow, *Model studies, *Finite element analysis, Analytical techniques, Hydrograph analysis, Land use, Analysis, Mathematical models, Mathematical studies, Flood routing, Flood flow, Runoff, Numerical analysis, Discharge(Water), Hydrographs, Hydrology, Rainfall-runoff relationships, *Simulation analysis.

A finite element approach to problem of flood routing, in which Galerkin's method was used to solve the kinematic equations of one-dimensional transient flow in open channels, was presented. A computer model was developed to predict runoff hydrographs given the required input parameters. The method of predicting precipitation excess appeared to give good estimates for the cases considered. The discretization feature of the model allowed sudden, isolated land use changes to be made, along with gradual land use changes which occur over an entire watershed. Also, the effect of the land use changes on the downstream flows could be determined. The effects of population increase and flood detention structures in the watershed were predicted. Comparisons were made between the present downstream hydrograph and the future downstream hydrograph with land use changes. Increases in the downstream peak flows, due to the changes, were relatively small but can be expected to become more apparent as the model is applied to less developed watersheds and storm events of lesser magnitude. (Humphreys-ISWS)
W78-03449

FAUNA AND DENSITIES OF MOLLUSCS IN SOME MOUNTAIN WATERS IN THE SURROUNDINGS OF DOMBAS (SOUTH NORWAY), (IN GERMAN),
Gesamthochschule Duisburg (West Germany).
For primary bibliographic entry see Field 5B.
W78-03669

2F. Groundwater

WATER INFILTRATION AND RUNOFF UNDER RAIN APPLICATIONS,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
For primary bibliographic entry see Field 2G.
W78-03249

CAMBRIAN STRATIGRAPHIC NOMENCLATURE AND GROUND-WATER PROSPECTING FAILURES ON THE HUALAPAI PLATEAU, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology; and Wyoming Univ., Laramie. Water Resources Research Inst.
P. W. Huntoon.
Ground Water, Vol 15, No 6, p 426-433, November-December 1977. 3 fig, 1 tab, 13 ref. OWRT B-031-WYO(2), 14-34-0001-6134.

Descriptors: *Aquifers, *Arizona, *Groundwater availability, *Groundwater resources, Stratigraphy, Springs, Base flow, Permeability, Groundwater recharge, Test wells, Water yield, Geologic formations, Drilling, Tertiary period, Paleozoic era, Structural geology, limestones, Dolomite, *Grand Canyon, *Hualapai plateau.

The best potential aquifers underlying the 600 sq mi Hualapai Plateau of northwestern Arizona are: (1) the Cambrian Rampart Cave Member of the Muav Limestone, and (2) interbedded Tertiary sedimentary and volcanic rocks that locally fill old canyons on the plateau. The target aquifers were identified on the basis of spring locations on the flanks of the plateau, primarily along the walls of the Grand Canyon to the north and east. Total groundwater discharge from springs along the plateau is approximately 4 cu ft/sec. To date, the largest production from a test well on the plateau is 120 gal/min from Tertiary rocks. The Cambrian rocks have frustrated development in part because of small permeabilities, small recharge (0.1 in/yr minimum), and the fact that the rocks are well drained. The complex stratigraphic nomenclature used to describe the Cambrian rocks in the region has contributed inadvertently to prospecting failures. The Cambrian section is characterized by thick interbedded limestones and shales, with the basal limestone being the principal target aquifer. These relationships have not been conveyed adequately to managers and drillers, with the result that critical test holes have been terminated in shales that overlie the target aquifer. Dry holes have been the result. (Visocky-ISWS)
W78-03445

THE IONIC COMPOSITION OF LAKES FED BY GROUND WATER AND PRECIPITATION IN THE UPPER ROMERIKE DISTRICT,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W78-03471

WATER TABLE MAPPING USER'S MANUAL,
Nevada Univ., Reno. Desert Research Inst.

For primary bibliographic entry see Field 7C.
W78-03484

2G. Water In Soils

DEVELOPMENT OF A SOIL-WASTE INTERACTION MATRIX FOR ASSESSING LAND DISPOSAL OF INDUSTRIAL WASTES,
Chemical Engineering Research Consultants Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5E.
W78-03222

WATER INFILTRATION AND RUNOFF UNDER RAIN APPLICATIONS,
Utah State Univ., Logan. Dept. of Agriculture and Irrigation Engineering.
A. Y. Hachum, and J. F. Alfaro.
Soil Science Society of America Journal, Vol. 41, No. 5, p 960-966, September-October 1977. 9 fig, 4 tab, 13 ref.

Descriptors: *Infiltration, *Runoff, *Model studies, *Laboratory tests, Simulated rainfall, Mathematical models, Ponding, Pressure head, Wetting, Irrigation, Sprinkler irrigation, Rainfall, Soils, Soil water, Saturation, Soil science.

Experiments to verify the validity and to evaluate the performance of rain infiltration models based on extending the Green and Ampt approach are lacking in the literature. There are severe gaps between theory, validity, and practicality of these models. In this study, a physically based model for describing infiltration into a homogeneous deep stable soil profile with uniform initial water content distribution was presented. The derivation of the model was based on the concept of mapping the actual wetted soil zone into an equivalent rectangular saturated zone with constant effective hydraulic conductivity and capillary pressure head at the abrupt wetting front. The model took into account the initial water mobility in the soil profile and predicted the system response under any rainfall pattern. The proposed model was further simplified, for practical purposes, by grouping 3 basic input parameters into a single parameter, the Surface Saturation Index. The validity of the model was tested and was supported strongly by the results of laboratory experiments conducted on samples of 3 soils, 2 silt loams and a silty clay loam, under 5 different (variable and constant) water application rate patterns. It was found that the amount of runoff from a nearly symmetrical convex variable rainfall pattern was very close to that which resulted from its equivalent average constant application rate pattern, regardless of the significant differences between the times at which runoff begins and the characteristics of infiltration rates thereafter. (Sims-ISWS)
W78-03249

RATES AND PATTERNS OF WATER UPTAKE IN A DOUGLAS-FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
J. U. Nnyamah, and T. A. Black.
Soil Science Society of America Journal, Vol. 41, No. 5, p 972-979, September-October 1977. 14 fig, 3 tab, 24 ref.

Descriptors: *Moisture uptake, *Forests, *Soil water movement, On-site investigations, Instrumentation, Tensiometers, Hydrometers, Trees, Douglas fir trees, Water balance, Hydraulic conductivity, Soils, Soil water, Root zone, Drying, Evapotranspiration, Soil science, Forestry, Root density, Forest water balance.

The forest water balance was studied in a thinned (840 stems/ha) and an unthinned (1,840 stems/ha) Douglas-fir forest during two consecutive summers. Soil water content was measured with the neutron meter. Soil water potential was measured with tensiometers and dew point hygrometers over a range of 0 to -15 bars. The data were used to compute water extraction rates and patterns for the root zone over a four-week drying period. The results showed a gradual downward shift of the zone of maximum root water uptake as the soil dried. The fully developed root system of Douglas fir showed less hydrotropic response than the developing root systems of annuals reported in the literature. There was good correlation between water uptake rate and rooting density. During the drying period, water flux into the bottom of the root zone, estimated by the use of Darcy's law, increased from 8 to 15% of the evapotranspiration at the thinned site and from 2 to 8% at the unthinned site. Soil profile water depletion corrected for flux out of or into the bottom of the root zone agreed well with evapotranspiration computed from micrometeorological energy balance data. Water withdrawal from trunk storage accounted for only 2% of the total evapotranspiration over the four-week drying period. (Sims-ISWS)
W78-03250

TEST OF A SOIL WATER MODEL UNDER FIELD CONDITIONS,
Goettingen Univ. (West Germany). Inst. Soil Science and Forest Nutrition.
F. Beese, R. R. Van der Ploeg, and W. Richter.
Soil Science Society of America Journal, Vol. 41, No. 5, p 979-984, September-October 1977. 4 fig, 2 tab, 27 ref.

Descriptors: *Soil water, *Unsaturated flow, *Evaporation, On-site investigations, Model studies, *Mathematical models, Lysimeters, Moisture content, Soil water movement, Soils, Soil properties, Precipitation(Atmospheric), Rainfall, Drainage, Subsurface drainage, Agriculture.

A 218-day experiment on a fallow loess soil was carried out to study infiltration and redistribution under natural field conditions. On an experimental plot of 6 by 6 m, tensiometers were installed at 11 depths: 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, and 200 cm. The tensiometers were read at short irregular intervals. The precipitation was measured daily. The hydraulic functions of the layered, horizontal soil and a relation between potential evaporation, actual evaporation, and the soil suction at 5-cm depth had been established previously. With use of these soil and atmospheric data, the unsaturated soil moisture flow equation was solved numerically. The purpose of the numerical analysis was to determine if the unsaturated soil moisture flow equation does describe observed soil moisture behavior for such a long period. It was found that the calculated soil suction values for all depths deviated less than 15% from the measured ones. It was concluded that the unsaturated moisture flow equation can be a useful means to supplement field measurements on infiltration, redistribution, evaporation, and internal drainage. (Sims-ISWS)
W78-03251

RETENTION OF SOIL WATER FOLLOWING FOREST CUTTING,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
J. G. McColl.
Soil Science Society of America Journal, Vol. 41, No. 5, p 984-988, September-October 1977. 6 fig, 2 tab, 20 ref.

Descriptors: *Forests, *Soil water, *Clear-cutting, *California, Evaporation, Evapotranspiration, Trees, Moisture content, Drying, On-site investigations, Instrumentation, Tensiometers, Nuclear meters, Forestry, Hydrology, *Eucalyptus trees.

Eucalyptus globulus forests in the Oakland-Berkeley hills, California, were clearcut in 1973-74 following severe damage from freezing in December 1972. The soil water regimes in clearcut and adjoining uncut areas were compared during the two years following cutting. During the wet winter season (December-May), surface drying and evapotranspiration by annual grasses were the only losses in the clearcut; more soil water was retained in the clearcut due to lack of evapotranspiration by the forest trees. Soil water rapidly decreased in both the clearcut and forest during the long, dry summer periods; and differences between the two areas widened. By midsummer, soil matric suctions in the clearcut dropped below 15 bars (22.4% P sub v, volumetric water content), and in the forest to below 70 bars (8.5% P sub v). During the summer, P sub v increased with profile depth in the clearcut; but in the forest, soil water was depleted uniformly with depth in the profile. Although volumetric water contents of soil (P sub v) were significantly different between clearcut and forest areas, rates of water loss (k) during summer were not clearly related to forest cover. In the clay-loam soil, k was dependent on the soil water storage at the beginning of the dry summer period, on the ability of trees in the uncut forest to withdraw water from parent material and from fractured bedrock in excess of that available in the soil profile, and on P sub v which decreased during summer. (Sims-ISWS)
W78-03252

A QUICK METHOD FOR ESTIMATING SOIL WATER DIFFUSIVITY FUNCTIONS,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy.
R. D. Miller, and E. Bresler.
Soil Science Society of America Journal, Vol. 41, No. 5, p 1020-1022, September-October, 1977. 1 fig, 4 ref.

Descriptors: *Diffusivity, *Soil water movement, *Infiltration, Model studies, Mathematical models, Equations, Regression analysis, Analytical techniques, Soils, Soil properties, Soil water, Physical properties, Laboratory tests, Soil science, Wetting fronts, Horizontal infiltration.

Published data for horizontal infiltration into air dry nonsodic stable soil imply excellent correlation between soil water diffusivity functions and the rate of advance of the visual wetting front in one dimensional horizontal infiltration experiments. When suitably transformed, data for each of eight soils, ranging from a clay loam to a sieved sand fraction, were represented remarkably well by a single regression equation involving dimensionless variables. This suggests that the same coefficients should apply to similar data for almost any soil. It was shown that the data also can be expressed for a somewhat simpler regression equation, involving only the simplest of experimentally measured quantities so that the diffusivity function can be quickly estimated for any soil. (Sims-ISWS)
W78-03253

ALTERATION OF ENVIRONMENTAL CONDITIONS IN CLEARED NARROW STRIPS IN SPRUCE FORESTS OF THE TIEN-SHAN, (IN RUSSIAN),
Akademiya Nauk Kirgizskoi SSR, Frunze. Inst. Biologii.
For primary bibliographic entry see Field 4C.
W78-03301

WATER CAPACITY OF MOUNTAIN-FOREST AND MEADOW SOILS OF THE NORTHERN CAUCASUS, (IN RUSSIAN),
A. P. Kazankin.
Pachvovedenie 12, p 91-96, 1976.

Descriptors: Trees, *Meadow soils, *Soil-water-plant relationships, *Field water capacity(Soils), Aspen, Beech, Fir, Hornbeam, Pine, Spruce.

Field capacity was determined on slopes with up to 48 degrees and on plain areas. Water in the

amount of 20-25 m3 was pumped. Fir and fir-spruce stands correspond to 146-214 mm field capacity; pure spruce stands to 115 mm field capacity, and thin pine and aspen seedlings to 104 mm. The increase of water capacity to 303 mm is observed under beech-fir plantations. Field capacity of soils under oak and hornbeam forests (218-226 mm) occupies an intermediate position between the zones of dark coniferous and beech forests. The knowledge of the relationship between water capacity and forest forming species is of great practical importance.--Copyright 1978, Biological Abstracts, Inc.
W78-03345

MERCURY DISTRIBUTION IN SOIL AROUND A LARGE COAL-FIRED POWER PLANT,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W78-03418

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON NITROGEN TRANSPORMATIONS IN SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W78-03424

THE DEPENDENCE OF DEGREE VARIATION OF SOIL MOISTURE ON ITS VALUE, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
N. S. Oreshkina.
Vestn Mosk Univ Ser Vi Biol Pochvoved 31(5), p 49-52, 1976.

Descriptors: *Soil moisture, *Moisture content, Soil analysis, *Alfalfa, *Birch forests.

The value of soil-moisture content under (alfalfa, fallow and birch forests) correlated very lowly with its degree of variation. A number of replications of moisture determinations are necessary to know the pattern of soil desiccation or moisture. --Copyright 1978, Biological Abstracts, Inc.
W78-03451

THERMAL REGIME OF PRAIRIE SNOWCOVER,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 2C.
W78-03460

ERODIBILITY OF SELECTED CLAY SUBSOILS IN RELATION TO PHYSICAL AND CHEMICAL PROPERTIES,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W78-03461

A LABORATORY TECHNIQUE FOR APPRAISING IN SITU SALINITY OF SOIL,
Montana State Univ., Bozeman. Dept. of Chemistry.
A. Mubarak, and R. A. Olsen.
Soil Science Society of America Journal, Vol. 41, No. 5, p 1018-1020, September-October 1977. 2 fig, 2 tab, 14 ref.

Descriptors: *Saline soils, *Salinity, *Electrical conductance, *Laboratory tests, Centrifugation, Chemistry, Salts, Analytical techniques, Soils, Soil properties, Immiscibility, Soil science, Immiscible displacement, Soil solutions, Dilution effects.

A laboratory technique was devised for removal of solution from soils at field water content. A soil sample can be placed directly in a closable centrifuge tube, thereby minimizing changes which could be induced by altering gaseous equilibria. Water need not be added to the soil sample, so changes in electrical conductivity (EC) and in concentration of species present are avoided. The soil solution was obtained from the sample by immiscible displacement with carbon tetrachloride using centrifugation. The technique is simple and relatively rapid. Values for EC in successively displaced solution samples from a given soil sample were found to be essentially constant. The values for EC obtained for an assortment of soils were significantly higher than those obtained using 2:1 or saturation extracts but were well correlated with them. (SimISWS)
W78-03462

VEGETATION ESTABLISHMENT AND SHORELINE STABILIZATION: GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 2L.
W78-03475

EQUILIBRIUM OPERATION OF SUBSURFACE ABSORPTION SYSTEMS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-03507

SOIL'S NATURAL PROCESSES CAN CLEAN WASTES FROM SEWAGE WATER.
For primary bibliographic entry see Field 5D.
W78-03558

POLYCYCLIC AROMATIC HYDROCARBONS IN AGRICULTURAL SOIL (POLYZYKLISCHE, AROMATISCHE KOHLENWASSERSTOFFE IN LANDWIRTSCHAFTLICH GENUTZTEN BODEN),
Mainz Univ. (West Germany). Hygiene Inst.
For primary bibliographic entry see Field 5B.
W78-03566

HEAVY METALS TRANSPORT MODEL IN A SLUDGE-TREATED SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5B.
W78-03590

METHOD FOR REDUCING WATER LOSS THROUGH SOIL BY SEEPAGE,
Flintkote Co., Stamford, CT. (Assignee).
G. Stepien, Jr., F. L. Califano, and T. E. Russell.
U.S. Patent No. 4,041,712, 9 p, 5 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 3, p 1019, August 16, 1977.

Descriptors: *Patents, *Soil treatment, *Soil sealants, *Soil moisture, Soil-water-plant relationship, Water conservation, Water loss, Seepage.

The primary purpose of this invention is to provide a method and composition whereby agricultural soils can be treated so as to form a semipervious barrier at a selected depth below the surface, so that the surface soil remains loose and of the proper consistency for nurturing the roots of various plants. The sub-surface barrier must be semipervious because it is necessary that the surface soil drain, in order not to rot the roots of the growing plants. The sub-surface barrier created by the composition and methods of this invention permit either natural moisture or moisture from irrigation to be retained in the top strata of the soil for longer periods of time. The waste of artificial nutrients and fertilizers is also reduced. The composition comprises an aqueous emulsion of asphalt including a cationic emulsifier, a non-ionic surface active agent and elastomer solids. The compositions are particularly adapted for application to agricultural soils. After application to the ground surface, the surface is flooded with water to force the aqueous emulsion downward into the subsurface. A semi-permeable fluid barrier is created several inches below the surface. (Sinha-OEIS)
W78-03615

WASTEWATER TREATMENT THROUGH SOIL -- WITH SPECIAL REFERENCE TO SEPTIC TANK EFFLUENT TREATMENT,
ADI Ltd., Fredericton (New Brunswick).
For primary bibliographic entry see Field 5E.
W78-03620

CONTENT OF HYDRATED WATER IN SOILS FROM AN ENERGETIC POINT OF VIEW, (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Inst. of Soil Science and Agrochemistry.
V. R. Volobuev.
Izv Akad Nauk SSSR Ser Biol. 3, p 444-447, 1974.

Descriptors: *Soil water movement, *Minerals(Soils), Energy, Silica, *Soil mass, Energetics, *Hydrated water(Soils), Soils, *Weathering(Soils).

The processes of weathering of the mineral mass of soils were studied. The content of hydrated water in soils was taken as an index of the weathering degree. An exponential form connection was established between the hydrated water content and possible energy expenses on soil formation. A straight-line connection was established between the hydrated water content and the energy of the lattice of the mineral mass of soil, except its part falling on silica.--Copyright 1975, Biological Abstracts, Inc.
W78-03658

PESTICIDE RECOVERY STUDIES FOR EVALUATION OF DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM SOIL AND SEDIMENT ANALYSIS METHODOLOGY. PART I. DETERMINATION OF PESTICIDE AND POLYCLORINATED BIPHENYL RECOVERIES FROM SOIL EXTRACTED IMMEDIATELY FOLLOWING FORTIFICATION OCTOBER-DECEMBER 1976,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-03667

TRACE ELEMENTS IN THE TERRESTRIAL ENVIRONMENT OF A COAL-FIRED POWERHOUSE,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5A.
W78-03677

2H. Lakes

COASTAL UPWELLING/DOWNWELLING CYCLES IN SOUTHERN LAKE SUPERIOR,
Wisconsin Univ., Madison. Marine Studies Center.
H. J. Niebauer, T. Green, and R. A. Ragotzkie.
Journal of Physical Oceanography, Vol 7, No 6, p 918-927, November 1977. 13 fig, 1 tab, 15 ref. NSF 33140.

Descriptors: *Lake Superior, *Upwelling, *Circulation, *Lakes, *Great Lakes, On-site investigations, On-site data collections, Data processing, Currents(Water), Water circulation,

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Winds, Weather, Atmospheric pressure, Coasts, Temperature, Water temperature, Hydrography, Limnology, *Downwelling(Lakes).

Extensive current meter, hydrographic, and wind data were collected in the region of the Keweenaw Current, a stron coastal jet, during the late spring and early summer regime of Lake Superior. The data were compared with surface wind and pressure patterns over the region with the following conclusions: (1) Longshore winds associated with migrating low-pressure systems generate onshore Ekman transport and coastal downwelling. The coastal downwelling results in an intensification of the onshore internal pressure gradient, and consequently, the coastal jet. Speeds of over 75 cm/s are both observed and calculated, suggesting the Keweenaw Current, at these times, is in geostrophic equilibrium. (2) Longshore winds associated with migrating high-pressure systems generate offshore Ekman transport and coastal upwelling. Upwelling velocities of 13-50 m/day, an offshore surface transport layer of 10 m, a nearshore deceleration of the Keweenaw Current, and current direction fluctuations of near- and sub-inertial period are found associated with the upwelling. The period of passage of highs (Upwelling) and lows (downwelling) in July is about 4-6 days. This gives the Keweenaw Current the appearance of a pulsating coastal jet of period 4-6 days and amplitude about 60 cm/s. (Sims-ISWS)
W78-03239

LIMNOLOGICAL ASPECT OF WATER RESERVOIRS OF THE LAKE REGION BETWEEN LECZNA AND WLODAWA. PART I, (IN POLISH),
Akademia Rolnicza, Lublin (Poland). Inst. Biol. Rodstaw Prod. Zwierzecej.
G. Brzek.
Biul Lubel Towarzystwa Nauk Biol 18(2), p 79-84, 1976.

Descriptors: Reservoirs, Limnology, *Poland, Trophic levels, Lakes, Aquatic plants, Aquatic animals, Cretaceous substratum, Holocene, Oligotrophy, Pleistocene, Tropism.

The lakeland between Leczna and Wlodawa (Poland) often called the West Forestland, is an extensive depression of the terrain containing numerous water reservoirs. Lakes of this land occur in 2 river basins; the Wieprz Basin of 43 lakes and the Wlodawka Basin of 23 lakes. Most lie on Cretaceous substratum, are of karst orgin and go back to the Pleistocene or the Holocene period. The rest of the existing lakes are remnants of ancient lakes of the 1st or the 2nd interglaciation. The lakes are small but rather deep. They represent various stages of trophism. They progress from the stage of early eutrophy inclusively. Some of the lakes, particularly several peat-bogs, are in their original state and they have unique floral and faunal resources. The area is cut by the artificial Wieprz-Krzna channel. Some lakes receive fertile and alkaline water full of fauna and flora from the Wieprz River by means of the system of channels. The several years' investigations, carried out on those storage reservoirs by Lublin zoologists and botanists, were divided into 3 stages. The flora and fauna were listed before letting the water enter from the Wieprz. Mixing the lake flora and fauna with those of the river resulted in a mutual dislodgement of elements of the former biocenosis. The development of new biocenosis in the storage reservoirs was observed.--Copyright 1978, Biological Abstracts, Inc.
W78-03272

PROBLEMS OF HYDROBIOLOGICAL RESEARCH IN THE LAKE REGION BETWEEN LECZNA AND WLODAWA, (IN POLISH),
Akademia Rolnicza, Lublin (Poland). Zaklad Zologii and Hydrobiologii. and Akademia Rolnicza, Lublin (Poland). Zaklad Botaniki.
G. Brzek, C. Kowalczyk, S. Radwan, and I. Wojciechowski.
Biul Lubel Towarzystwa Nauk Biol 18(2), p 85-90, 1976.

Descriptors: *Hydrobiology, *Poland, Lakes, Aquatic plants, Aquatic animals, *Biomass, Chironomidae, Cladocera, Coleoptera, Copepoda, Crustaceans, Ecological, Ephemeroptera, Euphyllopoda, Fish, Hydracarina, Moss, Parasites, Phyto, Pisces, Plankton, Primary production, Rotatoria, Seasonal, Succession.

This lakeland containing 66 lakes differentiated by their genetics, age, physical, chemical, and biological properties was studied previously. Rotatoria, Euphyllopoda, Cladocera, Copepoda, Hydracarina, Coleoptera (aquatica), Chironomidae, Simuliidae, Ephemeroptera, Pisces and fish parasites were investigated. A great number of new and rare (for Poland) species were discovered. Some interesting observations were made on ecology, geographical zone, quantitative and qualitative seasonal changes in fauna in a whole years period, the succession of seasonal fauna and the dependence of the rate of development of planktonic animals and biomass upon the biotical and abiotical factors. Some species of rotifers can be indicators of lake trophism. All the lakes were classified according to the degradation degree on the basis of the interrelation between the maximum depth of 61 lakes and the rate of crustacean biomass in epilimnion. The botanists have worked out phytosocial characteristics of vascular plants in the lakes and peatbogs and the flora of mosses. They found numerous rare species and phytographic elements, chiefly Atlantic and boreal ones. Phytoplankton was examined microbiologically and algogically in a full years cycle with respect to the structure of the groups both in their contents and activities. The age of the lakes was estimated at 11,000 yr. Further investigations are carried out on the primary and secondary productions of 3 lakes differentiated by their trophisms.--Copyright 1978, Biological Abstracts, Inc.
W78-03287

WATER STRATIFICATION DURING INTENSIVE BREEDING OF FISH IN PONDS OF THE SOUTHEASTERN TURKMEN SSR, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
V. D. Stepanov, R. Charyev, and R. P. Stepanova.
Osvo Pustyn 6, p 53-59, 1976.

Descriptors: *Stratification, Fish ponds, Hydrogen ion concentration, Oxygen, Biogenic elements, *Carp, *USSR(SE Turkmenistan).

The water layers in pools of the Tedjhen farm (southeast Turkmenistan (USSR)), where the largest quantity of fish (carp) are bred, are characterized by distinct stratification due to variability in the content of O2, pH and biogenic elements.--Copyright 1978, Biological Abstracts, Inc.
W78-03298

FORESTED WETLANDS FOR WATER RESOURCE MANAGEMENT IN SOUTHERN ILLINOIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
W. J. Mitsch, C. L. Dorge, and J. R. Wiemhoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 659, Price codes: A13 in paper copy, A01 in microfiche. University of Illinois Water Resources Center, Urbana, Report No. 132, November 1977. 275 p, 65 tab, 59 fig, 110 ref, append. OWRT A-088-ILL(1).

Descriptors: *Wetlands, Sedimentation rates, Floodplains, Water quality, Primary productivity, Ecosystems, Nutrients, Management, Water resources development, Forested wetlands, *Swamps, Primary productivity, *Cypress swamp, Phosphorus cycle, Taxodium, Hydrology budget, Flooding river, *Illinois, Non-point source loading, Duckweed.

A 30 ha cypress - tupelo (Taxodium distichum - Nyssa aquatica) floodplain swamp in Southern Illinois was studied for its hydrologic, biogeochemical and ecological characteristics. The hydrology, water chemistry, sediment dynamics and ecosystem productivity were described for the swamp and interactions with the adjacent Cache River were emphasized. A representative flood in the spring spilled water and sediments from the river to the swamp, temporarily reversing the normal flow of water from the swamp to the river. The annual hydrology budget for the swamp showed inflows of 74.4 cm throughfall, 63.9 cm runoff, and 21.9 cm groundwater; the outflows were 72.8 cm evapotranspiration, 54.9 cm surface outflow, and 21.0 cm groundwater, the latter two draining to the river. Loading rates for several chemical parameters were calculated from the swamp to the river and water chemistry of the swamp and river was contrasted. Primary productivity measurements showed high rates when the floating duckweed was included; cypress productivity was shown historically to be related to amount of flooding. A phosphorus budget was determined for the swamp and this indicated that the flooding river contributed over 10 times the phosphorus to the swamp as was discharged the rest of the year.
W78-03423

THE MEROMICTIC GREAT SALT LAKE,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
A. Lin.
Journal of Great Lakes Research, Vol 2, No 2, p 374-383, December 1976. 6 fig, 18 ref. OWRT A-029-UTAH(2), 14-31-0001-5045.

Descriptors: *Meromixis, *Great Salt Lake, *Chemical stratification, *Utah, Circulation, Water circulation, Salts, Seepae, Stratification, Dikes, Brackish water, Brines, Dissolved solids, Sodium, Chlorides, Chemicals, Lakes, Limnology, Ectogenic meromixis, Causeways.

The Great Salt Lake is an extreme case of ectogenic meromixis caused by diking. The formation and maintenance of the meromixis is largely due to a continuing supply of heavy blines from the North Basin to the monimolimnion of the South Basin. The meromictic stability of the South Basin is estimated to be 5700 g-cm/sq cm; the average entrainment rate is estimated at 4.62 x 10 to the minus 8th power m/sec, for a mean depth of 6.5 meters. The average entrainment rate appears to confirm Blanton's estimate. (Sims-ISWS)
W78-03446

THE STRUCTURE OF THE SPRING THERMAL BAR IN LAKE SUPERIOR, II,
Michigan Technological Univ., Houghton. Dept. of Biological Sciences.
J. D. Spain, G. M. Wernert, and D. W. Hubbard.
Journal of Great Lakes Research, Vol 2, No 2, p 296-306, December 1976. 12 fig, 24 ref. OWRT A-071-MICH(2).

Descriptors: *Lake Superior, *Water temperature, *Sampling, Lakes, Water circulation, Mixing, On-site investigations, Fluorescence, Temperature, Water pollution, Path of pollutants, Limnology, *Thermal bars, *Keweenaw Peninsula(Mich), Downwelling.

The thermal bar was studied during May and June of 1974 and 1975 near the Keweenaw Peninsula along the south shore of Lake Superior. Temperature distributions and distributions of naturally fluorescent material were measured in order to determine the nature of the energy and mass transport in the thermal bar zone. Transects were

located perpendicular to the thermal bar, and temperature was measured at 5 m intervals to a depth of 45 m using a thermistor probe with a 3 sec time constant interfaced with a signal conditioner and digital voltmeter. Accuracy in the range of 4C was + or - 0.01C. Water samples were collected, and the natural fluorescence arising from land runoff was measured. Station locations were determined by triangulation. Data for both temperature and fluorescence were plotted by a computer mapping program (SYMAP). The computer plotted temperature distributions provide the most detailed picture of the thermal bar thus far obtained. The complexity suggests considerable turbulence. A strong correlation between natural fluorescence and temperature supports the concept that little mixing occurs between inshore and offshore waters and that a significant portion of inshore waters and that a significant portion of inshore water arises from runoff. The bottom slope seems to have a strong influence on the flow near the thermal bar and on the rate of movement offshore. (See also W75-04038), (Sims-ISWS)
W78-03447

DIURNAL ZOOPLANKTON MIGRATION IN PONDS OF THE TURKMEN SSR, (IN RUSSIAN),
Akademiya Nauk Turkmensk i SSR, Ashkhabad. Inst. Zoologii i Parazitologii.
R. E. Muravleva.
Izv Akad Nauk Turkm Ssr Ser Biol Nauk 4, p 63-67, 1976.

Descriptors: *Zooplankton migration(Diurnal), Ponds, *USSR(Turkmen SSR), *Biomass, Water temperature.

Diurnal activity of zooplankton organisms (in the USSR) was investigated. The variations of zooplankton quantity and biomass were recorded. The maximal zooplankton concentration was registered in the evening at midnight, minimal from 12 to 6 p.m. The activity of zooplankton is influenced by feed factors, water temperature and ilumination.--Copyright 1978, Biological Abstracts, Inc.
W78-03453

LAKE CONSTANCE: ENDANGERMENT AND POSSIBILITIES FOR REHABILITATION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
For primary bibliographic entry see Field 5C.
W78-03464

THE IONIC COMPOSITION OF LAKES FED BY GROUND WATER AND PRECIPITATION IN THE UPPER ROMERIKE DISTRICT,
Oslo Univ. (Norway). Dept. of Limnology.
D. Hongve.
Nordic Hydrology, Vol. 8, No. 3, p 141-162, 1977. 6 fig, 9 tab, 30 ref.

Descriptors: *Water quality, *Water chemistry, *Lakes, *Geochemistry, *Chemical analysis, Analytical techniques, Chemistry, Precipitation(Atmospheric), Fallout, Runoff, Dissolved solids, Water analysis, Calcium, Chlorides, Magnesium, Sodium, Potassium, Geology, Sulfates, Salts, Foreign countries, Foreign research, *Norway, *Ionic composition, *Norwegian lakes, *Upper Romerike District(Norway).

In the Upper Romerike District the lakes possess widely different chemical characteristics depending on their hydrological conditions. The most dilute lakes are fed only by precipitation, and the more concentrated ones by groundwater. It was found that: in the precipitation fed lakes, the total ionic concentration was similar to that of the average precipitation, but the ionic ratio was different. Ionic sorption and exchange affected mostly calcium which decreased in concentration, while the monovalent ions increased. The groundwater fed lakes were dominated by bicarbonate, and their ionic proportions were constant regardless of total concentrations. The percentage composition was: Ca: 82%, Mg: 10.1%, Na: 6.5%, K: 1.4%, HC03: 78.3%, S04: 17.1%, C1: 4.6%. (Henley-ISWS)
W78-03471

LAKE ONTARIO BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
F. H. Quinn, and J. A. Derecki.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 782, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. ERL 365-GLERL 10, March 1976. 32 p, 6 fig, 16 tab, 1 ref, 1 append.

Descriptors: *Water levels, *Water storage, *Lake Ontario, *Great Lakes, Water level fluctuations, Gages, Gaging stations, Networks, Lakes, Water resources, Water supply, Watersheds(Basins), Limnology, Monthly water levels, Beginning-of-month water levels, Water-storage change rates.

Results were described of a study of Lake Ontario beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1974 were listed for use in scientific and planning studies. (Sims-ISWS)
W78-03474

THE LIMNOLOGY OF GRAND TRAVERSE BAY, LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Sea Grant Program.
M. T. Auer, R. P. Canale, and P. L. Freedman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 814, Price codes: A12 in paper copy, A01 in microfiche. Technical Report No 47 MICHU-SG-76-200, 1976. 262 p, 83 fig, 37 tab, 199 ref, 2 append.

Descriptors: *Lake Michigan, *Bays, *Limnology, Surveys, Sampling, Geology, Circulation, Hydrology, Water pollution, Water pollution sources, Nutrients, Phytoplankton, Zooplankton, Benthos, Sediments, Chemical properties, Physical properties, Aquatic biology, *Grand Traverse Bay(Mich).

The report contained 17 chapters divided into 3 sections. The first section contained the summary, introduction, and chapters dealing with the geologic, morphometric, and circulatory charcteristics of the bay. The following two chapters presented methods of analysis and data management. This section also contained a detailed discussion of the hydrology and contaminant sources to the bay. The second section was a summary of general water quality in the bay. Results of chemical analyses for trace metals, algal growth nutrients, and major ions were presented. A summary of findings regarding phytoplankton, zooplankton, coliform bacteria, benthos, and surficial sediments was provided. The third section was a collection of individual reports describing in detail findings regarding phytoplankton, zooplanton, benthos, and surface sediments. Each chapter is self-standing and serves as an in-depth report of a particular facet of the limnology of Grand Traverse Bay. Appendix A presented references used in the compilation of tables of general values, and Appendix B was a bibliography of Michigan Sea Grant reports and papers of Grand Traverse Bay. (Sims-ISWS)
W78-03487

GRAND TRAVERSE BAY LIMNOLOGICAL DATA,
Michigan Univ., Ann Arbor. Sea Grant Program.
M. T. Auer, R. P. Canale, and P. L. Freedman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 783, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 48, MICHU-SG-76-201, March 1976. 92 p, 1 fig, 8 tab.

Descriptors: *Lake Michigan, *Bays, *Limnology, *Data collections, *Great Lakes, On-site investigations, On-site data collections, Physical properties, Chemical properties, Primary productivity, Secchi disks, Chlorophyll, Phytoplankton, Zooplankton, Benthos, Sampling, Lakes, Aquatic biology, Water pollution, *Grand Traverse Bay(Mich).

A listing was presented of the latitude, longitude, and depth of sampling stations used in the Michigan Sea Grant field program on Grand Traverse Bay. A map of the sampling stations was provided as well as the date of each sampling cruise. In addition to these materials, portions of the data files used in preparing the report, 'The Limnology of Grand Traverse Bay, Lake Michigan' (Michigan Sea Grant Technical Report Number 47), were presented. The following data files were included: physical/chemical data, primary productivity (including Secchi disc and light measurements), chlorophyll a, total phytoplankton, total zooplankton, and benthos. The complete phytoplankton and zooplankton files were too voluminous to be included in this publication. The data, however, are available on card files at the Michigan Sea Grant Program in Ann Arbor, Michigan. (Sims-ISWS)
W78-03488

LARGE-SCALE CURRENT MEASUREMENTS IN LAKE SUPERIOR,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
P. W. Sloss, and J. H. Saylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 815, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No. ERL 363-GLERL 8, January 1976. 55 p, 24 fig, 2 tab, 7 ref.

Descriptors: *Currents(Water), *Water circulation, *Lake Superior, *Great Lakes, Current meters, Measurement, Surveys, Temperature, Water temperature, Thermal stratification, Winds, Weather, Flow, Limnology, Oscillatory currents.

Analyses of current meter data collected in Lake Superior in 1967 and 1973 showed a general counterclockwise circulation covering most of the lake. The following observations were reported: currents near the shore are strong (exceeding 10 cm/s for a half-month vector average) and generally parallel to the isobaths. Open-lake currents show strong periodic motions at the local inertial frequency. An interesting periodicity is seen in the currents between Isle Royale and the northern shore. Oscillatory components observed there are driven by inertial motions when the lake becomes thermally stratified in late summer, but in spring they show periodicities related to the first and sixth free surface modes of the lake. Other persistent features of the measured flow patterns are the Keweenaw Current and a general strengthening of summertime flows as the lake becomes stratified. (Sims-ISWS)
W78-03490

PHYTOPLANKTON OF THE BRITAJIAN RESERVOIR (THE NORTHERN DONETS RIVER), (IN RUSSIAN),
Kharkov State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W78-03603

STRONTIUM-90 CONCENTRATIONS IN THE BOTTOM BRINE AND SEDIMENTS OF LAKE SIVASH AS DEPENDENT ON THE HYDROCHEMICAL ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-03611

ZOOPLANKTON OF THE LOWER VOLGA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
For primary bibliographic entry see Field 5C.
W78-03618

FEEDING OF THE PERCH AND RUFF IN THE DISCHARGE ZONE OF THE KURAKHOVO STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Kiev State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W78-03622

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-03643

THE PHYTOSOCIOLOGY OF THE GREEN SWAMP, NORTH CAROLINA,
Bureau of Sport Fisheries and Wildlife Research Center, Jamestown, ND.
R. L. Kologiski.
North Carolina Agricultural Experiment Station Technical Bulletin No 250, December 1977, Raleigh, N.C. 101 p. 17 fig, 6 tab, 75 ref, 1 append.

Descriptors: *Swamps, *Trees, Soil types, Burning, Classification, Wetlands, North Carolina, *Phytosociology, *Green Swamp(NC), *Pocosin, *Hydroperiod, *Coastal wetlands, Bog, Pine savannah, Bay forest.

Vegetation types, typical of what once covered several thousand square miles of the lower coastal plain of North Carolina are delineated and described. Sampling was by the releve method using 221 sample plots subjectively located according to vegetation, soil type, disturbance, and accessibility. Data collected were cover values based on a modified Braun-Blanquet cover estimation technique. Gradient analysis indicated a definite relationship between vegetation type and soil type, hydroperiod, and fire. Hydroperiod is probably the most important factor and, to some extent, controls the effects of fire on vegetation. A gradient was defined ranging from mineral soils with short hydroperiods to deep organic soils with long hydroperiods. Vegetation was classified into 14 community types based on a new hierarchical classification of natural areas by A. E. Radford. (Stihler-Mass)
W78-03655

MARSH MANAGEMENT FOR WILDLIFE: A BIBLIOGRAPHY WITH ABSTRACTS,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-03656

THE LAGOON OF BAGES-SIGEAN, A MODEL OF A MEDITERRANEAN LAGOON, (IN FRENCH),
Arago Lab., Banyuis-sur-Mer (France).
H. Boutiere.
Vie Milieu Ser B Oceanogr. 24(1B), p 23-58, 1974.

Descriptors: Sediments, Winds, Rain, Climates, *Lagoons, *Mediterranean lagoons, Model studies, Vegetation, *Bages-Sigean Lagoon(France).

A lagoon basin of the French Mediterranean shore is described in its geological context and with its sedimentary contents, vegetation and climate. The role of the wind and the rain, as well as the existence of 2 types of shore, facing one another, are presented.--Copyright 1975, Biological Abstracts, Inc.
W78-03668

THE SILVER FLOWE. II FEATURES OF THE VEGETATION AND STRATIGRAPHY OF BRISHIE BOG, AND THEIR BEARING ON POOL FORMATION,
Hull Univ. (England). Dept. of Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-03699

LIMITATIONS OF MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN. II. WAVE ACTION, SEDIMENTS, AND WATERFOWL GRAZING,
Saint Andrews Univ. (Scotland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-03700

2I. Water In Plants

MARINE FISH CULTURE AND ARTIFICIAL REPRODUCTION FOR THE EXPLOITATION OF ORBETELLO (GR) LAGOON, (IN ITALIAN),
Parma Univ. (Italy). Ist. di Zoologia.
G. Alessio.
Ateneo Parmense Acta Nat 12(4), p 315-332, 1976.

Descriptors: *Marine fish, *Fish reproduction, Euryhaline fish, Fish growth, Fish eggs, Fish hatcheries, Age, Fry, Haline, Hormone, *Italy(Orbetello Lagoon), Maturation, Migration, Morone-labrax, Mugil-cephalus, Mugilidae.

To asses the potential of Orbetello Lagoon (Italy) for breeding euryhaline fishes, the catch and migration of Morone labrax and Mugil cephalus were studied. Growth compared to age, sexual maturation and fertility (measured as number of eggs produced) were studied. Results are discussed in terms of oganizing a station for gathering breeders (particularly Mugilidai) for hormonal treatment or building a hatchery for producing fry.--Copyright 1978, Biological Abstracts, Inc.
W78-03235

RATES AND PATTERNS OF WATER UPTAKE IN A DOUGLAS-FIR FOREST,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-03250

RETENTION OF SOIL WATER FOLLOWING FOREST CUTTING,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-03252

A HYDROPONIC STUDY OF HEAVY METAL UPTAKE BY SELECTED MARSH PLANT SPECIES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. R. Lee, T. C. Sturgis, and M. C. Landin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 224, Price codes: A04 in paper copy, A01 in microfiche. Technical Report D-76-5, June 1976. 64 p, 10 fig, 15 tab, 16 ref, 1 append.

Descriptors: *Absorption, *Hydroponics, *Marsh plants, *Aquiculture, *Plant growth, *Heavy metals, Lead, Nickel, Water pollution sources, Chemical wastes, Environment, Amphibious plants, Ecology, Plant groupings, Aquatic environment, Aquatic habitats, Cadmium, Zinc, Chemical analysis.

Eight marsh plants were grown in chemically controlled hydroponic solutions containing three concentrations of heavy metals to evaluate the ability of each plant species to take up and to accumulate heavy metals. The marsh plants studied were Cyperus esculentus, Scirpus validus, Spartina patens, Scirpus robustus, Distichlis spicata, Triglochin maritima, Spartina alterniflora, and Spartina foliosa. The heavy metals studied were zinc, cadmium, nickel, lead, and chromium, each at a concentration of 0.0, 0.5, and 1.0 ppm. Marsh plants were exposed to heavy metals for 6 weeks and harvested. Plants were separated into tops, lower stems, rhizomes, tubers, and roots and were analyzed for heavy metals to locate plant parts where heavy metals may accumulate. Exposure to heavy metals adversely affected the growth of S. validus, S. patens, D. spicata, and S. alterniflora more than the other plant species evaluated. The species that appeared to have more potential in taking up zinc, cadmium, and nickel were C. esculentus, S. patens, D. spicata, and to some extent S. alterniflora. Lead and chromium accumulated in the roots of all species with very little translocation into plant tops. Phosphorus and iron content in the roots appeared to be a major factor in determining the ability of a marsh plant to translocate heavy metals from the roots into other plant parts. (Henley-ISWS)
W78-03258

WATER CAPACITY OF MOUNTAIN-FOREST AND MEADOW SOILS OF THE NORTHERN CAUCASUS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W78-03345

SHORT- AND LONG-TERM EFFECTS OF ANTITRANSPIRANTS ON WATER RELATIONS AND PHOTOSYNTHESIS OF WOODY PLANTS,
Wisconsin Univ.- Madison. Dept. of Forestry.
W. J. Davies, and T. T. Kozlowski.
J Am Soc Hortic Sci. 99(4), p 297-304, 1974.

Descriptors: *Antitranspirants, Effects, Pine trees, *Photosynthesis, *Pinus-resinosa, Stomatal, Wax, *Woody plants.

Each of 8 antitranspirants reduced transpiration of 2 spp. of woody plants. Dow Silicone and CS 6432 were the most effective compounds on Fraxinus americana and Dow Silicone was effective on Pinus resinosa. Keykote, Folicote and Improved Wilt Pruf showed an increased effect on plant water loss and net photosynthesis (measured by net CO2 uptake) of P. resinosa up to 8 days after compound application. Thereafter there was no significant change in the effect of any compound on transpiration or photosynthesis. Effects on F. americana of all compounds except Improved Wilt Pruf decreased with time after application. Scanning electron micrographs of treated leaves suggested that antitranspirant films on F. americana leaves cracked over the guard cell pore, accounting for the decrease in compound effect with time. Antitranspirants apparently reduced water loss of P. resinosa by combining with wax in the stomatal pore and forming an impermeable plug. The compounds tested were toxic to F. americana seedlings and photosynthesis of treated plants decreased with time, even when direct physical effect of a compound had worn off P. resinosa seedlings showed no decrease in photosynthesis with time. F. americana plants treated with Keykote exhibited low rates of water loss and transpiration/photosynthesis ratios that were not significantly different from those of control plants. Folicote was toxic, and Clear Spray increased

water loss of F. americana seedlings. Dow Silicone reduced water loss of Pinus seedlings by about 80%, and plants treated with Dow Silicone, Improved Wilt Pruf, Keykote, or Folicote had favorable transpiration/photosynthesis ratios. The effects of antitranspirants on transpiration and photosynthesis were greatly influenced by environmental regimes and by species.--Copyright 1974, Biological Abstracts, Inc.
W78-03642

SALT-MARSH PLANT GERATOLOGY,
Georgia Univ., Brunswick. Marine Extension Service.
For primary bibliographic entry see Field 2L.
W78-03654

THE PHYTOSOCIOLOGY OF THE GREEN SWAMP, NORTH CAROLINA,
Bureau of Sport Fisheries and Wildlife Research Center, Jamestown, ND.
For primary bibliographic entry see Field 2H.
W78-03655

WATER BIRDS AND THEIR WETLAND RESOURCES IN RELATION TO OIL DEVELOPMENT AT STORKERSEN POINT, ALASKA,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5C.
W78-03657

ENERGY VALUE, ELEMENTAL COMPOSITION, AND PRODUCTIVITY OF BELOW-GROUND BIOMASS OF A JUNCUS TIDAL MARSH,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-03659

2J. Erosion and Sedimentation

PHYSICAL FACTORS AFFECTING DREDGED MATERIAL ISLANDS IN A SHALLOW WATER ENVIRONMENT,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 5E.
W78-03227

HEAVY METAL SEDIMENTATION IN SAANICH INLET MEASURED WITH 210PB TECHNIQUE,
Department of the Environment, Victoria (British Columbia). Ocean Chemistry Div.
For primary bibliographic entry see Field 5B.
W78-03245

PB210-DETERMINED SEDIMENTATION RATE, AND ACCUMULATION OF METALS IN SEDIMENTS AT A STATION IN CHESAPEAKE BAY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-03247

RESEARCH NEEDS IN EROSION AND SEDIMENTATION.
American Geophysical Union, Washington, DC.
EOS, Vol. 58, No. 12, p 1076-1083, December 1977.

Descriptors: *Erosion, *Sedimentation, *Research and development, Watersheds(Basins), Mudflows, Sediment yield, Sediment transport, Streams, Rivers, Channel morphology, Scour, Model studies, Reservoir silting, Dredging, Coasts, Estuaries, *Research needs(Erosion and sedimentation).

Erosion and sedimentation are important problems in environmental and water quality studies, watershed management, river mechanics and training, reservoir planning, and dredging in waterways and harbors. The importance of these problems is being magnified by the increasing demands for energy and foods, which in turn require an increased water supply. Discussion of erosion and sedimentation problems, in which research is needed, included basic mechanics of mudfloe, sediment yield predictive equations, estimation of sediment transport rate, river morphology and channel stability, model studies for scour and sedimentation, sedimentation and related problems affected by reservoirs, dredging and disposal operations, occurrence and control of scour near structures, transport of large-size particles such as coal in large-size pipelines, transport of pollutants absorbed by sediments, trapping of fine sediments (silts and clays) by structures, and sediment problems in coastal regions. (Humphreys-ISWS)
W78-03248

ANALYSIS OF SHORT-TERM VARIATIONS IN BEACH MORPHOLOGY (AND CONCURRENT DYNAMIC PROCESSES) FOR SUMMER AND WINTER PERIODS, 1971-72, PLUM ISLAND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 2L.
W78-03255

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.
For primary bibliographic entry see Field 5B.
W78-03257

SELECTIVE ANALYTICAL PARTITIONING OF SEDIMENTS TO EVALUATE POTENTIAL MOBILITY OF CHEMICAL CONSTITUENTS DURING DREDGING AND DISPOSAL OPERATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-03259

A TEST PARTICLE DISPERSION STUDY IN MASSACHUSETTS BAY.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W78-03270

ECOSYSTEMS AND RESOURCES OF THE MASSACHUSETTS COAST,
Massachusetts Office Coastal Zone Management, Boston. Inst. for Man and Environment.
For primary bibliographic entry see Field 2L.
W78-03274

NUMERICAL MODELING OF DISPERSION IN STRATIFIED WATERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W78-03278

SOME REASONS FOR DEVELOPMENT OF IRRIGATION EROSION, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
L. M. Dremailova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk 2, p 19-22, 1976.

Descriptors: *Irrigation practices, *Soil erosion, *Sprinkler irrigation, *Climates, Rain, Slopes, White cabbage, Winds.

Long-range sprinkler heads give rise to heavy outwash (in white cabbage plantings). This is explained by high irrigation rates, heavy wind effects and low coefficients of rain uniformity. It is reasonable to use short- and medium-spray sprinklers on slopes.--Copyright 1978, Biological Abstracts, Inc.
W78-03329

ERODIBILITY OF SELECTED CLAY SUBSOILS IN RELATION TO PHYSICAL AND CHEMICAL PROPERTIES,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
M. J. M. Romkens, C. B. Roth, and D. W. Nelson.
Soil Science Society of America Journal, Vol. 41, No. 5, p 954-960, September-October 1977. 2 fig, 6 tab, 21 ref.

Descriptors: *Soil erosion, *Subsoil, *Physical properties, *Chemical properties, *Clays, Laboratory tests, Regression analysis, Chemical analysis, Soils, Equations, Soil properties, Soil physics, Chemistry, *Erodibility(Subsoils).

Predictions of soil erodibility factors for selected clay subsoils were studied in relation to physical and chemical properties. Erodibility factors were determined from soil erosion rates on scalped surfaces during a series of simulated rainstorms. Subsoils were analyzed for their textural, chemical, and mineralogical composition. A predictive model, derived from previously gathered data of 46 surface soils, was used to determine the significance of soil properties in predicting subsoil erodibility. Weighted linear regression analysis using data from surface soils of the test model and 7 selected subsoils indicated that a textural parameter and the percent of iron plus aluminum extractable with citratedithionite-bicarbonate (CDB) were significant prediction properties of erodibility for these clay subsoils. Multiple linear regression yielded a prediction equation with a coefficient of multiple determination of R sq = 0.90. (Sims-ISWS)
W78-03461

VEGETATION ESTABLISHMENT AND SHORELINE STABILIZATION: GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 2L.
W78-03475

SLACK WATER SEDIMENTS IN THE ALPOWA CREEK DRAINAGE, WASHINGTON,
Washington State Univ., Pullman. Dept. of Anthropology.
L. L. Foley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 240, Price codes: A04 in paper copy, A01 in microfiche. Master's Thesis, June 1976. 73 p, 13 fig, 2 tab, 51 ref, 1 append. CX 8880-6-0015.

Descriptors: *Geologic history, *Sedimentary structures, *Stratigraphy, *Mineralogy, *Geomorphology, *Washington, Archeology, Flooding, Geology, History, Backwater, *Slack water sedimentation, *Snake River, *Alpowa Creek(Wash), Lower granite dam, Lacustrine deposits, Back water flooding.

Six geologic units in the Alpowa drainage, Washington, were describedin terms of stratigraphic position, geomorphic expression, sedimentary structures, estimated particle size, lithology, and elevation. Two episodes of 'slack water' deposition are recognized in the Alpowa drainage. Prior to deposition of the Upper Slack

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Water Unit, the following conditions predominated: mass wasting on the canyon walls, deposition of large coalescent alluvial fans, and aggradation by tributary streams. Tephra found in the floodplain alluvium stratigraphically below the Upper Slack Water Unit in Steptoe canyon is correlated tentatively with Mount St. Helens set X. An early episode of slack water deposition is represented by the Lower Slack Water Unit. The structure, particle size, and geomorphic expression of this unit suggest deposition in a lacustrine environment; however, a floodplain environment cannot be dismissed. Tephra layers found in the Lower Slack Water Unit have allowed correlation of the unit at 6 localities in the Alpowa drainage. Stratigraphic position, petrographic characteristics, and chemical composition of the tephra are different from the tephra found in Steptoe canyon, suggesting that they belong to distinct Mount St. Helens tephra sets. (Adams-ISWS)
W78-03476

SHOALING CHARACTERISTICS OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-03485

CRYOGENIC SEDIMENT SAMPLER,
Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).
W. J. Walkotten.
U.S. Patent No. 4,038,875, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 72, August 2, 1977.

Descriptors: *Patents, *Sampling, *Sediments, Cryogenics, Freezing, Equipment, Streams, Lakes, On-site tests, Probes.

A stream bed sediment sampler easily obtains a nearly undisturbed, stratified sample containing stream gravel, intergravel water, and organic material. The temperature of a probe inserted into the sediment is quickly reduced to a point where the material immediately surrounding the probe freezes and clings to the probe upon its removal from the stream bed. The sediment sampling apparatus comprises a first tube of heat-conducting material open at one end and closed at the other, a second tube open at one end and closed at the other. The second tube loosely fits inside the first tube so that the closed end of the second tube is in close proximity to the closed end of the first tube. Nozzles in an array are located near the closed end of the second tube. The nozzles are of a size which allows a controlled release of a gas under pressure from inside the second tube. Connected to the second tube is a means for delivering a gas under a pressure sufficient to decrease the temperature of he gas to below the freezing point of water when the gas is released to the atmosphere through the nozzles. (Sinha-OEIS)
W78-03601

STRONTIUM-90 CONCENTRATIONS IN THE BOTTOM BRINE AND SEDIMENTS OF LAKE SIVASH AS DEPENDENT ON THE HYDROCHEMICAL ENVIRONMENT, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-03611

IMPORTANCE, PRESERVATION AND MANAGEMENT OF RIPARIAN HABITAT: A SYMPOSIUM, TUCSON, ARIZONA, JULY 9, 1977.
For primary bibliographic entry see Field 4C.
W78-03661

PESTICIDE RECOVERY STUDIES FOR EVALUATION OF DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM SOIL AND SEDIMENT ANALYSIS METHODOLOGY. PART I. DETERMINATION OF PESTICIDE AND POLYCLORINATED BIPHENYL RECOVERIES FROM SOIL EXTRACTED IMMEDIATELY FOLLOWING FORTIFICATION OCTOBER-DECEMBER 1976,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-03667

INFLUENCE OF THE SEDIMENT/WATER INTERFACE ON THE AQUATIC CHEMISTRY OF HEAVY METALS,
New England Aquarium, Boston, MA.
For primary bibliographic entry see Field 5B.
W78-03678

2K. Chemical Processes

DEUTERIUM IN HAILSTONES COLLECTED ON 29 NOVEMBER 1972,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2B.
W78-03246

THE IONIC COMPOSITION OF LAKES FED BY GROUND WATER AND PRECIPITATION IN THE UPPER ROMERIKE DISTRICT,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W78-03471

WATER SAMPLER DEVICE,
For primary bibliographic entry see Field 7B.
W78-03596

INFLUENCE OF THE SEDIMENT/WATER INTERFACE ON THE AQUATIC CHEMISTRY OF HEAVY METALS,
New England Aquarium, Boston, MA.
For primary bibliographic entry see Field 5B.
W78-03678

2L. Estuaries

PHYSICAL FACTORS AFFECTING DREDGED MATERIAL ISLANDS IN A SHALLOW WATER ENVIRONMENT,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 5E.
W78-03227

A NEW CONCEPT FOR DREDGED MATERIAL DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-03228

DREDGING OPERATIONS IN THE GALVESTON DISTRICT,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 5G.
W78-03229

DREDGE MATERIAL CONTAINMENT IN NYLON BAGS IN THE CONSTRUCTION OF MINI-PROJECTS FOR BEACH STABILIZATION,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03230

THE NATIONAL DREDGING STUDY,
Office of the Chief of Engineers (Army), Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03231

USE OF REMOTE SENSING IN EVALUATING TURBIDITY PLUMES,
Texas A and M Univ., College Station. Coastal, Hydraulic and Ocean Engineering Group.
W. P. James.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 181-193, December 1976. 4 fig.

Descriptors: *Remote sensing, *Turbidity currents, *Texas, *Aerial photography, Currents(Water), Velocity, Water quality, Dredging, Turbidity, Surveys, Measurement, Methodology, On-site tests, Turbidity plumes.

Aerial monitoring can be used to study not only objects, but also processes. Mixing and circulation patterns in lakes and coastal waters often can be observed by the natural variation in turbidity of the water. The effluent plume from coastal streams can be studied to obtain a better understanding of the dispersion process and longshore currents. Dye drops from an aircraft can be used to compute water currents and diffusion coefficients. Experience has shown that a 35 mm, handheld camera taking oblique photos from a 500-ft altitude can be used to give reliable turbidity values in water. This procedure can be used to quantitatively evaluate tubidity planes for dredging operations or natural sources. Aerial photography has an advantage over conventional sampling in that it provides an elevated vantage point. It provides an easy method for determining the relative impact of dredging activity by comparison plumes with man-generated turbidity plumes. (See also W77-09325) (Humphreys-ISWS)
W78-03232

HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE DREDGE DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5E.
W78-03233

AQUATIC DISPOSAL OF DREDGED MATERIAL: RELEASE OF CONTAMINANTS DURING AND AFTER DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-03234

EDGE WAVES IN THE PRESENCE OF AN IRREGULAR COASTLINE,
British Columbia Univ., Vancouver. Dept. of Mathematics.
J. D. Fuller, and L. A. Mysak.
Journal of Physical Oceanography, Vol 7, No 6, p 846-855, November 1977. 4 fig, 8 ref.

Descriptors: *Waves(Water), *Ocean waves, *Coasts, *Model studies, Mathematical models, Continental shelf, Mathematics, Stochastic processes, Equations, Wavelengths, Energy, Oceanography, Coastal irregularities.

Reported herein was the examination of the generation of trapped edge waves on a continental shelf when a long wave from the deep ocean reaches an irregular coast and alterations in the propagation characteristics of trapped edge waves due to the coastal irregularities. The continental

shelf was modeled by a single flat-step model, and the coast was straight except for irregularities represented as a centered stationary random function of distance along the coast. The relevant boundary value problems was thus stochastic, with the randomness introduced through the boundary condition at the coast. The power flux into trapped edge waves and into a continuous spectrum of leaky modes, both generated by the scattering of an incident wave from the deep ocean, was found. Numerical results, assuming a Gaussian spectrum for coastal irregularities, indicated that there is less power transferred to the forward traveling trapped wave than the backward one, and less power to the scattered leaky modes than to either the forward or backward traveling trapped modes. The attenuation coefficient of a trapped edge wave, the 'tilting' of the wave toward the coast, and the correction to the dispersion relation due to the coastal irregularities were obtained. The results are valid for wave periods much shorter than the period associated with the Coriolis parameter and for wavelengths much greater than the average size of the coastal irregularities. (Sims-ISWS)
W78-03236

LONG COASTAL-TRAPPED WAVES OFF THE WEST COAST OF THE UNITED STATES, SUMMER 1973,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
D-P. Wang, and C. N. K. Mooers.
Journal of Physical Oceanography, Vol 7, No 6, p 856-864, November 1977. 8 fig, 16 ref. NSF OCE76-82151.

Descriptors: *Waves(Water), *Ocean waves, *Coasts, *Pacific Ocean, On-site investigations, Model studies, Mathematical models, Data processing, Winds, Atmospheric pressure, Continental slope, Sea level, Water levels, Water level fluctuations, Oceanography, *Coastal-trapped waves, *West coast(US).

Evidence for long coastal-trapped waves off the west coast of the United States was obtained from sea level, surface atmospheric pressure, and wind records over a 1500 km alongshore separation for two months in the summer of 1973. Corresponding evidence was obtained from current measurements off the northern Oregon coast. The dominant low-frequency motion occurred at a period of 10 days. Consistent with the theory of coastal-trapped waves, the observations indicate that: (1) the alongshore current fluctuations were mainly barotrapic, coastally trapped, and were related geostrophically to the adjusted sea level fluctuations; and (2) the adjusted sea level fluctuations propagated northward with a phase speed which depended upon the local shelf geometry. The 10-day fluctuations in the coastal ocean were driven by the northward traveling, large-scale winds; the response was nonlocal. There were also 4-day fluctuations for which the coastal water response was essentially local. The difference in response characteristics for the two periods can be explained with simple forced wave theory. (Sims-ISWS)
W78-03237

THE TRANSFER OF ENERGY AND MOMENTUM BY THE WIND TO THE SURFACE MIXED LAYER,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
J. Richman, and C. Garrett.
Journal of Physical Oceanography, Vol 7, No 6, p 876-881, November 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Energy transfer, *Momentum transfer, *Winds, *Ocean waves, *Model studies, Mathematical models, Currents(Water), Wind pressure, Waves(Water), Ocean currents, Energy, Drag, Mixing, Oceanography, *Surface mixed layer.

During the initial stages of the deepening of the surface mixed layer, the rate of increase of potential energy is proportional to the input of energy to the mixed layer by the wind. In an attempt to reconcile an apparent discrepancy between the rate of deepening in laboratory experiments and in the ocean, a simple model for the momentum and energy transfer by the wind to surface waves and the mixed layer was suggested. The net transfer of momentum is the wind stress less the local growth of surface wave momentum and the divergence of the surface wave momentum flux; and the net energy transfer is the work done on the waves by the wind less the local growth of surface wave energy, the divergence of the surface wave energy flux, and the viscous dissipation of the waves. Using the JONSWAP wave observations, the net momentum transfer is 97% of the wind stress. Using a simple momentum transfer function, allowing direct generation of long gravity waves and capillary-gravity waves, to estimate work done on the waves, the energy actually transferred to the mixed layer is a few percent of the wind stress times the 10 m wind speed. The oceanic and laboratory rates of deepening of the mixed layer appear roughly consistent. (Sims-ISWS)
W78-03238

HEAVY METAL SEDIMENTATION IN SAANICH INLET MEASURED WITH 210PB TECHNIQUE,
Department of the Environment, Victoria (British Columbia). Ocean Chemistry Div.
For primary bibliographic entry see Field 5B.
W78-03245

OBSERVATIONS OF THE MIXING IN THE BALTIC THERMO- AND HALOCLINE LAYERS,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
For primary bibliographic entry see Field 5B.
W78-03254

ANALYSIS OF SHORT-TERM VARIATIONS IN BEACH MORPHOLOGY (AND CONCURRENT DYNAMIC PROCESSES) FOR SUMMER AND WINTER PERIODS, 1971-72, PLUM ISLAND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Coastal Research Center.
R. W. Abele, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 266, Price codes: A06 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Report No. 77-5, March 1977. 101 p, 83 fig, 1 tab, 24 ref. CERC DACW 72-71-C-0023.

Descriptors: *Beaches, *Geomorphology, *Beach erosion, *Massachusetts, On-site investigations, Profiles, Coasts, Waves(Water), Currents(Water), Ocean waves, Weather, Winds, Erosion, Sedimentation, Sands, Shores, Barrier island, *Plum Island(Mass), Beach morphology, Beach profiles.

An analysis of the relationship between wave and meteorological variables and beach morphology was undertaken during summer and winter periods, 1971-72, on Plum Island, Massachusetts. Variables were measured or computed bihourly, 24 hours per day, throughout both study periods. The variables were wave period, wave height, breaker type, breaker angle, longshore current velocity, wave steepness, breaker power, windspeed and direction, barometric pressure, air and water temperature, and groundwater elevation. Daily topographic maps of the intertidal zone were constructed for 12 beach profiles spaced at 60-meter intervals. Variations in beach process variables, during both the summer and winter periods, were related directly to the passage of high- and low-pressure systems and to the proximity of the systm to Plum Island. With an increase in breaker power and breaker steepness, the high tide beach-face gradient increased. Increases in breaker power also resulted in a rise in the level of the groundwater surface. Although most process variables were similar for the summer and winter periods, strong offshore winds and extreme low temperatures that accompany polar high-pressure systems were unique to the winter period. Differences in beach morphology within a small area appear to reflect the state of recovery of the beach profiles after a storm. Adjacent profiles at different stages of maturity are controlled by the proximity of the nearshore bar. The closer the bar is to shore, the faster the sediment is returned to the beach zone. (Sims-ISWS)
W78-03255

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.
For primary bibliographic entry see Field 5B.
W78-03257

EVALUATION OF SAFETY FACTORS WITH RESPECT TO OCEAN DISPOSAL OF WASTE MATERIALS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-03269

A TEST PARTICLE DISPERSION STUDY IN MASSACHUSETTS BAY.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W78-03270

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W78-03271

GEOGRAPHIC AREAS OF PARTICULAR CONCERN.
Delaware Coastal Zone Management Program, Dover.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-263 241, Price codes: A02 in paper copy, A01 in microfiche. Working Paper No. 3, Public Involvement, September 1976. 20 p.

Descriptors: *Baseline studies, *Geographical regions, *Land use, *Coasts, *Delaware, Water quality, Environmental effects, Groundwater, Habitats, Hazards, Coastal processes, Coastal waters, Coastal zone management, Subsqueous lands, Outer Continental Shelf.

This is the third in a series of working papers which will be issued to interested citizens and governmental officials so that they may actively and effectively participate in the development of Delaware's Coastal Zone Management Program. It deals only with the process of determining areas and describes the significance of those areas considered and the initial planning steps taken which will lead to eventual designation of Geographic Areas of Particular Concern. Subjects treated include: Area of unique, scarce, fragile or vulnerable natural habitat or feature, historic or achaeological significance, or scenic value; areas of high productivity or essential habitat for living resources, or of critical concern for the production

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of food; areas of substantial urban use, recreation or economic value, opportunity or concentration; areas subject to significant hazards due to coastal processes, groundwater resources areas; areas of geologic, topographic or morphologic concern for development; and coastal waters and subaqueous lands. (Sinha-OEIS)
W78-03273

ECOSYSTEMS AND RESOURCES OF THE MASSACHUSETTS COAST,
Massachusetts Office Coastal Zone Management, Boston. Inst. for Man and Environment.
C. Carlozzi, K. King, and W. F. Newbold, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 411, Price codes: A05 in paper copy, A01 in microfiche. Prepared for NOAA Office of Coastal Zone Management, Washington, DC. 1975, 78 p.

Descriptors: *Baseline studies, *Ecosystems, *Coasts, *Estuaries, *Resources, Water quality, Geology, Beaches, Dunes, Salt marshes, Sedimentation, Wetlands, Coastal marshes, Tidal marshes, *Massachusetts, Coastal zone management, Coastal resources, Environmental impact, Outer Continental Shelf, Barrier islands, Tidal flats, Salt ponds.

All the natural and many man-made systems making up the Massachusetts coastline, their importance as facets of the environment, and the ways in which they are used and altered by man are discussed. The report was prepared as a guide for all Massachusetts citizens to use in order to better enjoy and understand their unique heritage. The publication has been divided into four main sections. The first two parts present an overview of the natural forces and ecosystems that form the productive basis for coastal resources. The next part describes man's use of coastal resources and the environmental consequences of man's activities. Finally the report analyzes important broad coastal ecosystems and their resource wealth, complexity, and environmental health. This last section considers needs for future scientific research and information tied to the management of Massachusetts' wealth of coastal resources. (Sinha-OEIS)
W78-03274

APPLICATION OF ESTIMATION THEORY TO DESIGN OF SAMPLING PROGRAMS FOR VERIFICATION OF COASTAL DISPERSION PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-03275

SPORT FISHING IN WESTERN DELAWARE BAY: ASSESSMENT OF CRITICAL AREAS (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W78-03277

NUMERICAL MODELING OF DISPERSION IN STRATIFIED WATERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W78-03278

KINEMATICS OF BREAKING WAVES IN THE SURF ZONE: EMPHASIZING ANALYSIS OF IDENTIFIED AND CLASSIFIED BREAKERS,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 8B.
W78-03279

A SUMMARY OF THE TEST PROCEDURES AND OPERATIONAL DETAILS OF A DELAWARE RIVER AND AN OCEAN DUMPING POLLUTION MONITORING EXPERIMENT CONDUCTED AUGUST 28, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-03280

A PRELIMINARY TEST OF A GOVERNMENT-OWNED LOCAL AREA OIL ON WATER SURVEILLANCE SYSTEM,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-03281

ULTIMATE DISPOSAL OF OIL AND HAZARDOUS MATERIALS,
Coast Guard Office of Research and Development, Groton, CT.
For primary bibliographic entry see Field 5E.
W78-03283

UNIQUE ECOLOGICAL FEATURES OF THE LOUISIANA COAST.
Burk and Associates, Inc., New Orleans, LA.
For primary bibliographic entry see Field 6G.
W78-03284

DETERMINATION OF THE ATMOSPHERIC CONTRIBUTION OF PETROLEUM HYDROCARBONS TO THE OCEANS,
World Meteorological Organization, Geneva, (Switzerland).
For primary bibliographic entry see Field 5B.
W78-03285

THE PHYSICAL OCEANOGRAPHY AND WATER QUALITY OF NEW YORK HARBOR AND WESTERN LONG ISLAND SOUND,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-03286

IMPACTS OF OUTER CONTINENTAL SHELF ACTIVITIES: LAFOURCHE PARISH, LA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-03288

BARATARIA BASIN: BIOLOGICAL CHARACTERIZATION,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-03289

SHORE AND BEACH MANAGEMENT IN LOUISIANA,
Louisiana Coastal Commission, Layfayette.
V. Behrhorst.
Shore and Beach, Vol 44, No 1, p 3-5, April 1976.

Descriptors: *Louisiana, *Beach erosion, *Mississippi River, *Shore protection, *Land management, Permits, Legal aspects, State governments, Coastal marshes, Coasts, Land use, Shores, Coastal plains, Legislation, Gulf of Mexico, State jurisdiction, Deltas, Alluvium, Erosion, Water law, Tidal marshes.

Due to active delta-building processes, the Louisiana coastal region consists of an irregular shoreline with few sandy beaches. Erosion, primarily caused by poor Gulf currents, has been a serious problem for those few existing beaches. The poor shoreline and hurricane threats have hampered growth along the coast. Only two recreational areas have been developed on the shore. The few settlements on the coast have resulted from offshore oil drilling companies establishing makeshift towns. The author in large part blames Louisiana state government for the poor coastal conditions. Although federal money and Army Corps of Engineers expertise was available, the state's failure to produce a comprehensive beach and shore management program made it ineligible for federal help. The author urges the state to integrate a shore and beach management plan into the larger coastal zone plan. Otherwise both growth and preservation of the [illegible] cannot be accomplished. (Cocheu-Florida)
W78-03341

NORTH CAROLINA COASTAL ZONE MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
S. Hecker.
Shore and Beach, Vol 44, No 1, p 7-8, April 1976.

Descriptors: *North Carolina, *Land management, *Coasts, *Regulation, *State government, Coastal plains, Legislation, Legal aspects, Scenery, Preservation, Aesthetics, Economics, Land use, Local governments, Project planning, Environmental effects, Land development, State jurisdiction, Atlantic Ocean, Protection.

The 1974 North Carolina Coastal Area Management Act was enacted because of the danger that uncontrolled pressures would destroy the state's coastal regions. The Act established a comprehensive state and local coastal planning program under the Coastal Resources Commission to preserve and manage existing resources, plan careful development, and provide standards for protection of the coastal area. The state hoped to foster orderly conservation and development through a program of land and water use planning. Local governments were given the primary responsibility for planning in their regions. The state publicized the program to initiate public participation in local planning. Serving as an overseer-coordinator, the state gathered technical data from the localities and made certain the localities complied with the Act. Problems were encountered with the Act. Public acceptance was not overwhelming because many factions in the state believed the law hindered development. There has also been difficulty defining the areas of environmental concern. However, the program is expected to have far-reaching effects on both the aesthetics of the coastal area and the economy. Therefore, the Coastal Resources Commission is determined to do a proper job. (Cocheu-Florida)
W78-03342

THE URBAN WATERFRONT: OPPORTUNITIES FOR RENEWAL,
New York Univ., NY. Graduate School of Public Administration.
M. L. Moss.
National Civic Review, Vol 65, p 241-44, May, 1976.

Descriptors: *Coastal engineering, *Urban renewal, *Coastal structures, *Area redevelopment, *Community development, City planning, Urbanization, Urban mapping, Navigable waters, Harbors, Land use, Cities, Canneries, Seashores, Coasts, Recreation, Industries, Shores, Piers, Docks, Railroads.

There is now a nationwide trend to convert urban waterfront areas from port uses to large-scale, multi-purpose complexes which can be used for both residential and commercial activity. This growing trend is caused by the decline of urban port areas resulting in wasted space and urban blight. Deterioration of urban ports can be blamed

on several factors including developments in surface transportation which have led to a decline in the amount of cargo shipped by railroads and the change in the pattern of passenger transportation from ocean liner to airplanes. Redevelopment of declining ports is a new aspect of coastal zone management programs. In the past, management programs were only concerned with the protection of undeveloped coastal areas. Now the redevelopment of urban waterfront renewal may be aimed at a variety of objectives including new residential housing, commercial shopping districts, or recreational facilities. Modern construction technologies make it possible to extend the city's boundaries through landfill, piles, and over-water decks. Waterfront renewal also provides stimulation of the urban economy. (Quarles-Florida)
W78-03344

ISSUES INVOLVED IN UNITED STATES BEACH PRESERVATION AND PROTECTION PROGRAMS,
Cook Coll., New Brunswick, NJ.
J. K. Mitchell.
Shore and Beach, Vol. 43, No. 1, p 27-29, April 1975.

Descriptors: *Coastal engineering, *Structural engineering, *Beach erosion, *Shore protection, *Land management, Erosion, Environmental engineering, Sea walls, Coasts, Land tenure, Legal aspects, Land use, Legislation, Coastal structures, Shores, Environmental effects, Financing, Beaches, Geology, Ecosystems, Dune sands, Federal jurisdiction, Preservation.

In the past, structural engineering was the primary federal solution to beach erosion. Recent booming coastal development has vastly accelerated loss of sandy beaches. Over 70% of the land fronting the nation's shore is privately owned. Since federal funds cannot be spent to protect private property unless some significant public benefit exists, beach erosion is a problem in desperate need of new solutions. Private property owners want federal funding but are unwilling to increase public access to beaches they feel are theirs. Localities, often hard pressed to pay for expensive engineering, alternatively do not want to save the shores for a few landowners or open up the beaches to many non-resident users. To combat the fiscal squeeze and the reluctance of private owners to grant access to the shore, the author suggests new management techniques for beach protection. State and local coastal management and zoning as envisioned in the Coastal Zone Management Act of 1972 is a beginning. However, local regions must adopt programs balancing public and private interests to provide access and control growth. Federal financing can then be utilized to rebuild beach damage, both natural and man-made. (Cocheu-Florida)
W78-03348

NORTHERN ST. JOHNS COUNTY COASTAL MANAGEMENT PLAN,
Florida Coastal Engineers, Inc., Jacksonville.
For primary bibliographic entry see Field 6F.
W78-03349

THE FIGHT TO SAVE HAWAII'S SHORELINES,
D. Meller.
Shore and Beach, Vol. 45, No. 1, p. 12-16, January 1977.

Descriptors: *Hawaii, *Public access, *Shore protection, *Legislation, *Beaches, Zoning, Recreation, Coastal structures, Legal aspects, Real property, Right-of-way, Banks, Fishing, Shores, Water rights, Coastal engineering, Boundaries(Property), Oceans, Access routes, Non-consumptive use, Recreation facilities.

The rapid development of Hawaii's shorelines has stimulated citizens' groups to lobby for public policies which would preserve the appearance and recreational value of these shorelines. They desire a strong state coastal zone management program to replace the present interim shoreline protection law. The authors believe the existing Act is likely to prevent unpopular shoreline development although its effectiveness has not yet been tested. The availability of shoreline land for public recreational purposes will require state acquisition of access, use and title to the shoreline. An effective state coastal zone management program should incorporate the following elements: (1) 'down zoning' of the shoreline with restrictions on county authority to allow shoreline development; (2) a provision that no permits be granted by public agencies unless land is dedicated for shoreline access and greenbelts; and (3) earmarking of funds for acquisition of shoreland by the state. (Maass-Florida)
W78-03354

ACCURATE CALCULATION OF TRANSPORT IN TWO DIMENSIONS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
For primary bibliographic entry see Field 5B.
W78-03463

ON THE STABILITY OF THE CALIFORNIA UNDERCURRENT OFF VANCOUVER ISLAND,
National Center for Atmospheric Research, Boulder, CO.
L. A. Mysak.
Journal of Physical Oceanography, Vol. 7, No. 6, p 904-917, November 1977. 11 fig, 3 tab, 24 ref.

Descriptors: *Ocean currents, *Currents(Water), *Pacific Ocean, *Model studies, Mathematical models, Circulation, Water circulation, Stability, Upwelling, Coasts, Continental slope, Temperature, Water temperature, Remote sensing, Oceanography, *California Undercurrent, *Vancouver Island.

Recent satellite infrared imagery and hydrographic maps of the sea surface temperature of the northeast Pacific revealed a fairly regular pattern of cells or eddies that are aligned north-south about 150 km west of Vancouver Island. The wavelength of the pattern lies in the range 80-100 km. Current observations taken near the edge of the continental shelf at a depth of 200 m off Tofino, Vancouver Island, showed oscillations with periods of days to about 2 weeks. At intermediate depth off the coast of Vancouver Island and northern Washington, recently derived geostrophic flow patterns showed a northward current along the continental slope (the California Undercurrent). The stability of a two-layer model of the California Undercurrent off Vancouver Island and northern Washington was considered in an attempt to explain the source of the observed spatial and temporal variations. The model flow is baroclinically unstable, with the amplifying wave disturbances propagating northward along the continental slope. For typical vertical shears associated with the California Undercurrent, the most unstable waves have wavelengths and periods in the ranges 65-94 km and 5-10 days, respectively, in good agreement with the observed fluctuations. (Sims-ISWS)
W78-03465

DISPERSION OF A PASSIVE CONTAMINANT IN OSCILLATORY FLUID FLOWS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-03466

OBSERVATION OF A BATHYMETRICALLY TRAPPED CURRENT RING,
Washington Univ., Seattle. Dept. of Oceanography.
T. H. Kinder, and L. K. Coachman.
Journal of Physical Oceanography, Vol. 7, No. 6, p 946-952, November 1977. 8 fig, 1 tab, 13 ref. NSF GA11147.

Descriptors: *Ocean currents, *Salinity, *Bathymetry, Circulation, Ocean circulation, Currents(Water), Water circulation, Temperature, Water temperature, On-site investigations, Oceanography, *Bering Sea, Current rings.

Examination of hydrographic data obtained over a large submarine canyon revealed a cell with a core of high salinity water nestled in the outer (deeper) reaches of the canyon. Because of the T-S distribution within the cell and the current that parallels the continental slope adjacent to the canyon, it was suggested that the cell is similar to the current rings which have been observed elsewhere. (Sims-ISWS)
W78-03467

IRRADIANCE MEASUREMENTS IN THE UPPER OCEAN,
Oregon State Univ., Corvallis. School of Oceanography.
C. A. Paulson, and J. J. Simpson.
Journal of Physical Oceanography, Vol. 7, No. 6, p 952-956, November 1977. 4 fig, 2 tab, 9 ref. ONR N00014-76-C-0067.

Descriptors: *Solar radiation, *Light penetration, *Oceans, *Pacific Ocean, On-site investigations, On-site data collections, Oceans, Light, Irradiation, Measurement, Depth, Secchi disks, Optical properties, Turbidity, Data processing, Regression analysis, Oceanography.

Observations were made of downward solar radiation as a function of depth during an experiment in the North Pacific (35 deg N, 155 deg W). The irradiance meter employed was sensitive to solar radiation of wavelength 400-1000 nm arriving from above at a horizontal surface. Because of selective absorption of the short and long wavelengths, the irradiance decreases much faster than exponential in the upper few meters, falling to one-third of the incident value between 2 and 3 m depth. Below 10 m the decrease was exponential at a rate characteristic of moderately clear water of Type IA. Neglecting one case having low sun altitude, the observations are well represented by an equation. The depth at which the irradiance falls to 10% of its surface value is nearly the same as observations of Secchi depth when cases with high wind speed or low solar altitude are neglected. Parameters were computed for the entire range of oceanic water types. (Sims-ISWS)
W78-03468

TIDAL CHARTS OF THE INDIAN OCEAN NORTH OF 15 DEG SOUTH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
C. McCammon, and C. Wunsch.
Journal of Geophysical Research, Vol. 82, No. 37, p 5993-5998, December 20, 1977. 6 fig, 2 tab, 14 ref. NSF OCE72-01384, ONR N00014-75-C-0219.

Descriptors: *Tides, *Charts, *Indian Ocean, Mapping, Maps, Gaging stations, Water levels, Water level fluctuations, Oceans, Sea level, Oceanography, *Tidal charts.

New tidal charts of the northern Indian Ocean were constructed by empirical means from existing data and from recent deep pressure gage measurements. A brief comparison was made to Dietrich's charts (published in 1944) and to some existing numerical models of the region. The deviations from Dietrich's charts are significant but not drastic. (Sims-ISWS)
W78-03469

OBJECTIVE ANALYSIS AND CLASSIFICATION OF OCEANOGRAPHIC DATA,
National Oceanic and Atmospheric Administration, Washington, DC. Center for Experiment Design and Data Analysis.
J. B. Jalickee, and D. R. Hamilton.
Tellus, Vol. 29, No. 6, p 545-560, December 1977. 10 fig, 7 ref.

Descriptors: *Data processing, *Analytical techniques, *Oceanography, Model studies, Mathematical models, Temperature, Water temperature, Salinity, Depth, Profiles, Oceans, Classification, *Data collections, *Oceanographic data.

A new approach to the analysis and classification of oceanographic data is presented. The technique is an empirical one, based on the singular decomposition theorem, for characterizing temperature-salinity-depth profiles as in water-mass analysis. Complementary to the profiles are station or cast-dependent coefficients, which show similarities and differences according to the space-time distributions of the individual stations in the data set. These coefficients were used for classifying the individual stations into groups having similar profiles. Results of applying the new method to a set of data from ocean stations off the coast of Oregon were given. (Sims-ISWS)
W78-03470

VEGETATION ESTABLISHMENT AND SHORELINE STABILIZATION: GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Range Science.
J. W. Webb, and J. D. Dodd.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 169, Price codes: A05 in paper copy, A01 in microfiche. Coastal Engineering Research Center, Technical Paper No. 76-13, August 1976. 74 p, 29 fig, 32 tab, 25 ref. CERC DACW72-74-C-0002.

Descriptors: *Shore protection, *Vegetation establishment, *Erosion control, *Texas, Vegetation, Erosion, Marsh plants, Coastal marshes, Shoreline cover, Salinity, Salt tolerance, Saline soils, Waves(Water), Bays, Estuaries, *Galveston Bay(Tex), Wave stilling.

Adaptation of species for shoreline stabilization, use of wave-stilling devices, and effects of fertilizers were studied along the north shore of East Bay in Texas. Water salinity varied with rainfall and evaporation throughout the study but never exceeded 18,500 parts per million. Soil texture was classified as a loam or clay-loam. Soil pH, salinity, and cation concentrations fluctuated with bay water salinity, rainfall, evaporation, and location in relation to tidal zones. Giant reed and gulf cordgrass were best adapted for dry areas. Smooth cordgrass was the species best adapted in areas exposed to tidal action. The survival and growth of this species appeared essential in stabilizing the eroding upper Texas coast bay shoreline. Wave-stilling devices of hay bales were not able to withstand highwave energy. Tires on cables attached to posts lost their effectiveness as they sank into the mud. Nevertheless, smooth cordgrass survival was significantly greater behind these devices. Mechanical planting behind a tractor was accomplished at low tides. Nitrogen and phosphorus fertilizers did not significantly improve survival or reproduction in transplanted areas, but they were significant in natural smooth cordgrass stands for reproduction and herbage production. (See also W76-07567) (Sims-ISWS)
W78-03475

SIXTH SEMIANNUAL INTERAGENCY BRIEFING FEBRUARY 1976, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5G.
W78-03477

NUMERICAL MODEL RESULTS OF DREDGED MATERIAL DISPOSAL AT TEN PROPOSED OCEAN DISPOSAL SITES IN THE HAWAIIAN ISLANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-03483

SHOALING CHARACTERISTICS OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
J. M. Atturio, D. R. Basco, and W. P. James.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 101, Price codes: A06 in paper copy, A01 in microfiche. CDS Report No. 187, TAMU-SG-76-207, May 1976. 112 p, 9 fig, 10 tab, 33 ref, 8 append.

Descriptors: *Channels, *Shoals, *Texas, Sediment transport, Sedimentation, Dredging, Coasts, Hydrology, Model studies, Inland waterways, Gulfs, Analysis, *Texas Gulf Intracoastal Waterway, *Intracoastal waterways, Shoaling rate.

Maintenance dredging records were used to compute average shoaling rates in 5000-ft reaches for the entire Texas Gulf Intracoastal Waterway. Environmental data pertinent to the waterway were gathered from published and unpublished sources. Computed shoaling rates and selected environmental features were plotted on Composite Factors Maps. Similar reaches were grouped and examined using analysis of variance techniques to determine the effect of selected environmental factors on shoaling rates. A model also was developed to predict shoaling rate in a reach with known environmental factors. The average shoaling rate over the entire waterway was found to be 10.5 in per year. Shoaling in open bay areas was found to be an average of 3 in per year greater than in land-cut areas. The combination of dredged material mounds, or fetch greater than 5 mi, with water depths less than 6 ft (surrounding bay depth) increased average shoaling rates 5 in per year. The placement of dredged material in mounds on the windward side of the waterway increased the average shoaling rate of open bay areas by 7 in per year. In bay areas with long fetches and depths less than three ft, it was found that windward placement of dredged material was actually advantageous. Hurricanes did not appear to have a drastic impact on shoaling rates; however, localized effects were noted in several areas. (Lee-ISWS)
W78-03485

HYDRAULICS AND DYNAMICS OF NORTH INLET, SOUTH CAROLINA, 1974-75,
South Carolina Univ., Columbia. Dept. of Geology.
R. J. Finley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 419, Price codes: A09 in paper copy, A01 in microfiche. GITI Report No. 10, September 1976. 188 p, 57 fig, 17 tab, 76 ref, 4 append.

Descriptors: *Waves(Water), *South Carolina, *Inlets(Waterways), Tides, Hydraulics, Winds, Beaches, Beach erosion, Hydrography, Sedimentation, Seasonal, *Inlet morphology, Tidal hydraulics, Manning's n friction coefficients, Keulegan Repletion Coefficients.

Detailed quarterly studies at North Inlet, South Carolina, showed variations in wave parameters, beach and inlet morphology, and tidal hydraulics. The variations are related to seasonal climatic patterns. Wind magnitude and direction, occurrence of northeast storms, and brackish water influx from adjacent Winyah Bay are significant process variables. Over 800 unique visual wave observations indicated that annual resultant wave energy flux is directed to the south. However, an energy flux reversal due to ebb tidal delta morphology results in longshore transport of sediment toward the inlet, adding to swash bars, the channel-margin linear bars, and a northward recurving spit. An estimate of the volume of inlet-directed longshore sediment transport (350,000 cubic meters per year), based on observed energy fluxes, gave a value which is 83% of the annual longshore transport rate (430,000 cubic meters per year), based on 39 years of spit and shoal growth. Beach profiles at 11 locations showed that erosion is primarily due to northeast storms and that the shoreline is transgressive. A maximum of 7 m of foredune retreat was observed during the winter of 1972-73. The foredune retreat contributes abundant sediment to the ebb tidal delta, which has a present volume of over 35,700,000 cubic meters. (Lee-ISWS)
W78-03489

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-03564

PLANKTON INVESTIGATIONS IN ISHIKARI BAY, HOKKAIDO, ZOOPLANKTON BIOMASS DURING THE SUMMER AND AUTUMN OF 1975, (IN JAPANESE),
M. Kotori.
Sci Rep Hokkaido Fish Exp Stn 19, p 1-11, 1977.

Descriptors: *Zooplankton, *Distribution, Seasonal, Sampling, *Biomass, *Chaetognatha, *Copepod, *Japan(Ishikari Bay).

Information of the biomass of zooplankton (macroplankton) in Ishikari Bay (Japan) is Aug.-Sep. and Oct., 1975 is given. Zooplankton were collected with a North Pacific standard net (NORPAC net) at 56 stations distributed over Ishikari Bay from Aug. 26th-Oct. 20th in 1975. In addition, MORPAC net samples obtained at 3 stations on Oct. 17th, 1974, were also examined. The samples were obtained by vertical hauls from the near sea bottom to the surface of from a depth of 150 m to the surface when the bottom was deeper than 150 m. The areal distribution of zooplankton biomass indicated that the biomass increased in seaward in the bay, and that only a few zooplankton (< 0.1 g wet wt/m2 per 0-20 m) lived in the Ishikari River estuary. The zooplankton biomass was estimated to be 0.5-0.7 g wet weight/m2 per 0-20 m in Ishikari Bay in Aug.-Sept. and Oct. On the basis of vertical hauls with the standard net at 3 stations Oct. 17th, 1974, it is evident that the biomass of copepods was approximately 40% of the total mass of zooplankton, and the chaetognaths comprised about 30% of the total zooplankton weight. Ishikari Bay in Oct. is characterized by warm temperate waters.--Copyright 1978, Biological Abstracts, Inc.
W78-03595

SALT-MARSH PLANT GERATOLOGY,
Georgia Univ., Brunswick. Marine Extension Service.
M. A. Hardisky, and R. J. Reimold.
Science, Vol 198, No 4317, p 612-614, 11 November 1977. 1 fig, 2 tab, 6 ref.

Descriptors: *Primary productivity, *Salt marshes, *Plant growth, Plant ecology, Maine, Delaware, Georgia, Wetlands, Spartina spp.

Culm elongation and leaf production, senescence, and abscission were measured on individual culms of salt-marsh hydrophytes. Continual addition of plant material by individual culms indicates an independence of annual primary productivity from peak standing crop biomass. Lead residence time, continual culm mortality, and pulses of detritus

export constitute essential processes controlling primary productivity and ultimately determine the value of a plant species to the estuarine wetland ecosystem. (Stihler-Mass)
W78-03654

THE PHYTOSOCIOLOGY OF THE GREEN SWAMP, NORTH CAROLINA,
Bureau of Sport Fisheries and Wildlife Research Center, Jamestown, ND.
For primary bibliographic entry see Field 2H.
W78-03655

MARSH MANAGEMENT FOR WILDLIFE: A BIBLIOGRAPHY WITH ABSTRACTS,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
M. L. Spohrer.
Special Publication No 1, December 1975. 55 p, 167 ref.

Descriptors: *Bibliographies, *Wildlife management, *Freshwater marshes, *Coastal marshes, Waterfowl, Furbearers, *Louisiana, Wetlands.

Included are wildlife management studies that have been done in marsh ecotypes similar to those found in the Louisiana coastal marshes and techniques adaptable to Louisiana. Emphasis is on freshwater marshes. The 167 entries are divided into two groups: (1) General marsh management including water-level manipulation, salinity control, grazing regulations for cattle, plowing and planting, burning, creating mechanical openings, and chemical control of undesirable marsh plants, and (2) Species management subdivided into waterfowl and shorebirds, furbearers, and other wildlife. (Stihler-Mass)
W78-03656

WATER BIRDS AND THEIR WETLAND RESOURCES IN RELATION TO OIL DEVELOPMENT AT STORKERSEN POINT, ALASKA,
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5C.
W78-03657

ENERGY VALUE, ELEMENTAL COMPOSITION, AND PRODUCTIVITY OF BELOW-GROUND BIOMASS OF A JUNCUS TIDAL MARSH,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
A. A. De La Cruz, and C. T. Hackney.
Ecology, Vol 58, No 5, p 1165-1170, Late Summer 1977. 2 fig, 1 tab, 19 ref.

Descriptors: *Estuarine environment, *Root development, *Standing crops, *Cycling nutrients, *Tidal marshes, *Primary productivity, *Wetlands, Annual turnover, Biomass, Plant growth, Energy, Root systems, Root zones, Gulf of Coastal Plain, *Mississippi, Rhizones, Coastal marshes, *Needlerush, *Root productivity, *Estuarine energetics, Energy values, St Louis Bay(Miss).

Belowground standing crop of a Juncus roemerianus marsh in Mississippi ranged from 9.7 to 12.4 kg dry wt/sq m with the peak biomass occurring in April. Annual productivity estimated from expected maximum minus expected minimum biomass fitted into a periodic regression model was 1.36 kg/sq m. Ninety-four percent of the productivity was within the top 20 cm indicating that the bulk of the materials found beyond this depth consisted of dead tissues. Energy, carbon, hydrogen, nitrogen, and phosphorus contents of belowground materials did not vary significantly during the year, but patterns of differences in samples taken from different depths were evident. The productivity of belowground materials in Juncus marshes is comparable with aboveground productions reported in the literature with respect to dry biomass. The probability that large portions of the underground production enter the aqueous system and become incorporated in estuarine energetics merits further consideration. (Steiner-Mass)
W78-03659

COASTAL RECREATION RESOURCES IN AN URBANIZING ENVIRONMENT, SYMPOSIUM, HYANNIS, MASSACHUSETTS, APRIL 12-14, 1976.
For primary bibliographic entry see Field 6B.
W78-03662

MACROZOOBENTHOS OF SALT WATER BODIES OF THE SOUTH PRIMOR'YE (THE SEA OF JAPAN), (IN RUSSIAN),
Far Eastern Univ., Vladivostok (USSR).
G. N. Volova.
Gidrobiol Zh. 10(6), p 32-37, 1974.

Descriptors: *Distribution, Sea water, Brackish water, Salinity, *Sea of Japan, Lakes, Saline lakes, *Benthos, *USSR(Lake Talmi).

The regularity in distribution of various groups of benthic organisms in the water bodies under study was determined. In water bodies connected with the sea (with great fluctuation of water salinity) the fauna consists of marine brackish-water and freshwater forms; in the water bodies isolated to some extent from the sea (with constant low salinity) it consists of freshwater and brackish-water forms. In the Lake Talmi (USSR) (Salinity 9.7-21.6%) the fauna is represented by marine and brackish-water species.--Copyright 1975, Biologica Abstracts, Inc.
W78-03681

ROTARY CROSS-BISPECTRA AND ENERGY TRANSFER FUNCTIONS BETWEEN NON-GAUSSIAN VECTOR PROCESSES. II. WINDS AND CURRENTS OFF THE OREGON COAST,
Oregon State Univ., Corvallis. School of Oceanography.
N-C. Yao, S. Neshyba, and H. Crew.
Journal of Physical Oceanography, Vol. 7, No. 6, p 892-903, November 1977. 8 fig, 2 tab, 7 ref. ONR N00014-68-0148, NSF GA23015, GA1589.

Descriptors: *Ocean currents, *Winds, *Coasts, *Oregon, *Pacific Ocean, Currents(Water), Model studies, Mathematical models, On-site investigations, On-site data collections, Data processing, Current meters, Wind pressure, Energy transfer, Oceanography, Rotary bispectra, Cross-bispectra.

Application of rotary cross-bispectra and energy transfer functions to a set of wind and current data measured from the Totem research buoy showed these elements to be non-Gaussian and that nonlinear interactions do occur between the wind stress and current at 14 m depth. Such transfers account for 35% of the total energy estimates and for 100% of the estimates at the inertial frequency. For the latter, the most effective set of nonlinear interacting components include half-day and quarter-day components of wind stress. No energy transfers linearly. The effect of nonlinear interaction in broadening the current response spectrum was noted. (See also W75-07911) (Sims-ISWS)
W78-03688

A LEGAL ORDER FOR THE OCEANS, II,
For primary bibliographic entry see Field 6E.
W78-03691

BASELINE STUDY PROGRAM, NORTH PUGET SOUND BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL. II BIBLIOGRAPHY,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 5B.
W78-03698

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEATH OF THE SWEET WATERS,
For primary bibliographic entry see Field 5G.
W78-03326

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, DC. Office of the Secretary.
J. E. Cadotte.
U.S. Patent No. 4,039,440, 6 p, 6 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 254, August 2, 1977.

Descriptors: *Patents, *Desalination, *Water purification, Separation techniques, Membrane processes, *Reverse osmosis, *Membranes.

The efficiency of the reverse osmosis process depends to a large extent on the nature of the membrane. In this invention the reverse osmosis membrane is prepared by reaction of a film or layer of polyethylenimine with a polyfunctional reagent whose functional groups are capable of reacting with amine groups. The polyfunctional reagent is preferably a water-soluble, aromatic or heterocyclic compound having acid chloride or isocyanate functional groups. The membrane is preferably prepared in situ on a polysulfone or chlorinated polyvinyl chloride support by initial formation of a layer of polyethylenimine on the support, followed by interfacial reaction with the polyfunctional reagent to produce a thin surface coating possessing salt barrier characteristics. (Sinha-OEIS)
W78-03606

ION-EXCHANGE PROCESS FOR DESALTING WATER AND SUBSEQUENT REGENERATION OF THE ION EXCHANGERS,
CKD DUKLA, Prague (Czechoslovakia). (Assignee).
V. Kadlec, and P. Huebner.
U.S. Patent No. 4,039,442, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 254, August 2, 1977.

Descriptors: *Patents, *Desalination, *Water treatment, *Water purification, Desalination processes, *Ion exchange, Separation techniques, Desalination apparatus, Regeneration.

Water to be desalted in an ion-exchange process is contacted with a first cation exchanger in the form of a monovalent cation, and a first anion exchanger. The resultant treated solution is then reacted with a second, weakly acidic cation exchanger in the form of a free acid and, in certain applications, with a second weakly basic anion exchanger in the form of a free base to complete the desalting portion of the process. The second ion exchangers are then regenerated with the use of desalted water at a temperature greater than 30 degrees C, and the products of such reaction (including a hydroxide of the monovalent cation) are employed to regenerate one or more of the remaining exhausted ion exchangers. (Sinha-OEIS)
W78-03607

3B. Water Yield Improvement

SNOW ACCUMULATION AND MELT IN SPRAYED AND UNDISTURBED BIG SAGEBRUSH VEGETATION,
Rocky Mountain Forest and Range Experimentation Station, Collins, CO.
For primary bibliographic entry see Field 4C.

LIBRARY OF THE URBANA-CHAMPAIGN

W78-03320

THE COMING WATER FAMINE,
House, Washington, DC.
J. Wright.
Coward-McCann, Inc., New York, 1966, 255 p.

Descriptors: *Water shortage, *Water transfer, *Weather modification, *Water pollution, Water conservation, Water purification, Consumptive use, Cloud seeding, Sulfite liquors, Water Quality Act, Watershed Protection and Flood Prevention Act, Water management(Applied), Water distribution(Applied), Water pollution sources, Shellfish, Industrial waste, Thermal pollution, Federal government, Evaporation control, Detergents, Desalinization, Irrigation, Biochemical oxygen demand, Aerobic bacteria.

In the midst of unprecedented plenty, America has been rapidly running out of usable water. In an attempt to analyze the causes of and solutions to the predicted water famine, the author has traced the early beginnings of man's incredible misuse of one of his most abundant resources. He uses an anecdotal style in exploring global use and misuse of water throughout history. Specific scrutiny is given to drought, urbanization, agriculture, pollution, water transfer, weather modification and desalinization. Solutions to the approaching crisis are explored with emphasis on the need for federal leadership in this area through federal water-development programs. State projects such as the Ohio River Valley Water Sanitation Commission are examined. The author concludes that action must be taken immediately if the approaching crisis is to be staved off. He suggests: (1) change in public attitude; (2) greater sense of administrative urgency; (3) tightening of congressional procedures; (4) increased research on desalinization and weather modification; (5) expanded pollution abatement; (6) water transport planning; (7) coordinated water management; and (8) more upstream programs of land treatment and small detention dams in tributaries. (Quarles-Florida)
W78-03324

WATER SAVED OR WATER LOST: THE CONSEQUENCES OF INDIVIDUAL CONSERVATION MEASURES IN THE APPROPRIATION STATES,
W. E. Bergholz, Jr.
Land and Water Law Review, Vol XI, No 2, p 435-57, (1976).

Descriptors: *Water rights, *Appropriation, *Water conservation, *Developed waters, Prior appropriation, Environmental effects, Environmental engineering, Technology, Legal aspects, Legislation, Priorities, Aesthetics, Environment, Water transfer, Water demand, Water distribution(Applied), Water allocation(Policy), Water, Water loss, Water law, Water control, Judicial decisions.

In the appropriation states of the western United States, one who salvaged or developed waters traditionally had a superior right to such water. However, this rule has come under much criticism recently as the demand for previously appropriated waters has increased. This article examines the legal effects of individual water conservation efforts as they relate to users in the western states. The author discusses the legal background for salvaged and developed waters as well as the economic, technical aesthetic, and identification problems involved in this area of law. A major problem is that one who salvages water is then precluded from applying that water to new lands. The efficient use of water requires use of a system which encourages conservation by rewarding those who institute conservation practices with the right to use conserved water and apply it to new lands. The system, however, must be one which provides incentives to conserve and develop water resources without harming other appropriators or destroying the environment. The author proposes rules which he feels will accomplish this balance while providing a workable system. (Josepher-Florida)
W78-03379

THE EFFECT OF IRRIGATION ON PRECIPITATION IN THE GREAT PLAINS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-03486

SHORT- AND LONG-TERM EFFECTS OF ANTITRANSPIRANTS ON WATER RELATIONS AND PHOTOSYNTHESIS OF WOODY PLANTS,
Wisconsin Univ.- Madison. Dept. of Forestry.
For primary bibliographic entry see Field 2I.
W78-03642

IMPORTANCE, PRESERVATION AND MANAGEMENT OF RIPARIAN HABITAT: A SYMPOSIUM, TUCSON, ARIZONA, JULY 9, 1977.
For primary bibliographic entry see Field 4C.
W78-03661

3C. Use Of Water Of Impaired Quality

THE RISING COST OF MAKING DESERTS BLOOM,
Earthscan, London (England).
For primary bibliographic entry see Field 4B.
W78-03621

MANAGEMENT MODEL FOR WASTEWATER DISPOSAL ON LAND,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5E.
W78-03636

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03685

3D. Conservation In Domestic and Municipal Use

FINANCING AND COST SHARING MUNICIPAL WATER SUPPLY SYSTEMS,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 6C.
W78-03419

URBAN STORMWATER MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03632

SELECTION OF MODELS FOR URBAN DRAINAGE PROBLEMS: TECHNICAL ASPECTS AND NON-TECHNICAL CONSTRAINTS,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-03633

WATER QUALITY ASPECTS OF AGRICULTURAL AND URBAN DRAINAGE,
Rice Univ., Houston, TX.
For primary bibliographic entry see Field 5G.
W78-03638

SIMULATION OF QUALITY OF URBAN DRAINAGE EFFLUENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-03641

INCOME AND PRICE ELASTICITIES OF DEMAND FOR WATER IN DEVELOPING COUNTRIES,
Harvard Univ., Cambridge, MA. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6D.
W78-03645

OWNERSHIP AND WATER SYSTEM OPERATION,
West Virginia Univ., Morgantown. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-03647

THE COMPLETE DRAINAGE PROGRAM--MORE THAN AN ORDINANCE,
Hydrocomp, Inc., Atlanta, GA.
For primary bibliographic entry see Field 6E.
W78-03650

WATER CONSUMPTION IN SMALL COMMUNITIES OF NORTHEAST THAILAND,
Asian Inst. of Tech., Bangkok, Thailand.
For primary bibliographic entry see Field 6D.
W78-03651

3E. Conservation In Industry

STARCH RECOVERY EXCEEDS 90% WITH LIQUID CYCLONE SYSTEM.
For primary bibliographic entry see Field 5D.
W78-03202

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS OF DYESTUFF INDUSTRY,
Arlabs Ltd, Bhatghar (India).
For primary bibliographic entry see Field 5D.
W78-03204

RECOVERY AND REUSE OF MATERIALS FROM DYESTUFF INDUSTRY,
V. J. T. Inst., Bombay (India). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5D.
W78-03205

TEXTILE INDUSTRY EFFLUENTS--INSTRUCTIONS FOR PRACTICAL USE (TEXTIL-ABWASSER--WEGLEITUNG FUER DIE PRAXIS).
For primary bibliographic entry see Field 5G.
W78-03206

CONCENTRATING WOOL CONTAMINANTS.
For primary bibliographic entry see Field 5D.
W78-03208

WATER CONSERVATION IN TEXTILE FINISHING,
Tootal Fabric Div. Research, Cheshire (England).
For primary bibliographic entry see Field 5D.
W78-03211

WATER REUSE IN THE SOUTHWEST,
New Mexico State Univ., University Park.

For primary bibliographic entry see Field 5G.
W78-03219

ORGANIC BIODEGRADATION IN HYPERSALINE WASTEWATER,
For primary bibliographic entry see Field 5C.
W78-03220

LEATHER TANNING AND FINISHING WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
For primary bibliographic entry see Field 5D.
W78-03225

WASTE RECOVERY: ZINC RECOVERY FROM RAYON PLANT SLUDGE,
Avtex Fibers, Inc., Front Royal, VA.
For primary bibliographic entry see Field 5D.
W78-03295

METHOD FOR TREATING PULPING EFFLUENT, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W78-03299

NEW REFLECTIONS ON CLOSED CYCLES IN THE PAPER AND BOARD INDUSTRY (REFLECTIONS NOUVELLES SUR LES CYCLES FERMES DANS L'INDUSTRIE DU PAPIER ET DU CARTON),
Sulzer Freres S. A., Winterthur (Switzerland).
For primary bibliographic entry see Field 5D.
W78-03307

NEW ENGLAND TISSUE MILL RECYCLES 73% OF ITS WHITE WATER EFFLUENT,
Marcal Paper Mills, Inc., Elmwood Park, NJ.
For primary bibliographic entry see Field 5D.
W78-03313

ENVIRONMENTAL PROTECTION ENERGY USE IN THE (U.S.) PULP AND PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5G.
W78-03318

BLEACH PLANT FILTRATE RECOVERY,
Erco Envirotech Ltd., London (Ontario). (Assignee).
For primary bibliographic entry see Field 5D.
W78-03322

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, (Washington, DC.).
For primary bibliographic entry see Field 6E.
W78-03359

THE ENVIRONMENTAL EFFECTS OF USING COAL FOR GENERATING ELECTRICITY,
Argonne National Lab., IL.
For primary bibliographic entry see Field 6G.
W78-03455

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 5. BASIC PETROCHEMICALS INDUSTRY,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5D.
W78-03457

WATER RECLAMATION AND REUSE, (LITERATURE REVIEW),
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-03537

MATRIX OF ALGAE AND METHOD OF MAKING SAME AND METHOD OF OBTAINING URANIUM FROM SEA WATER BY SAID MATRIX,
Kernforschungsanlage Juelich G.m.b.H. (West Germany)
E-A. Heide, M. Wald, M. Paschke, and K. Wagener.
U.S. Patent No. 4,039,445, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 255, August 2, 1977.

Descriptors: *Patents, *Sea water, Algae, Chlorophyta, Uranium extraction, Mutants.

A method of extracting uranium from sea water consists from sea water consists in passing uranium-containing sea water through a matrix containing single cell green algae cultivated compatible with uranium. The uranium compatible algae mutants are placed in a filter cage in an area of sea in which low and high tides pass streams of sea water through the matrix. The separation of the uranium from the matrix is carried out by means of one of the customary methods such as extraction by tributylphosphate. (Sinha - OEIS)
W78-03610

WATER-ENERGY CONFLICTS IN MONTANA'S YELLOWSTONE RIVER BASIN,
Montana State Dept. of Health and Environmental Sciences, Billings. Bureau of Water Quality.
For primary bibliographic entry see Field 6E.
W78-03649

ASSESSMENT OF WATER RESOURCES FOR NUCLEAR ENERGY CENTERS,
Oak Ridge National Lab., TN.
G. Samuels.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-5097, Price codes: A06 in paper copy, A01 in microfiche. Report No. ORNL-5097, UC-80, September 1976. 99 p, 29 fig, 21 tab, 14 ref, 1 append. W-7405-eng-26.

Descriptors: *Assessments, *Water resources, *Nuclear powerplants, *Maps, *Rivers, Water levels, Flow rates, Reservoirs, Sites, Exploration, Water supply, Water utilization, Water demand, Planning, Electric power demand, Forecasting, Nuclear energy, Power capacity.

General screening data of the 48 contiguous states identify large land areas that could potentially contain sites for nuclear centers; the data represent an overview of problems and interactions which might by encountered with the undertaking or more in-depth feasibility and practicality studies. Maps show the rivers with sufficient flows: (1) mean annual flows greater than 3,000 cfs, with the flow rates identified for ranges of 3,000 to 6,000, 6,000 to 12,000, 12,000 to 24,000 and greater than 24,000 cfs; (2) monthly, 20-year low flows greater than 1,500 cfs, with the flow rates identified for ranges of 1,500 to 3,000, 3,000, to 6,000, 6,000 to 12,000, and greater than 12,000 cfs. Criteria relating river flow rates required for various size generating stations, both for sites located on reservoirs and for sites without local storage of cooling water, are discussed; these are used in conjunction with plant water consumption rates to estimate the installed generating capacity that may be located at one site or within a river basin. Projections of future power capacity requirement, future demand for water (both withdrawals and consumption), and regions of expected water shortages are presented. Regional maps of water availablility, based on annual, 20-year low flows are also shown. The feasibility of locating large energy centers in these regions is discussed. The availability of water resources and the projected power capacity density vary widely across the country, necessitating detailed long-range planning to resolve conflicting demands of available water resources. The appendix presents definitions of terminology and conversion factors. (Wares-IPA)
W78-03673

A REVIEW OF TRACE ELEMENT STUDIES RELATED TO COAL COMBUSTION IN THE FOUR CORNERS AREA OF NEW MEXICO,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 5A.
W78-03674

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA.
Corps of Engineers, Cincinnati, OH.
For primary bibliographic entry see Field 6B.
W78-03675

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03685

POSSIBILITIES FOR TREATING WASTEWATERS GENERATED IN ELECTROPLATING SHOPS TO AVOID SPECIAL WASTES--METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL. PART III (MOEGLICHKEITEN ZUR BEHANDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN--METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE. TEIL III),
For primary bibliographic entry see Field 5D.
W78-03689

3F. Conservation In Agriculture

WATER REUSE IN THE SOUTHWEST,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 5G.
W78-03219

EVAPOTRANSPIRATION FROM A SATSUMA MANDARIN ORCHARD DETERMINED BY ENERGY BALANCE METHOD, (IN JAPANESE),
Ministry of Agriculture and Forestry, Hiroshima (Japan). Fruit Tree Research Station.
For primary bibliographic entry see Field 2D.
W78-03262

SOME REASONS FOR DEVELOPMENT OF IRRIGATION EROSION, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
For primary bibliographic entry see Field 2J.
W78-03329

UPPER MISSOURI REGION, FISCAL YEAR 1974.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 6E.
W78-03360

THE EFFECT OF IRRIGATION ON PRECIPITATION IN THE GREAT PLAINS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-03486

METHOD OF SUPPLEMENTAL IRRIGATION FOR FARMING,
H. A. King.
U.S. Patent No. 4,037,787, 5 p, 5 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 4, p 1624, July 26, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Water delivery(Applied), Fog, Mist, Humidity, Supplemental irrigation.

A method of supplemental irrigation of substantial areas for supplying water to plants and for conserving water already in the plants and in the soil, places in the atmosphere over the area a fog of water particles. The system presents a technique for distributing water over substantial areas - typically 40 to 160 acres - from one to nine central distributing points. It is based on the fact that as water droplets get smaller they will stay in the air for longer and longer periods of time and if given motion can travel for quite long distances before coming to earth. If the production of these fine droplets is combined with a method of moving and directing them - such as with a movable fan, blower, or nozzle - the water can be transported for hundreds of feet before reaching earth as liquid water or as an increased humidity. The majority of the droplets will have a diameter between about 10 and about 200 microns, the mass median diameter being about 50 micros. (Sinha-OEIS)
W78-03597

IRRIGATION PIPE JOINT LOCK,
L. W. Clements.
U.S. Patent No. 4,037,859, 3 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 960, No 4, p 1648, July 26, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Pipe, Pipe joint lock.

A U-lock has a pair of hinged channel-like arms with flared free ends and a U-shaped spring strap handle connected to the arms and adapted to push them onto and hold them in clamping positions on flanges of irrigation pipe sections. (Sinha-OEIS)
W78-03599

METHOD FOR REDUCING WATER LOSS THROUGH SOIL BY SEEPAGE,
Flintkote Co., Stamford, CT. (Assignee).
For primary bibliographic entry see Field 2G.
W78-03615

AGRICULTURAL BENEFIT ASSESSMENT FROM FLOOD CONTROL,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6F.
W78-03634

MICRO-CLIMATE CONTROL OF DECIDUOUS FRUIT PRODUCTION WITH OVERHEAD SPRINKLERS,
Utah State Univ., Logan.
R. E. Griffin.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 278-297, 1976. 10 fig, 3 tab, 12 ref.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Computer models, Fruit crops, Deciduous trees, Temperature, Orchards, Spring, Winter, Utah, *Evaporative cooling, *Overtree sprinkling, *Fruit trees, Bud delay, Water application.

Reported is the use of overhead sprinklers to delay fruit bud development and reduce early spring freeze damage to fruit trees. Overtree sprinkling to provide evaporative cooling has been found to effectively prevent over 80% of early spring freezes. To obtain maximum delay for maximum protection, sprinkling must be initiated as soon as winter rest has been completed; a computer model has been developed which will predict in advance of this date. Savings in water can be realized by following various operating procedures. Sprinkling for blossom delay can be combined with sprinkling for freeze protection. The former can be used in the early spring and the latter in late spring as a means of good protection and water saving. (Bell-Cornell)
W78-03635

ECONOMIC ANALYSIS OF WATER-SAVING TECHNIQUES IN IRAN,
Florida Univ. Gainesville. Dept. of Food and Resource Economics.
G. R. Soltani.
Water Resources Bulletin, Vol. 12, No. 6, p 137-142, December 1976. 4 ref.

Descriptors: *Irrigation efficiency, *Water supply, *Budgeting, *Marginal productivity, Economic feasibility, Field crops, Cost comparisons, Farms, Effects, Investment, *Water-saving technology, *Iran, Net return.

The possibility of increasing the water supply for irrigation through adoption of more efficient water-application techniques as an alternative to new irrigation projects was studied in an irrigated region of Iran. Excessive water application at the farm level ranks high among the causes of water shortages in the selected region. An empirical analysis of the effect of water-saving technology on the farm operator's net return was made choosing two farms in the region as a case study. The problems facing these farms are common to most farms throughout the country. The results of the budgeting analysis of the selected farms indicated that an improvement in irrigation technique can result in the expansion of water supply and in a higher marginal value product for water. Comparing the costs of irrigation systems with the net return resulting from the higher efficiency showed that such an investment is economically feasible. (Bell-Cornell)
W78-03644

ECONOMIC FEASIBILITY OF IRRIGATING SOUTHERN PINES,
Wisconsin Univ.-Parkside, Kenosha. Div. of Social Sciences.
C. Manogaran.
Water Resources Research, Vol. 9, No. 6, p 1485-1496, December 1973. 3 fig, 5 tab, 19 ref, append.

Descriptors: *Economic feasibility, *Irrigation, Soil moisture, *Loblolly pine trees, *Forests, Forestry, Regional analysis, Benefits, Costs, Data collections, Climatic data, Operating costs, Water supply, Southeast U.S., Texas, Mathematical models, Systems analysis, Forecasting, *Estimating, Atlantic coast.

A climatic model developed for estimating the depressing effect of drought on the diameter growth of loblolly pines in the southern United States is used to project potential pine growth under conditions of no soil moisture deficit, which irrigation could assure. The regional distribution of the additional growth demonstrates that the benefits of irrigation would increase from the Atlantic coast toward east Texas. The dollar value of the additional growth based on the current price of pulpwood is compared with the costs necessary to irrigate southern pines. Under present conditions of technology, costs of irrigation would exceed benefits. Technological changes, higher pulpwood prices, or decisions of the federal government to improve southern forests may justify the irrigation costs necessary to increase southern pine production. (Bell-Cornell)
W78-03652

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ROUTING OF FLOODS IN RIVER CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-03240

OPTIMAL SCHEDULING OF WATER SUPPLY PROJECTS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
J. Knudsen, and D. Rosbjerg.
Nordic Hydrology, Vol. 8, No. 3, p 171-192, 1977. 5 fig, 1 tab, 8 ref.

Descriptors: *Water supply development, *Water demands, *Project planning, *Scheduling, *Model studies, Mathematical models, Planning, Projects, Water supply, Water sources, Costs, Water costs, Economics, Optimization, Water resources, Resources development.

Some capacity expansion problems encountered in water resources development were studied. Models yielding least-cost schedules (i.e., optimal selection and sequencing of potential projects) in order to meet a stipulated increase in water demand were discussed first. However, uncertainties in the future water demand ought to be taken into account, and therefore, a new general dynamic programming algorithm was developed. Depending on the amount of known detail, the preferences against shortage can be stated. Chance-constraints or penalty functions were included in the optimization. The use of the algorithm as an aid in the current planning was illustrated by solving an example under deterministic as well as stochastic assumptions about the future demand. (Sims-ISWS)
W78-03241

RESEARCH NEEDS IN EROSION AND SEDIMENTATION.
American Geophysical Union, Washington, DC.
For primary bibliographic entry see Field 2J.
W78-03248

CHANNEL MODIFICATION GUIDELINES.
Soil Conservation Service, Washington, DC.
Federal Register, Vol. 42, No. 152, p. 40119-22, August 8, 1977. 1 tab.

Descriptors: *Channels, *Project planning, *Water management(Applied), *Soil conservation, *Wildlife conservation, Wild Rivers Act, Agriculture, Non-structural alternatives, Maintenance, Management, Planning, Fiber crops, Wetlands, Riprap, Channel improvement, Coordination, Ecology, Standards, Aquatic habitats, Balance of nature, Wildlife habitats, Fish conservation, Channel flow, Social needs.

Planned channel modifications often result in confrontations between agricultural and environmental interests. Such modifications can both protect farmland and destroy wetlands. The Soil Conservation Service and the Fish and Wildlife Service have established guidelines to define the conditions under which channel modifications will be considered acceptable by both agencies. Their purpose is to guide the agencies' personnel in identifying when and where channel modification may be used to implement water and related land resource projects through a policy of balancing the need to maintain a naturally functioning ecosystem with economic and social needs. Restrictions are placed on the planning of channel modification projects

which would jeopardize endangered species or alter productive wetlands. No channel modification will be allowed unless the adverse effect on potential or actual wild and scenic rivers is minimal and appropriate protective measures can be taken to minimize the adverse effects of important fish and wildlife values. Types of channel modification and alternatives are listed and described and a chart detailing field level planning coordination between the agencies from preapplication through maintenance is also included. (Spector-Florida)
W78-03350

FORESTED WETLANDS FOR WATER RESOURCE MANAGEMENT IN SOUTHERN ILLINOIS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-03423

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 22-24 OCTOBER 1975, CHARLESTON, S.C.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-03429

HISTORY OF THE AQUATIC PLANT CONTROL PROGRAM,
Office of the Chief of Engineers (Army), Washington, D. C. Construction Operations Div.
For primary bibliographic entry see Field 5G.
W78-03430

RECENT SOUTH AMERICAN FIELD STUDIES OF PROSPECTIVE BIOCONTROL AGENTS OF WEEDS,
Agricultural Research Service, Stoneville, MS. Southern Weed Science Lab.
For primary bibliographic entry see Field 5G.
W78-03431

AQUATIC WEED PROBLEMS IN MEXICO AND TEXAS AND SOME OF THE MEASURES FOR THEIR CONTROL,
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
For primary bibliographic entry see Field 5G.
W78-03432

FIELD TRIP, GOOSE CREEK RESERVOIR,
Army Engineer District, Charleston, SC.
J. L. Carothers.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 22-23, December 1976. 2 fig.

Descriptors: *Alligatorweed, *Aquatic weed control, *Biocontrol, *Goose Creek Reservoir(SC), *Alligatorweed flea beetle, Reservoirs, Insects, Agasicles, Alternanthera philoxeroides, Savannah National Wildlife Refuge(SC), South Carolina.

Alligatorweed flea beetles (Agasicles sp) were released in 1965-66 on Goose Creek Reservoir near Charleston, South Carolina to control alligatorweed infestations; by October 1975 the plants had been almost completely eliminated in sections of greatest beetle concentrations. The distance from the bank to the outer edge of the floating mat has been monitored since September 1969 at ten sites. Leaf loss due to senescence and webworm damage could not be estimated. In the southern section of the reservoir, where the beetle population was concentrated, surface vegetation or topgrowth was 98% eliminated in September 1969, and there was extensive feeding in stems. About 20,000 beetles were transferred from Jacksonville, Florida to the reservoir and other locations in Florida, Georgia, Alabama, Mississippi, Texas, South Carolina, and North Carolina in 1965-67. Peak beetle populations occur in May-June and September-October. (See also W78-03429) (Lynch-Wisconsin)
W78-03433

AQUATIC PLANT PROBLEMS IN PUERTO RICO,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
C. F. Zeiger.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 24-25, December 1976.

Descriptors: *Puerto Rico, *Aquatic weed control, *Water hyacinth, Alligatorweed, Biocontrol, Aquatic weeds, Human pathology, Human diseases, Eichhornia crassipes, Alternanthera philoxeroides, Bilharzia(Schistosomiasis).

The major aquatic nuisance weed in Puerto Rico, water hyacinth (Eichhornia crassipes), is distributed island wide in freshwater lakes, rivers, and streams. Infestation are concentrated in coastal plain areas, especially along the north coast between Rio Grande and Arecibo. Lesser infestations are found in river systems along the southern part of the island from Naguabo to Ponce, and in the southwest from Mayaguez through Valle de Lajas to Yauco. Major invested reservoirs are Lago de Loiza, Lago de Cidra, Lago de la Plata, Lago dos Bocas, Lago Coamo, and Laguna Cartagena. Few problems occur in the mountainous interior. Alligatorweed, Alternanthera philoxeroides, was first reported in Lago Loiza in June 1968, and although currently not a major problem, it could become one. Other problem plants are giant smartweed, naiad, coontail, water lettuce, cattail, algae, and aquatic grasses. Control of these plants will help control the snail Biomphalaria glabrata, carrier of the human disease bilharzia (Schistosomiasis). Because of heavy water hyacinth infestations and the danger of bilharzia, many Puerto Rican lakes, canals, and streams are closed to recreational and other use. Research using biological plant control methods has been recommended in a preliminary reconnaissance report for Puerto Rico, including white amur, water hyacinth beetles, and the alligatorweed flea beetle. (See also W78-03429) (Lynch-Wisconsin)
W78-03434

RECONNAISSANCE SURVEY OF AQUATIC WEED INFESTATIONS IN LAKES AND NAVIGABLE STREAMS IN OKLAHOMA,
Oral Roberts Univ., Tulsa. Dept. of Natural Science.
For primary bibliographic entry see Field 5G.
W78-03435

AQUATIC WEED VERSUS PLANT PATHOGEN, A STUDY OF A BIOLOGICAL CONTROL IN ACTION,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-03436

CONTROLLED RELEASE HERBICIDES - RUBBER FORMULATIONS,
Creative Biology Lab., Inc., Barberton, OH.
For primary bibliographic entry see Field 5G.
W78-03438

LARGE-SCALE FIELD TEST WITH THE MONOSEX WHITE AMUR IN FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-03439

POSSIBLE EFFECTS OF THE INTRODUCTION OF THE WHITE AMUR INTO LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W78-03440

INTEGRATED CONTROL OF WATER-HYACINTHS WITH FOUR BIOLOGICAL AGENTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-03441

WATERHYACINTHS - A NUISANCE OR A BENEFIT,
National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
For primary bibliographic entry see Field 5G.
W78-03443

FINITE ELEMENT SIMULATION OF OVERLAND AND CHANNEL FLOW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-03449

SEEPAGE FROM OXIDATION PONDS,
Tahal Water Planning for Israel Ltd., Tel Aviv. Dept. of Sewage Reclamation.
For primary bibliographic entry see Field 5B.
W78-03472

DATA EVALUATIONS AND RECOMMENDATIONS FOR COMPREHENSIVE PLANNING FOR THE YAZOO RIVER BASIN, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
F. W. Suggitt, T. J. Wood, J. R. Clark, and P. R. Becker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 360, Price codes: A05 in paper copy, A01 in microfiche, and AD-A029 361, Price codes: A17 in paper copy, A01 in microfiche. Technical Report No. Y-76-2, 2 Vol., August 1976. 470 p, 18 fig, 4 tab, 9 ref, 5 append.

Descriptors: *Planning, *Water resources development, *River basins, *Mississippi, Watersheds(Basins), Rivers, Runoff, Floods, Flood control, Flood plains, Drainage, Environment, Recreation, Social impact, Social change, Economy, Projects, Geology, Vegetation, Aquatic environment, Aquatic life, Data processing, Evaluation, *Yazoo River Basin(Miss).

An evaluation of environmental data requirements and needs for the comprehensive planning of water and related land resources of the Yazoo River Basin was conducted. The information gathered was provided in Volume II of the report (Appendices B,C,D, and E) and covered the geology; physiography; physiochemical characteristics; and the aquatic, terrestrial, and sociocultural resources of the Yazoo Basin. Sufficient data are not currently available to enable the Army Engineer District, Vicksburg, to implement its plan of study in accordance with the guidelines of 'Principles and Standards' of the Water Resources Council; therefore, it was recommended that an Information Assimilation and Evaluation Program (IAEP) be initiated in order to formulate and accomplish the plan of study for the Yazoo Basin by 1980. The 5-year program includes the develop-

ment of a Resource Information System for data management; environmental baseline investigations of physical, chemical, biological, and socioeconomic factors; environmental impact investigations of actual construction projects; analysis of changes taking place due to natural processes; and special investigations to evaluate nonstructural alternatives to floodwater and runoff management. Relative cost and duration information for each of the 33 work units in the IAEP was provided. Throughout the description of the IAEP, three points were emphasized: the necessity for information exchange and coordination between work units, response of the IAEP to guidelines of 'Principles and Standards,' and the importance of public participation and coordination in the planning process. (Sims-ISWS)
W78-03473

METHOD FOR CONTROLLING THE GROWTH OF AQUATIC PLANTS,
Aquashade, Inc., Dobbs Ferry, NY. (Assignee).
C. G. Wilson.
U.S. Patent No. 4,042,367, 5 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 961, No 3, p 1240, August 16, 1977.

Descriptors: *Patents, *Aquatic plants, *Aquatic weed control, Algal control, Dyes, Organic compounds, Blue dye, Light absorption.

The growth of aquatic plants, and particularly undesirable aquatic plants such as weeds and algae, is controlled by adding a dye to the water in the vicinity of the undesired plant growth. The dye is of a color such that it absorbs a substantial portion of the light at wavelengths normally used by the plants in photosynthesis, so that growth of the plants is stopped or arrested. The color of the dye preferably ranges from blue to green, and preferably is predominantly blue so that the water has a pleasing appearance to the eye. Preferably, the dye is applied prior to germination of the plants and at such further times as necessary. (Sinha-OEIS)
W78-03616

RESERVOIR PLANNING AND OPERATION,
Harvard Univ., Cambridge, MA. Dept. of Engineering and Applied Mathematics.
M. B. Fiering.
In 'Stochastic Approaches to Water Resources, Volume II.' Edited and Published by Hsieh Wen Shen, Colorado State University, Fort Collins, 1976, p 17-1 to 17-21. 19 ref.

Descriptors: *Reservoir operation, *Planning, *Political aspects, *Governments, Hydrologic data, Water quality, Economics, Optimization, *Decision making, Analytical techniques, Computers, Sampling, Simulation analysis, Mathematical models, Projects, Systems analysis, *Data requirements, Resilience, Stability.

This chapter discusses real problems associated with reservoir planning such as politics, data requirements, and the stability and resilience of the system. Attention is drawn to the results of a study on flow synthesis showing that the sampling errors connected with parameter estimation for a normal distribution are much less than those with other distributions. Thus, it is generally better to fit the data with a normal distribution than with other distributions, even though the normal distribution may not be the correct one. Described is an idealization of how a project is initiated and how it progresses through the decision making levels of government. Discussed are: hydrologic, meteorologic, and hydraulic data; water quality; the preliminary model; economic ssues and parameters; measures of risk aversion; and objective function; generation of alternatives; the automatic computer; and institutional requirements. The next section deals with the reality of the planning process and offers reasons for failure of some of the idealism. Considered next are the classical, neo-classical, and romatic traditions of wisdom (including the well- and the ill-tempered computer). The concepts of ecological resilience and statistical robustness are found to be entirely analogous: These two ideas will form the basis of water resource design practice for both quantity and quality control in the near future. (See also W77-10439) (Bell-Cornell)
W78-03630

STOCHASTIC MODELS FOR RESERVOIR DESIGN,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
D. P. Loucks.
In: Stochastic Approaches to Water Resources, Volume II. Edited and Published by Hsieh Wen Shen, Colorado State University, Fort Collins, 1976. p 18-1 to 18-71. 19 fig, 9 tab, 19 ref.

Descriptors: *Stochastic processes, *Model studies, *Reservoir design, *Planning, *Optimization, *Simulation analysis, *Economic efficiency, *River basins, Reservoir storage, Flood control, Water policy, Probability, Markov processes, Streamflow, Constraints, Equations, Systems analysis, Multiobjective planning, Firm yield models, Benefit maximization, Chance-constrained modeling.

Shown are the advantages and limitations of available models for river basin management which incorporate various uncertainties that must be considered in preliminary planning. Discussed are: benefit-loss and cost criteria in investment modeling; multiobjective planning; the trade-offs between quantified objectives; modeling river basin components; firm yield models; modeling stochastic demands; and chance-constrained models. Models are classified either as optimization or simulation models, static or dynamic models, and investment and operating policy or strictly operating policy models. No one model is the most appropriate for analyzing all surface water management problems in all river basins. In choosing the best model for the problem at hand, it is necessary to determine the desired trade-offs among the kinds of information each model can best provide, given limitations of time, money and computer capacity. (See also W77-10439) (Bell-Cornell)
W78-03631

SELECTION OF MODELS FOR URBAN DRAINAGE PROBLEMS: TECHNICAL ASPECTS AND NON-TECHNICAL CONSTRAINTS,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
P. E. Wisner, A. F. Ashamalla, and P. A. Ahren.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, New York, p 246-263, 1976. 7 fig, 1 tab, 16 ref.

Descriptors: *Urban drainage, *Urban runoff, *Model studies, *Simulation analysis, Hydrology, Constraints, Design, Hydrograph, Storm water, Sewers, Environmental effects, Flow storage, Planning, Costs, Systems analysis, *Rational method, *Hydrograph models.

Presented is an outline of some technical and nontechnical considerations for selection between the two basic techniques in urban drainage: the Rational Method and Hydrograph Models (such as the EPA Storm Water Management Model). The paper considers directly only flow quantity aspects, although it is mentioned that hydrograph simulation is a prerequisite for many quality control aspects. Discussed in the following order are: problems in urban drainage modeling; urban runoff models; a comparison of the two methods for flow simulation; a comparison of the methods for design application, considering the analysis of existing sewer systems and design of relief alternatives, detention storage, master drainage planning, and flow simulation for trunk and interceptor sewers; and finally constraints of urban runoff models with the Rational Method must be based not only on accuracy of flow simulation but also on the scope of drainage studies offered by the different methods. The hydrograph method is shown to be advantageous for flow simulation, where as the Rational Method cannot adequately predict system performance. In the area of design application, many urban drainage problems require sophisticated modeling; however, the large majority of drainage studies is concerned with simpler applications such as the design of storm drainage systems for new subdivisions. In this area, the advantage of models must be further ascertained. (Bell-Cornell)
W78-03633

AGRICULTURAL BENEFIT ASSESSMENT FROM FLOOD CONTROL,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6F.
W78-03634

MICRO-CLIMATE CONTROL OF DECIDUOUS FRUIT PRODUCTION WITH OVERHEAD SPRINKLERS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 3F.
W78-03635

MANAGEMENT MODEL FOR WASTEWATER DISPOSAL ON LAND,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5E.
W78-03636

MODELS FOR SCHEDULING RELEASES FROM MULTIRESERVOIR SYSTEMS: A STATE-OF-THE-ART REVIEW,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
O. T. Sigvaldason.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 331-348, 1976. 1 fig, 53 ref.

Descriptors: *Reservoir operation, *Reservoir releases, *Scheduling, *Optimization, *Simulation analysis, *Mathematical models, *Water policy, *Stochastic processes, Dynamic programming, Linear programming, Economic efficiency, Algorithms, Benefits, *Reviews, Benefit maximization.

Provided is a brief but informative state-of-the-art overview of the various modeling strategies which are being used for defining policies and procedures for the scheduling of releases from multireservoir systems. The models are separated into three general groups: Optimization models for single reservoirs; optimization models for multireservoir systems; and simulation models. It is concluded that there are strong economic incentives for continuing research in this field, since the economic gains that can be realized from only a modest improvement in operating procedure may amount annually to millions of dollars. The explicit stochastic optimization approach, while being the only technique capable of producing truly optimal solutions, is for all practical purposes computationally intractable for anything except a single reservoir. The implicit stochastic optimization approach is more promising, although it is still being confined to small multireservoir systems; rapid developments in these models are taking place. For larger systems, the most successful modeling

strategy still seems to feature the use of simulation models. (BelllCornell)
W78-03637

WATER QUALITY ASPECTS OF AGRICULTURAL AND URBAN DRAINAGE,
Rice Univ., Houston, TX.
For primary bibliographic entry see Field 5G.
W78-03638

ASSESSMENT OF ENVIRONMENTAL IMPACT ON THE AQUATIC ENVIRONMENT WITH LIMITED DATA,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W78-03639

OUTLET DRAINAGE - AN ASSESSMENT OF ENVIRONMENTAL EFFECTS,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-03640

SIMULATION OF QUALITY OF URBAN DRAINAGE EFFLUENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-03641

INTER-STATE WATER DISPUTES: A CASE STUDY OF INDIA,
Methodist Coll., Fayetteville, NC. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-03646

THE COMPLETE DRAINAGE PROGRAM--MORE THAN AN ORDINANCE,
Hydrocomp, Inc., Atlanta, GA.
For primary bibliographic entry see Field 6E.
W78-03650

ASSESSMENT OF WATER RESOURCES FOR NUCLEAR ENERGY CENTERS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 3E.
W78-03673

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME I,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03682

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME II,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03683

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME III,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03684

4B. Groundwater Management

THE IMPACT OF LAND USE CHANGE ON THE GROUND WATER RESOURCES OF THE BOZEMAN, MONTANA AREA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
R. L. Brustkern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 695, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 88, September 1977. 38 p, 1 fig, 9 ref, append. OWRT A-078-MONT(1), 14-31-0001-5026.

Descriptors: *Groundwater basins, *Land use, Urbanization, Model studies, Aquifers, Simulation analysis, *Computer models, Computer programs, *Montana(Bozeman Fan).

A finite-difference model of the Bozeman fan aquifer was developed. The model simulates aquifer response to changes in input to the aquifer system. A variety of land-use related changes in input variables may thus be simulated. The computer model simulates the way in which ground water levels fluctuate with changes in input variables such as irrigation water applied, ground water pumping, and evapotranspiration. Since land use change results in changes in input variables such as these, the model can be used to simulate assumed land use change patterns. A qualitative rather than a quantitative emphasis should be placed on the interpretation of simulation results. Large scale land use changes from irrigated agriculture to residential acreage would result in a significant lowering of the water table. Small scale changes of this type would result in a significant lowering of water levels only within and immediately adjacent to the area of change.
W78-03427

CAMBRIAN STRATIGRAPHIC NOMENCLATURE AND GROUND-WATER PROSPECTING FAILURES ON THE HUALAPAI PLATEAU, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology; and Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2F.
W78-03445

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-03448

FIRST ANNUAL REPORT ENVIRONMENTAL PROTECTION AGENCY/CORPS OF ENGINEERS TECHNICAL COMMITTEE ON CRITERIA FOR DREDGED AND FILL MATERIAL,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03481

THE RISING COST OF MAKING DESERTS BLOOM,
Earthscan, London (England).
A. Agarwal.
New Scientist, Vol. 76, No. 1073, p 96-97, October, 1977.

Descriptors: *Return flow, *Irrigation practices, *Water reuse, *Groundwater recharge, *Aquifer management, Artificial recharge, Groundwater resources, Desalination, Saline water intrusion, Water utilization, Water pollution control, Waste water treatment.

Israel has adopted extensive programs to utilize marginal water resources such as storm runoff, brackish water, and treated waste water for irrigation and for artificial groundwater recharge. The Dan Region sewage reclamation project, designed to treat 130 mcm of sewage from the greater Tel Aviv area, is scheduled for completion in 1985. Treated sewage has also been used to prevent seawater intrusion into fresh groundwater. One of the major goals of the Israeli water program is to keep water consumption constant without limiting agricultural growth. Water-saving practices in use include drip and sprinkler irrigation, electronically controlled irrigation systems, and irrigation with brackish water. Since Israel's water system now operates as a closed cycle, salt and other dissolved materials such as pesticides, fertilizer nitrates, detergents, and minerals are not regularly flushed from the aquifer. Desalination plants are being considered for aquifer purification. (Schulz-FIRL)
W78-03621

TRACE ELEMENTS IN THE TERRESTRIAL ENVIRONMENT OF A COAL-FIRED POWERHOUSE,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5A.
W78-03677

THE RELATIONSHIP BETWEEN THE BORON CONCENTRATION OF EAST LANSING MUNICIPAL WASTEWATER AND RETENTION TIME THROUGH THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT UNDER CONTINUOUS FLOW CONDITIONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5A.
W78-03680

4C. Effects On Water Of Man's Non-Water Activities

RETENTION OF SOIL WATER FOLLOWING FOREST CUTTING,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W78-03252

ALTERATION OF ENVIRONMENTAL CONDITIONS IN CLEARED NARROW STRIPS IN SPRUCE FORESTS OF THE TIEN-SHAN, (IN RUSSIAN),
Akademiya Nauk Kirgizskoi SSR, Frunze. Inst. Biologii.
L. S. Cheshev, and Z. I. Chernykh.
Lesovedenie 1, p 19-26, 1977.

Descriptors: *Clear-cutting, Soil moisture, Soil temperature, Soil erosion, Costs, Forest management, *Picea-schrenkiana, Precipitation(Atmospheric), Snow.

In felled area (Picea schrenkiana stands) more precipitation falls, snow disappears 15-25 days later, soil temperature and moisture are higher, the hydrothermal regime is more favorable, soil water-physical properties remain the same and erosion processes are absent compared to forests. Clear cuttings are acceptable for the Tien-Shan, (Kirgiz SSR, USSR); they are more profitable than selective ones and do not reduce protective properties of the forest.--Copyright 1978, Biological Abstracts, Inc.
W78-03301

SNOW ACCUMULATION AND MELT IN SPRAYED AND UNDISTURBED BIG SAGEBRUSH VEGETATION,
Rocky Mountain Forest and Range Experimentation Station, Collins, CO.
D. L. Sturges.
U.S.D.A. Forest Service Research Note RM-348, Fort Collins, Colorado, September, 1977. 6 p. 4 fig, 6 ref, 2 tab.

Descriptors: *Snow cover, *Snowmelt, *Sagebrush, *Herbicides, 2,4-D, Winds, Vegetation, Snowpacks, Brush, Brush control, Topography.

The influence of big sagebrush control on snow accumulation and melt was studied in a location where wind is an important snow relocation agent. A small (less than 5 cm) but significant reduction in snow accumulation was detected before vegetation was covered by snow on plots sprayed with 2,4-D compared to plots with untreated vegetation. Sagebrush control had no effect upon maximum depth of snow accumulation or snowmelt rates. Snow deposition at the experimental site was controlled by topographic factors once snow depth exceeded vegetation height. (Witt-IPC)
W78-03320

RIVER SHORE DYNAMICS, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Ecological Botany.
C. Nilsson.
Sven Bot Tidskr 71(1), p 23-28 1977.

Descriptors: *River shores, Alluvial, Meadow, *Regulation, Shrubs, Sweden(River Umealven), Trees, Vegetation.

Recent vegetational changes on an alluvial meadow by the river Umealven (N Sweden), formerly used for hay-making, now affected by water regulation, were studied. The dynamics of the tree and shrub layers during the last century and the changes in the field layer caused by water regulation are described.--Copyright 1978, Biological Abstracts, Inc.
W78-03339

THE IMPACT OF LAND USE CHANGE ON THE GROUND WATER RESOURCES OF THE BOZEMAN, MONTANA AREA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4B.
W78-03427

ASSESSMENT OF ENVIRONMENTAL IMPACT ON THE AQUATIC ENVIRONMENT WITH LIMITED DATA,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W78-03639

IMPORTANCE, PRESERVATION AND MANAGEMENT OF RIPARIAN HABITAT: A SYMPOSIUM, TUCSON, ARIZONA, JULY 9, 1977.
USDA Forest Service, General Technical Report RM-43. 217 p.

Descriptors: *Banks, *Riparian plants, *Southwest U.S., Streams, Birds, Wildlife, Sycamore trees, Cottonwoods, Aquatic habitats, Colorado River, Wetlands, *Riparian habitat, Habitat management, Endangered species, Classification systems.

In the past, use of riparian habitat focused on water management; other values were not considered. Grazing and clearing for agricultural purposes are destroying much of this unique vegetation type. As a basis for management, tentative classification systems for riparian and wetland vegetation in the Southwest are presented. A number of papers consider the biotic importance of this habitat. In the Southwest most fish species occur mainly in riparian habitats. Both breeding and migratory avian populations make use of such habitats. The highest density of nesting birds in North America are reported in Southwestern cottonwood riparian forests. Grazing by cattle inhibits the regeneration of cottonwoods, restricting such forests to the narrow erosion channels. As a case history, the Colorado River with its associated cottonwood forests is discussed. (Stihler-Mass)
W78-03661

PHOTOGRAMMETRY, WATER QUALITY, SAFETY APPURTENANCES, AND SHOULDER DESIGN.
Transportation Research Board, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03676

4D. Watershed Protection

RESEARCH NEEDS IN EROSION AND SEDIMENTATION.
American Geophysical Union, Washington, DC.
For primary bibliographic entry see Field 2J.
W78-03248

FOREST VEGETATION AS A SOURCE OF BIOGENIC AND ORGANIC SUBSTANCES IN NATURAL INLAND WATERS,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-03265

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT (VOLUME I-TEXT).
Forest Service (USDA), Washington, DC.
For primary bibliographic entry see Field 5B.
W78-03417

WATER QUALITY ASPECTS OF AGRICULTURAL AND URBAN DRAINAGE,
Rice Univ., Houston, TX.
For primary bibliographic entry see Field 5G.
W78-03638

PHOTOGRAMMETRY, WATER QUALITY, SAFETY APPURTENANCES, AND SHOULDER DESIGN.
Transportation Research Board, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03676

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DEVELOPMENT OF A SOIL-WASTE INTERACTION MATRIX FOR ASSESSING LAND DISPOSAL OF INDUSTRIAL WASTES,
Chemical Engineering Research Consultants Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5E.
W78-03222

DEUTERIUM IN HAILSTONES COLLECTED ON 29 NOVEMBER 1972,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2B.
W78-03246

PB210-DETERMINED SEDIMENTATION RATE, AND ACCUMULATION OF METALS IN SEDIMENTS AT A STATION IN CHESAPEAKE BAY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-03247

AN AUTOMATED SYSTEM FOR COLLECTING, PROCESSING, AND DISPLAYING ENVIRONMENTAL BASELINE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 7C.
W78-03256

SELECTIVE ANALYTICAL PARTITIONING OF SEDIMENTS TO EVALUATE POTENTIAL MOBILITY OF CHEMICAL CONSTITUENTS DURING DREDGING AND DISPOSAL OPERATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
J. M. Brannon, R. M. Engler, J. R. Rose, P. G. Hunt, and I. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 247, Price codes: A09 in paper copy, A01 in microfiche. Technical Report D-76-7, December 1976. 176 p, 24 fig, 70 tab, 107 ref, 3 append.

Descriptors: *Sediments, *Chemical analysis, *Dredging, Sampling, Analytical techniques, Chemicals, Ammonia, Nitrogen, Phosphorus, Iron, Manganese, Copper, Zinc, Nickel, Cadmium, Arsenic compounds, Water quality, Water pollution, Water pollution sources, Chemistry, *Dredged material disposal, Dredged materials.

When sediments are agitated by dredging and subsequent resuspension in water by discharge operations, there is a possibility that large amounts of some chemicals in the sediment could be released into the water column. To better understand the short- and long-term release effects of sediment resuspension on water quality, a functionally derived sediment selective extraction procedure was developed. The procedure explores the association of trace metals and other elements or compounds within sediments and their distribution among sediment phases of various stability and mobility. The effect of these sediment fractions or extractable phases upon water quality as indicated by the standard elutriate test and upon the relation of elutriate concentrations to these fractions was investigated thoroughly. The sediment chemical partitions studied in the selective extraction procedure were those dissolved or in solution in sediment interstitial water; sorbed on sediment mineral and organic material (exchangeable); occluded, co-precipitated, or bound within iron and manganese oxide and hydroxide partitions; bound in organic matter as complexes and compounds precipitated as sulfide salts; and occurring as an extremely stable residual partition in mineral crystalline lattices. Results of the sediment partitioning fractionation scheme showed that these operationally or functionally defined phases in a sediment could be isolated with good elemental mass balance and precision among the phases. This procedure was used on marine, estuarine, and freshwater sediments. (Sims-ISWS)
W78-03259

CHEMICAL ANALYSES FOR WATER POLLUTANTS: TRAINING MANUAL.
National Training and Operational Technology Center, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 260, Price codes: A08 in paper copy, A01 in microfiche.

Report No. EPA-430/1-75-013, November 1976. 155 p, 49 fig, 21 tab, 84 ref.

Descriptors: *Chemical analysis, *Pollutant identification, Acidity, Alkalinity, Phosphorus, Sediments, *Analytical techniques, Statistical methods, Oxygenation, Hardness(Water), Nitrogen, Carbon, Particulates, Winkler-azide method.

Information used by lecturers at the Environmental Protection Agency National Training and Operational Technology Center when presenting topics in Course 100.3, 'Chemical Analyses for Water Pollutants,' is presented. Areas covered include individual constituents found in water, e.g., dissolved oxygen and information useful to analysts, e.g., statistics. Theoretical concepts are given for acidity and alkalinity determinations, pH measurement, biochemical oxygen demand, dissolved oxygen, calcium and magnesium hardness determination, nitrogen analyses (ammonia, Kjeldahl, nitrate, nitrite), phosphorus determinations, total organic carbon analysis, and total solids determination. A section of laboratory procedures adapted for class groups is included describing the biochemical oxygen demand test (dilution technique), laboratory procedure for dissolved oxygen (Winkler-azide), determination of Kjeldahl nitrogen, determination of nitrate-nitrite nitrogen, and laboratory procedure for total solids, total hardness, phosphorus, acidity, and total alkalinity. (Wares-IPA)
W78-03261

SELECTED ASPECTS OF THE CONTROL OF TOXIC SUBSTANCES (A COMPILATION OF SPEECHES), BY THE MEMBERS OF THE STAFF OF THE OFFICE OF TOXIC SUBSTANCES.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W78-03263

EVALUATION OF A PROTOTYPE INSTRUMENT FOR DETERMINING PHOSPHORUS IN WATER,
Environmental Research Lab., Athens, GA.
T. B. Hoover, and J. M. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 234, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/4-76-033, October 1976. 18 p, 5 fig, 6 ref. Task 72 1BAO27; ROAP 16 ADN.

Descriptors: *Pollutant identification, *Phosphorus, *Spectrometers, *Water pollution, Chemical analysis, Rivers, Sewage, Prototype tests, Research and development, Evaluation, *Flame spectrometers.

A second-generation flame spectrometer for direct determination of phosphorus in water was evaluated. Response to phosphorus in the form of phosphoric acid is linear from 0.5 to 16 ppm phosphorus, and the relative standard deviation is approximately constant at 20% over the range. River water and municipal sewage effluent were analyzed after the addition of phosphoric acid and filtration through a series of microporous membranes. Recovery of the added phosphorus averaged 70% for river water and 95% for sewage effluent after treatment with cation exchange resin. There was no clear relation to filter pore size in the range 5 to 0.2 micrometers. Analyses of higher range EPA Nutrient Reference Samples agreed within one standard deviation with reference values, both for inorganic and total phosphorus. The lower concentration range samples gave barely detectable signals. The prototype flame spectrometer was found to require modification to achieve convenient, safe, and reliable operation in determination of phosphorus in water. (Wares-IPA)
W78-03264

FOREST VEGETATION AS A SOURCE OF BIOGENIC AND ORGANIC SUBSTANCES IN NATURAL INLAND WATERS,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5B.
W78-03265

SURVEY OF EQUIPMENT AND TECHNIQUES TO IDENTIFY AND QUANTIFY DISCHARGED HAZARDOUS CHEMICALS,
Battelle Columbus Lab., OH.
R. E. Heffelfinger.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 840, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. CG-D-87-76, 1976. 69 p, 6 fig, 7 tab, 1 ref, 2 append. Task No. 4415.1, DOT-CG-23223-A.

Descriptors: *Pollutant identification, *Water pollution, *Chemical analysis, *Analytical techniques, *Equipment, Coasts, Instrumentation, Water analysis, Hazards, On-site data collections, On-site investigations, On-site tests, On-site laboratories, Gas chromatography, Spectroscopy, Spectrophotometry, *Coast Guard, Infrared interferometry.

The results of reseach performed to determine equipment and techniques that may be utilized by the U.S. Coast Guard to identify and quantify hazardous chemical discharges via field-oriented equipment incorporated in a mobile unit are presented. The hazardous chemicals considered are those identified in the Coast Guard's Chemical hazardous Response Information System (CHRIS). The problem approach comprised four tasks: appropriate equipment and techniques were identified; the operational applicability of the equipment and techniques was correlated with generic groupings of chemicals; the most promising equipment and techniques were prioritized as infrared, gas chromatography, wet chemistry (ion selective electrodes, color test equipment, separatory equipment, hot plate, glassware), optical emission spectrography, and ultraviolet visible spectrophotometry; and finally, optional mixes were proposed and a design concept for a mobile laboratory was developed. These mixes were proposed on the basis of options relating to cost: (1) less than $100,000; (2) less than $500,00; (3) no limit; and (4) equipment availablity (infrared interferometry and helicopter deliverable laboratory). Results indicated that the first two cost options are achievable and workable, differing only in user convenience. Little addition benefit is achieved by the absence of a cost limit. The infrared interferometric approach was determined to be achievable, but only with considerable developmental effort. The helicopter-deliverable module was determined to be limited by the lack of availability of a light rugged structure to support necessary equipment. Equipment and techniques that will fit a mobile van laboratory and will provide for identification and quantification of CHRIS chemicals are recommended. The appendices present an evaluation matrix and an applicability matrix. (Wares-IPA)
W78-03266

PRE-SCREENING FOR ENVIRONMENTAL HAZARDS--A SYSTEM FOR SELECTING AND PRIORITIZING CHEMICALS.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03267

APPLICATION OF ESTIMATION THEORY TO DESIGN OF SAMPLING PROGRAMS FOR VERIFICATION OF COASTAL DISPERSION PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-03275

A SUMMARY OF THE TEST PROCEDURES AND OPERATIONAL DETAILS OF A DELAWARE RIVER AND AN OCEAN DUMPING POLLUTION MONITORING EXPERIMENT CONDUCTED AUGUST 28, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
W. D. Hypes, and C. W. Ohlhorst.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16465, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum No. NASA TM X-74005, February 1977. 42 p, 11 fig, 14 tab.

Descriptors: *Water pollution,control, *Monitoring, *Remote sensing, *Water quality control, Organic wastes, *Delaware River, Pollutant identification, *Outer Continental Shelf, *Ocean dumping, *Pollution monitoring, Acid wastes, Sea truth, Sensors, Pollution detection.

On August 28, 1975, two remote-sensor evaluation experiments were conducted. One experiment was conducted at the DuPont acid dump site off the Delaware coast. The second was conducted at an organic waste outfall in the Delaware River. The operational objective of obtaining simultaneous sea-truth sampling with remote-sensor overpasses was met. Descriptions of the test sites, sensors, sensor platforms, flight lines, sea-truth data collected, and operational chronology are presented. (Sinha-OFIS)
W78-03280

A PRELIMINARY TEST OF A GOVERNMENT-OWNED LOCAL AREA OIL ON WATER SURVEILLANCE SYSTEM,
Coast Guard Research and Development Center, Groton, CT.
J. R. White.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 541, Price codes: A04 in paper copy, A01 in microfiche. Report No. CG-D-121-70, June 1976. 70 p, 23 fig, 11 tab, 3 ref.

Descriptors: *Coasts, *Harbors, *Estuaries, *Water pollution control, New York, Thin films, *Pollutant identification, *Outer Continental Shelf, *Point sensors, *Pollution monitoring, *New York Harbor, Sensors, *Surveillance systems, Oil films.

A field test of three fixed site, oil on water point sensors was conducted in New York Harbor from September 1975 through March 1976. Over 2000 hours of strip chart recordings were analyzed to determine such items as, number of alarms for various threshold levels and time durations, effects of tidal fluctuations, effects of oil background levels, and sensor reliability. In addition, surface samples were obtained and analyzed to provide ground truth data. To be operationally desirable, the sensors comprising a local area surveillance system must unequivocally initiate an alarm in one circumstance only. That is the case when there is a surface oil film large enough to warrant cleanup, preventative measures, or legal action. The result of the Bayonne evaluation indicated that this criteria would be difficult to meet with two types of sensors evaluated. The problems of thin film sensitivity, threshold levels, and alarm time delays combine to raise serious questions to the practicability of employing point sensors in a widespread harbor monitoring system. It appears they would be more effective monitoring specific problem areas such as moored tankers or storm drain outfalls. (Sinha-OFIS)
W78-03281

MARKING THE SEA SURFACE WITH ARTIFICIAL SEA SLICKS AND FLUORESCENT DYES TO AID SEARCH AND RESCUE OR OCEAN DUMPING SURVEILLANCE OPERATIONS,
Naval Research Lab, Washington, DC.
W. R. Barger, and W. D. Garrett.

Available from the National Technical Information Service, Springfield VA 22161 as AD-A037 140, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Coast Guard Office of Research and Development Final Report No. CG-D-107-76, July 1976. 79 p, 15 fig, 5 tab, 15 ref, append. MIPR Z-70099-5-53378.

Descriptors: *Pollutant identification, *Monomolecular films, *Remote sensing, *Marking techniques, *Oil spills, Dyes, Surface waters, Pollution, *Pollution monitoring, *Sea markers, *Pollution detection, Ocean dumping, Uranine, Oil slicks.

A new technique of marking the ocean surface with monomolecular films in combination with dyes was studied in order to develop a practical sea marker which can be detected by airborne remote sensing devices in addition to visual observation. Monomolecular films of surface-active chemicals damp capillary waves on a body of water and can be used to make marks that are detectable day or night by radar. The area of damped waves is also visible to the eye even though the single-molecule-thick film itself is too thin to be seen. Since the film is so thin, a very small amount of material can be used to cover a large area on the surface with a detectable mark. Several water-soluble fluorescent dyes were examined, and uranine was chosed for use in the combined seamarker package. A prototype package for a hand-held marker which dispenses both dye and monolayer-forming chemicals was designed and tested in the field. Based on the laboratory and field data a series of mathematical equations was developed to approximate the shapes, sizes and lifetimes of monolayer slicks under different wind conditions. These equations allow the proper amount of monolayer-forming material to be chosen to make a mark of desired size of lifetime. Practical seamarkers using monolayer-film-forming chemicals in combination with water-soluble fluorescent dyes can be produced for marking objects or activities on the sea surface. The information in this report can be used to produce a dye/slick seamarking device tailored to a specific need. (Sinha-OEIS)
W78-03282

DETERMINATION OF THE ATMOSPHERIC CONTRIBUTION OF PETROLEUM HYDROCARBONS TO THE OCEANS,
World Meteorological Organization, Geneva, (Switzerland).
For primary bibliographic entry see Field 5B.
W78-03285

ANALYSIS OF CHLORINATED COMPOUNDS IN BLEACH PLANT EFFLUENTS (ANALYS AV KLORERADE FORENINGAR I BLEKERIAVLOPPSVATTEN),
Goteborg Univ. (Sweden).
B. Josefsson, and A. Bjorseth.
Nordforsk Miljovardssekretiariatet Publikation No. 2, p 103-112, 1976. 1 fig, 12 ref, 4 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Neutron activation analysis, Wastes, Industrial wastes, Analytical techniques, Chemical analysis, Pulp wastes, Chlorine, Chlorination, Water pollution sources, Pulp and paper industry, Effluents, Pollutant identification, Kraft mills, Sulfite pulp mills.

The mechanism of chlorination (bleaching) of pulp is reviewed, along with the bleaching-effluent composition and specific chlorinated compounds. Neutron activation analysis was used to show the presence of extractable chlorinated compounds of both a nonpolar and a phenolic nature in the bleaching effluents of both kraft and sulfite pulp mills. Total chlorine concentrations ranged from 0.2 to 3.8 ppm. (Speckhard-IPC)
W78-03304

COMPOSITION OF SPRUCE SULFATE PULP BLEACHING EFFLUENTS (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Papir a Celuloza, Vol. 32, No. 5, p V12-V15, 1977. 3 fig, 12 ref, 4 tab. English summary.

Descriptors: *Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, *Pulp wastes, Pulp and paper industry, Effluents, Chlorides, Chemical oxygen demand, Biochemical oxygen demand, Color, *Waste identification, Chemical properties, *Kraft mills, Spruce trees.

Kraft pulps with a Kappa-number of 31.9, 39.5, and 55.4 were prepared and bleached in the laboratory, using the CEHDED sequence. For each pulp, the filtrates after individual bleaching stages were collected and analyzed for chlorides, COD, 5-day BOD, and color. With pulp of higher unbleached kappa-number the pollution load generated during bleaching increased. Depending on the unbleached pulp kappa-number, chlorides ranged from 104.02 to 128.44 kg/ton, COD (chromate method) from 74.04 to 130.54 kg/ton, BOD from 11.14 to 21.74 kg/ton, and color from 171.57 to 299.88 kg/ton (platinum method). The highest portion of the pollution load originated from the alkaline extraction stage. (Trubacek-IPC)
W78-03309

IDENTIFICATION AND REMOVAL OF TOXIC MATERIALS FROM KRAFT AND GROUNDWOOD PULP MILL EFFLUENT,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W78-03311

CORRECTION FACTOR FOR ANTHRONE CARBOHYDRATE IN COLORED WASTE WATER SAMPLES,
University of Western Ontario, London.
A. Leduy, N. Kosaric, and J. E. Zajic.
Water Pollution Research Canada, Proceedings 10th Canadian Symposium, 1975, p 126-131. 5 fig, 3 ref, 1 tab.

Descriptors: *Waste water(Pollution), *Carbohydrates, *Sulfite liquors, *Spectrophotometry, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Color, Pulp and paper industry, Effluents, Waste dilution, Analytical techniques, Organic compounds, *Pollutant identification, Spent sulfite liquors.

Spectrophotometric determination of total carbohydrate in waste water samples by anthrone reagent is a simple and rapid method for following the utilization of substrate and hence the reduction in 5-day BOD during biological treatment with chemoheterotrophs. However, for colored waste water samples or treatment plant effluents, a correction factor was found necessary to compensate for color interference. Studies were conducted on various spent sulfite liquors (ammonium, calcium, magnesium, sodium, and mixed base) with a wide range of colors from creamy to black. The correction factor was calculated from the deviation of the standard calibration curves of glucose with and without the presence of spent sulfite liquor. These correction factors depended both on the nature and on the amount of spent sulfite liquor present. Within the practical dilution range of various spent sulfite liquors for the determination of total carbohydrate, the correction factors varied from 15 to 40%. In all spent sulfite liquor samples, the correction became more significant at higher concentrations of spent liquor in the solution. Spectrophotometric studies of spent sulfite liquor at various concentrations within the visible range led to the development of an empirical equation expressing color as a function of solvent (water) color and spent liquor dilution, critical dilution, and chromatic index. (Speckhard-IPC)
W78-03321

THE ACCUMULATION OF 90 SR BY FRESHWATER PLANTS IN BODIES OF WATER OF THE STEPPE ZONE OF THE UKRAINIAN SSR, (IN RUSSIAN),
Dnepropetrovskii Gosudarstvennyi Univ. (USSR). Research Inst. of Biology.
T. A. Murzina, I. P. Lubyanov, and A. M. Chaplina.
Gidrobiol Zh 12(6), p 76-80, 1976.

Descriptors: *Strontium-90, Aquatic plants, *Bioindicators, *Pollutant identification, Calcium, *Chara-Sp, *Myriophyllum-spicatum, *Potamogeton-perfoliatus, *USSR(Ukranian SSR).

Freshwater plants in several bodies of water in the Ukrainian SSR (USSR) were capable of accumulating 90 Sr in concentrations 10-100 times the 90 Sr level in the water. The accumulation coefficient was a function of species and ecological specificity (high in submerged plants, low in semisubmerged), the seasons (increase from spring to summer, decrease in fall), and the water Ca level (higher Ca concentrations were accompanied by lower 90 Sr accumulation levels). Of the studied plant species, Potamogeton perfoliatus, Myriophyllum spicatum and especially Chara sp. can be recommeded as bioindicators of 90 Sr pollution.--Copyright 1978, Biological Abstracts, Inc.
W78-03334

MERCURY DISTRIBUTION IN SOIL AROUND A LARGE COAL-FIRED POWER PLANT,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W78-03418

MONITORING HEAVY METALS AND PESTICIDES IN THE CAPE FEAR RIVER BASIN OF NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
F. K. Pfaender, M. S. Shuman, H. Dempsey, and C. W. Harden.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 703, Price codes: A08 in paper copy, A01 in microfiche. North Carolina Water Resource Research Institute, Raleigh, UNC-WRRI Report No. 126, October 1977. 151 p, 16 fig, 22 tab, 130 ref, 2 append. OWRT A-073-NC(2), 14-31-0001-5033.

Descriptors: *Metals, *Heavy metals, *Trace elements, Ion exchange, Adsorption, Analytical techniques, Chromium, Cadmium, Copper, Mercury, Zinc, Lead, Monitoring, *Pollutant identification, *Path of pollutants, Pesticides, Pesticide residues, *Trace metals, Resins, *Haw River(NC), *North Carolina, *Cape Fear River(NC).

A research effort to examine new methods for monitoring heavy metals and pesticides in natural waters of North Carolina was undertaken. The methods developed were applied to a monthly sampling of the Cape Fear River Basin. The heavy metals (chromium, cadmium, copper, lead and zinc) monitoring technique was based upon the field application of cationic and anionic ion exchange resins to examine various species of the metals. Macroreticular XAD resins were used to concentrate the pesticides, atrazine, DDT (DDE, DDD), diuron, methyl parathion and trifluralin, from water. Monthly samples from 10 sites in the Cape Fear River Basin indicated that anionic chromium species were present at all sites except the farthest upstream (indicating anthropogenic inputs), that metal concentrations generally decrease as the water flows downstream, and that

there were no evident correlations between metal concentrations and flow or rainfall. Cr, Cu and Cd appear to come principally from industrial and municipal sources, while Zn and Pb appear to have non-point source origins. Only Pb values at two stations exceeded the EPA maximum values for public water supply. Zn, Cd, and Cr exceeded proposed minimal risk values. Trifluralin was the most commonly observed pesticide compound present in 97% of the samples. Atrazine, although present in only 42% of the samples represents the pesticide present in highest concentration and transported in greatest quantity in the water. DDT, DDE and methyl parathion were also commonly detected, with diuron less frequently encountered. (Kiger-NC State)
W78-03426

DEVELOPMENT OF SUSPENDED SOLIDS QUALITY CONTROL AND PERFORMANCE EVALUATION SAMPLES,
Weston (Roy F.), Inc., West Chester, PA.
E. L. Stover, and P. J. Marks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 250, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/4-76-052, October 1976. 39 p, 2 fig, 11 tab, 14 ref. 1H0621, 68-03-2333.

Descriptors: *Pollutant identification, *Monitoring, *Quality control, *Water quality standards, Calibrations, Performance, Solid wastes, Suspended solids, Water pollution sources, Coals, Sampling, Rayon, Fuller's earth.

A two-phase study was conducted to develop a synthetic suspended solids sample for use as quality control check and performance evaluation within environmental monitoring laboratories. The first phase consisted of a feasibility study to determine compounds that exhibited the optimum physical and chemical properties for synthetic suspended solids samples and the second phase involved production of suspended solids samples in individual containers. Considerations of such factors as solubility, wettability, dispersion, flocculation, abrasion, biodegradability, stability, and subsampling recovery resulted in the selection of anthracite coal, Fuller's earth, and rayon fibers as solids materials for suspended solids quality control samples. A total of 10,000 quality control samples, each consisting of one of three specified weights of one of these three compounds, was packaged in individual containers. It was concluded that precision and accuracy obtainable in the suspended solids test depend, within limits, on the specific gravity and particle size of the solids. Also, the accuracy of the subsampling step is dependent to some degree upon the dispersion characteristics of the suspended solids in the sample. Recommendations to minimize variability in quality assurace data and to evaluate analytical results are included. (Wares-IPA)
W78-03450

EVALUATION OF INSTRUMENT FOR THE DETERMINATION OF PHENOL IN WATER,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
L. S. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 936, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-76-048, September 1976. 34 p, 9 fig, 7 tab, 47 ref, 1 append. 1HA-323-JBA-027, R-803172-01.

Descriptors: *Pollutant identification, *Instrumentation, *Phenols, *Spectrometer, Pollutants, Analytical techniques, Water pollution, Methodology, Sampling, Bathymetry, *Spectra PH-2 Phenol Instrument, 4-AAP method, Bathochromic shift, Phenolic compounds.

The Spectra Product's PH-2 Phenol Instrument (ultraviolet spectrophotometer), designed specifically for the determination of phenolic compounds in water and wastewater, was evaluated for applicability to water pollution assay. The analytical procedure is based on the measurement of the bathochromic shift that occurs with phenol when pH of the solution is changed from pH 4 to pH 12. The method allows for the rapid, sensitive, and reproducible analysis of phenols. The time of a single analysis exclusive of any distillation that may be necessary, is less than five minutes. Results of evaluation show than the determination of phenols in water can be otained with an accuracy of plus or minus 5% in the range of 50 ppb to 50 ppm and with an accuracy of plus of minus 12% in the range of 5 ppb to 50 ppb. The results of the evaluation were based on analysis of variety of synthetic samples of phenol and of substituted phenols and their mixtures, and of real samples from a number of sampling site in the local area. It was concluded that the pH-2 instrument gives more precise results than 4-AAP methods and can be used to detect para substituted phenols, but as with the 4-AAP method the pH-2 instrument method cannot be used to detect all substituted phenols quantitatively. (Wares-IPA)
W78-03452

PRECIPITATION PRODUCTS IN THE FE(II) AND TRISODIUM-PHOSPHATE SYSTEM AT PH 2.5-13.0, (IN GERMAN),
Goettingen Univ. (West Germany). Abt. Oekochemie.
For primary bibliographic entry see Field 5F.
W78-03454

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II - FINAL REPORT (APPENDIX, LISTING OF REFERENCES),
Stanford Research Inst. Menlo Park, CA.
S. L. Brown, F. Y. Chan, J. L. Jones, D. H. Liu, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 165, Price codes: A10 in paper copy, A01 in microfiche. Report No. NSF-RA-E-75-190E, April 1975. 214 p, 2,363 ref. SRI ECU-3386.

Descriptors: *Chemical properties, *Environmental effects, Physical properties, Biological properties, Chemical industry, Hazards, Public health, Chemicals, *Bibliographies, Pharmacology, Toxicology.

The fifth volume of a report on the study of 80 chemicals, identified as having the greatest potential for environmental effects, contains a listing of the references for the data collected and general notes describing the data. Information was collected on the extent of the exposure of the environment to these chemicals (during manufacture and use) and on the possible environmental effects of this exposure (chemical, physical, and biological properties, persistence, and toxicity). A questionnaire survey of industry was conducted to determine the amount and types of losses in the manufacturing plants, and survey information was tabulated. Summary reports, submitted for each chemical included flow diagrams showing industrial data on the amounts used for various applications, assessment of data gathered on toxicology and environmental persistence, computer printout of a tabular summary of important data gathered, and copies of 25 most pertinent abstracts found on toxicology. Numbered references list the author, publication, date of publication, and chemical substance(s) discussed therein. (Wares-IPA)
W78-03456

USER HANDBOOK FOR THE ALLOCATION OF COMPLIANCE MONITORING RESOURCES,
Systems Control, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5G.
W78-03458

GRAND TRAVERSE BAY LIMNOLOGICAL DATA,
Michigan Univ., Ann Arbor. Sea Grant Program.
For primary bibliographic entry see Field 2H.
W78-03488

THE EFFECT OF SLUDGE DIGESTION ON VIRUS INFECTIVITY,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
For primary bibliographic entry see Field 5C.
W78-03517

A NEW MODEL OF PLANKTON DREDGE FOR COLLECTING SAMPLES OF WATER AND PLANKTONIC ORGANISMS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 7B.
W78-03524

GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC IDENTIFICATION OF PHENOLS AND AROMATIC ACIDS IN RIVER WATERS,
Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
G. Matsumoto, R. Ishiwatari, and T. Hanya.
Water Research, Vol. 11, No. 8, p 693-698, 1977. 7 fig, 2 tab, 21 ref.

Descriptors: *Analytical techniques, *Phenols, *Pollutant identification, *Gas chromatography, *Mass spectrometry, Solvent extractions, Separation techniques, Aromatic compounds, Path of pollutants, Water pollution sources, Rivers, Industrial wastes, Municipal wastes, Waste water disposal.

The presence of phenols and aromatic acids in the Tama and Sumida Rivers in Tokyo, Japan, was investigated in laboratory experiments with gas chromatography-mass spectrometry. Water samples were subjected to ethyl acetate extraction and silica gel column chromatography. Separation procedures used for the analysis of phenols and aromatic acids are described. Analyses indicated that the ratio of ethyl acetate extracts to total organic matter was about 10% for each river water sample. Phenols and aromatic acids identified in the Tama River included: pentachlorophenol, phthalic acid, trimesic acid, p-hydroxybenzoic acid, vanillic acid, syringic acid, p-coumaric acid, ferulic acid, bisphenol A, o-hydroxybenzoic acid, and m-hydroxybenzoic acid. All of these compounds except p-courmaric acid, ferulic acid, and bisphenol A were detected in the Sumida River. Possible sources are hypothesized for each of the compounds. It is suggested that pentachlorophenol, bisphenol A, and phthalic acid are probably industrial in origin, while phenolcarboxylic acids probably originated from lignin-like matter and urine. (Schulz-FIRL)
W78-03560

ULTRASONIC SLUDGE DIP STICK.
Water Services, Vol. 81, No. 978, p 526-527, August, 1977.

Descriptors: *Automation, *Monitoring, *Settling basins, *Ultrasonics, *Equipment, Electronic equipment, Analytical techniques, Remote control, Separation techniques, Sludge treatment, Municipal wastes, Industrial wastes, Waste water treatment.

The USP 10 ultrasonic sludge level meter has been produced by Krohne Measurement and Control Ltd. of Moulton Park, England. A probe which contains an ultrasonic transmitter/receiver is suspended from a fixed cabinet in the sludge settling tank. The strength of pulses returned by a reflector connected to the probe is proportional to the position of the sludge interface, with pulses

being weaker when absorption by suspended solids is at its maximum. The probe measuring depth range is 1-10 m and the probe can be raised and lowered automatically or manually. The probe can be positioned to correspond to suspended solids contents of 0.3-10%, and indication of the probe depth is available. The probe can be moved at a speed of 0.66 m/min. With the use of two limit switches, the input of raw material and the extraction of clear water and sludge can be controlled. (Schulz-FIRL)
W78-03561

SEROLOGICAL TYPING AND CHLORINATION RESISTANCE OF WASTEWATER CYANOPHAGES,
Virginia Commonwealth Univ., Richmond. School of Dentistry.
J. L. Stanley, and R. E. Cannon.
Journal Water Pollution Control Federation, Vol. 49, No. 9, p 1993-1999, September, 1977. 2 fig, 2 tab, 15 ref.

Descriptors: *Bioindicators, *Viruses, *Cyanophyta, *Algae, *Path of pollutants, Analytical techniques, Microorganisms, Disinfection, Chlorination, Bioassay, Sewage bacteria, Pollutant identification, Effluents, Waste water treatment.

The chlorine resistance of waste water-isolated cyanophages and their ecologic distribution according to serological typing were evaluated with regard to the use of LPP-cyanophages as possible indicators of animal viruses and coliforms in waste water. Samples of waste water were collected on a biweekly basis from the inflow, following primary settling tanks, following trickling filtration, and after chlorination of LPP-cyanophages and Plectonema boryanum, a species of filamentous blue-green algae which is attacked by LPP-cyanophages, were measured. Cyanophages were observed in waste water on a year-round basis, with a decline during the winter months attributed to a decline in the cyanophage host algae. Studies on inactivation of stock cyanophages and cyanophages isolated from waste water indicated that the latter were much more resistant to chlorination. Since cyanophages also appear to be more resistant to chlorination than enteric viruses, cyanophage monitoring is suggested as an inexpensive, reliable, simple method of testing for viral and bacterial contamination. (Schulz-FIRL)
W78-03562

HOW RELIABLE IS INSTRUMENTATION IN WASTEWATER APPLICATIONS,
Raytheon Co., Portsmouth, RI.
A. E. Molvar, R. H. Babcock, J. F. Roesler, and R. H. Wise.
Instruments and Control Systems, Vol. 150, No. 10, p 29-33, October, 1977. 1 tab.

Descriptors: *Monitoring, *Automation, *Flow meters, *Analytical techniques, *Equipment, Dissolved oxygen analyzers, Hydrogen ion concentration, Water analysis, Chemical analysis, Waste water treatment.

Measurement principles, potential applications, operating characteristics, and user's experiences are discussed for analytical sensors, transducers, and monitoring devices observed during a survey of 50 waste water treatment plants. Data presented for instrument operating experiences include variable, type of instrument, applications, typical cost, mean time between failures, typical life expectancy, and maintenance requirements in terms of frequency/hr, maintenance-hrs/yr, and skill level. Types of instruments discussed include level-measuring devices, flow meters, wet chemical analyzers, sludge density meters; and pH electrodes. Monitors for TOC, COD, TOD, DO, residual chlorine, chlorine gas, flammable gas, and turbidity are also evaluated. (Schulz-FIRL)
W78-03563

STUDY OF POLYSACCHARIDES IN ACTIVATED SLUDGE MUCILAGE (ETUDE DES POLYOSIDES DU MUCILAGE DES BOUES ACTIVEES),
Institut National de la Recherche Agronomique, Villeneuve d'Ascq (France). Station de Technologie Alimentaire.
For primary bibliographic entry see Field 5D.
W78-03565

DISSOLVED SOLIDS IN WASTEWATER,
Connecticut Univ., Stors.
For primary bibliographic entry see Field 5B.
W78-03567

VENTURI FUMES AND REQUIREMENTS FOR MEASUREMENTS TECHNIQUES FOR EXACT MEASUREMENTS OF QUANTITIES OF WASTE WATER VENTURIKANAELE UND MESSTECHNISCHE ANFORDERUNGEN FUER GENAUE ABWASSERMENGEN),
Zuellig A. G., Rheineck (Switzerland). Apparatebau fuer die Wasserwirtschaft.
H. Zuellig.
Wasser, Energie, Luft, Vol 69, No 5, p 111-115, 1977. 9 fig, 4 ref.

Descriptors: *Venturi meters, *Venturi flumes, *Flowmeters, *Flow measurement, *Hydraulic structures, Water measurement, Monitoring, Instrumentation, Gages, Flow rates, Waste water treatment.

Venturi flumes and flow measurement techniques are described with respect to waste water flow measurements at treatment facilities. Venturi flumes with U or hexagonal profile and parabolic or trapezoidal throat are best for exact measurements, especially at low flow velocities. The required accuracy of the flow measurement (+ or - 0.25% of the end value) can be achieved by the air bubble or sonic depth finder methods. (Takacs-FIRL)
W78-03569

DETERMINATION OF HEAVY METALS IN SEWAGE-BASED FERTILIZER USING SHORT-LIVED ISOTOPES,
Surrey Univ., London (England). Dept. of Physics.
A. Egan, and N. M. Spyrou.
Journal of Radioanalytical Chemistry, Vol. 37, No. 2, p 775-784, 1977. 3 tab, 18 ref.

Descriptors: *Pollutant identification, *Neutron activation analysis, *Analytical techniques, *Heavy metals, *Radioisotopes, *Irradiation, Data processing, Computer programs, Chemical analysis, Sewage, Fertilizers, Industrial wastes, Municipal wastes, Metals, Waste water treatment.

A fully instrumental method of neutron activation analysis is presented for use in the analysis of heavy metals present in sewage sludge. Objectives of the project under which the procedure was devised included the development of a means of analysis based on a fixed experiment time per sample, non-destructive irradiation and count, fully instrumental data collection, standard computing procedure, absolute determination of microgram quantities, and accuracy compatible with sampling uncertainties. The method which was developed is based on short-lived isotopes and requires a total experiment time of 1 hr per sample. Cyclic irradiation based on period of radiation to measure 207 Pb (T=0.8s) was used to activate the samples. Gamma ray spectral data obtained by the Ge(Li) detectors were transferred to magnetic tape and analyzed by the SAMPO spectral analysis program. Modifications to the SAMPO program included the addition of an IDENTIFY subroutine which included a library of peaks for identification followed by a quantitative determination of the mass of the target element, eliminating the need for standards. Sample and standard preparation, irradiation and counting conditions, sensitivities and detection limits, and data-processing methods are presented. (Schulz-FIRL)
W78-03571

PHOTOMETRIC DETERMINATION OF TOTAL PHOSPHATE WITH HYDRAZINE-MOLYBDIC ACID REAGENT (PHOTOMETRISCHE BESTIMMUNG DES GESAMTPHOSPHATS MIT HYDRAZIN-MOLYDAENSAEURE-REAGENZ),
Stadt Dusseldorf (West Germany). Chemisch-Biologische Lab.
A. Beyer.
Gas- und Wasserfach, Wasser-Abwasser, Vol. 118, No. 7, p 327-332, 1977. 6 tab, 5 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Photometry, *Phosphates, *Water analysis, *Chemical reactions, Chemical analysis, Phosphorus, Hydrolysis, Waste water treatment.

A photometric method for the determination of the total phosphate content in water is described. After treatment with sulfuric acid, the condensed phosphoric acid is hydrolyzed to orthophosphoric acid by boiling with distilled water. The acid is neutralized, and a 40-ml sample is successfully combined with 1 ml of 2% citric acid and 9 ml of hydrazine sulfate-molybdic acid reagent. The flask is heated in a boiling water bath for 30-60 min to develop the colored complex. The extinction is measured at room temperature against a blank sample of distilled water treated in the same manner. The method permits the accurate and reproducible determination of 4-260 micrograms PO(4) per 40 ml. Heavy metal ions and silicic acid do not falsify the results. Chromate reduces the readings at concentrations of about 15 mg/liter and over. Sulfuric acid up to 0.25 g/40 ml has no influence on the result. Nitrate has to be destroyed when present in concentrations exceeding 2.5 mg/liter. (Takacs-FIRL)
W78-03572

POLLUTION MONITORING WITH TOTAL ORGANIC CARBON ANALYSIS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineering.
R. L. Chandler, J. C. O'Shaughnessy, and F. C. Blanc.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2791-2803, December, 1976. 11 fig, 2 tab, 4 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Water analysis, *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon, Organic compounds, Monitoring, Water pollution control, Effluents, Municipal wastes, Industrial wastes, Waste water treatment.

A TOC analyzer which oxidizes organic carbon in the sample to CO2 and then reduces the CO2 to CH4 was used in experiments to evaluate the use of TOC as an indirect measure of BOD and COD in domestic and industrial waste water treatment and river quality monitoring. Correlations between BOD, COD, and TOC are described. Experiments with municipal waste water indicated that there was a significant correlation between 5-day BOD and TOC for samples from a specific location within a treatment process. In general, the correlation between TOC and 5-day BOD in domestic secondary effluents was greater than the relationship between TOC and COD. Regression equations for nitrification-inhibited and noninhibited 5-day BOD yielded values which were significantly different at the 0.10 level. Analysis of TOC measurements is also suggested to evaluate activated carbon for advanced waste water treatment, to monitor substrate-removal batch-treatibility studies, and to monitor industrial waste water for fluctuations in strength. The correlation between 5-day BOD and TOC in river water was significant at the 0.01 level, although this decreased as the river approached higher flow conditions. TOC

measurements are reported as unaffected by a sample storage period of 1 wk, provided the samples are acidified, capped, and refrigerated. (Schulz-FIRL)
W78-03574

A MERCURY-FREE ACCELERATED METHOD FOR DETERMINING THE CHEMICAL OXYGEN DEMAND OF LARGE NUMBERS OF WATER SAMPLES BY AUTOCLAVING THEM UNDER PRESSURE WITH ACID-DICHROMATE,
National Swedish Environment Protection Board, Uppsala (Sweden). Algal Assay Lab.
S-O. Ryding, and A. Forsberg.
Water Research, Vol 11, No 9, p 801-805, 1977. 2 fig, 2 tab, 10 ref.

Descriptors: *Analytical techniques, *Water analysis, *Chemical oxygen demand, *Pollutant identification, Water pollution control, Monitoring, Sampling, Chemical reactions, Effluents, Waste water treatment.

A simplified colorimetric method for measuring COD in waste water effluents and receiving waters was developed in response to a program initiated in 1972 by the National Swedish Environment Protection Board to assess the effects of tertiary treatment on receiving waters. The RR method, named for a Swedish abbreviation for the words waste water treatment plant and receiving body of water, has been adapted for use with either waste water or fresh water with a detection range of 10-300 and 10-100 mg 02/liter, respectively. Details of the apparatus, reagents, and procedure are presented. Reagents include potassium dichromate, sulfuric acid, silver sulfate, ferrous ammonium sulfate, and a ferrion indicator solution. The method requires small sample and reagent volumes of 1.0 and 2.0 mls, respectively, and does not require mercury. The procedure includes the rapid addition of amixture of all the reagents to the sample and auto-claving for 1 hr in flasks fitted with glass stoppers. Titration of the excess dichromate with ferrous ammonium sulfate and the ferrion indicator is used to calculate the COD from dichromate. Parallel analyses with the RR method and KMn04 consumption of 318 samples from 14 waste water receiving lakes yielded a correlation coefficient (r) of +0.90. Possible interference is presented by chloride at concentrations greater than 1 g/liter. (Schulz-FIRL)
W78-03577

IDENTIFICATION OF END PRODUCT RESULTING FROM OZONATION AND CHLORINATION OF ORGANIC COMPOUNDS COMMONLY FOUND IN WATER,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
P. P. K. Kuo, E. S. K. Chian, and B. J. Chang.
Environmental Science and Technology, Vol 11, No 13, p 1177-1181, December, 1977. 7 fig, 4 tab, 22 ref.

Descriptors: *Pollutant identification, *Organic wastes, *Chlorination, *Ozone, Chemical reactions, Chemical wastes, Municipal wastes, Reverse osmosis, Effluents, Ultraviolet radiation, Waste water treatment, Analytical technique, Water analysis, Oxidation.

Chlorination of the humic acid materials in the ultra-filtration (UF) retentate and of the fulvic acid materials in the reverse osmosis (RO) retentate of secondary effluents can result in the formation of potentially toxic halogenated organics. Studies were conducted on the effects of ozonation with and without ultraviolet irradiation on 2-propanol, acetic acid, and oxalic acid. These compounds have been identified as poorly removed by RO and activated carbon in municipal waste water treatment. Further studies examined the formation of volatile halogenated organics during chlorination and ozonation of the UF and RO retentates of municipal secondary effluent. The ozonation studies indicated that 2-propanol was oxidized to acetone which was, in turn, oxidized to acetic and oxalic acids. Ozonation of acetic acid yielded glyoxylic and oxalic acids. Ultraviolet irradiation significantly enhanced the removal of organics during ozonation, increasing the rate constant for organic carbon removal by a factor of 8 for 2-propanol and by a factor of 6 for acetic acid. Volatile halogenated organics detected in the chlorinated UF and RO retentates included: methylene chloride, chloroform, carbon tetrachloride, bromodichloromethane, chlorodibromomethane, and bromoform. (Schulz-FIRL)
W78-03578

CHEMICAL MONITORING OF SEWAGE SLUDGE IN PENNSYLVANIA,
Pennsylvania Agricultural Experimental Station, University Park.
W. T. Doty, D. E. Baker, and R. F. Shipp.
Journal of Environmental Quality, Vol 6, No 4, p 421-426, October-December, 1977. 1 fig, 1 tab, 26 ref.

Descriptors: *Monitoring, *Sampling, *Fertilizers, *Heavy metals, *Chemical analysis, Cadmium, Zinc, Copper, Zinc, Lead, Chromium, Food chain, Sludge disposal, Treatment facilities, Municipal wastes, Effluents, Waste water treatment, Waste water disposal.

A one-year sampling program of sewage from six Pennsylvania cities was initiated to determine the sampling procedures required for the chemical monitoring of sewage sludge destined for land application. The program emphasized techniques required for a municipal waste water treatment plant which treated combined domestic and industrial wastes. Bi-weekly samples were collected at each plant and analyzed for solids, total-N, NH4-N, P, K, Na, Ca, Mg, Al, Fe, NO3-N, Mn, Cd, Co, Cr, Cu, Ni, Pb, Zn, and pH. The data revealed that sewage sludge from every treatment plant varied significantly over time with respect to almost every composition variable. The differences in solid concentrations were greater between the different plants than the material from any given plant. In general, solids concentrations varied inversely with respect to changes in total-N. Although the variation in sludge composition was significant with respect to time, no seasonal trends were observed. Since the nitrogen concentration in sludge from all plants ranged from 1-36% of the dry solids and phosphorus ranged from 1-6%, the prediction of the fertilizer value of the sludge was considered impossible without continuous chemical analysis. Heavy metal concentrations, particularly Cd, were considered the limiting factor in the feasibility of land application of the sludge since only 35% of the sludges analyzed were acceptable for application to cropland and 25% were in ranges which could adversely affect crop composition and the food chain. (Schulz-FIRL)
W78-03579

LEAK TESTING WITH DYED LIQUID TRACERS,
Shannon-Glow Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-03580

COMPARISON OF MEMBRANES FOR FECAL COLIFORM RECOVERY IN CHLORINATED EFFLUENTS,
Illinois State Water Survey, Peoria. Water Quality Section.
S. D. Lin.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2255-2265, November, 1977. 4 tab, 21 ref.

Descriptors: *Membrane processes, *Analytical techniques, *Coliforms, *Sewage bacteria, *Chlorination, Disinfection, Filtration, Membranes, Water analysis, Effluents, Waste water treatment.

Various membrane-based techniques have been proposed for the enumeration of fecal coliforms in waste water effluents. Ten varieties of commercially available membranes were tested for their ability to recover fecal coliforms from chlorinated effluents. Grab samples of secondary and tertiary effluents were obtained from five Illinois waste water treatment plants. Statistical analyses of fecal coliform data obtained with the ten membranes revealed significant differences in performance. Membrane capabilities fell into four groups, with greater differences in fecal coliform recovery occurring between groups than within a group. The Millipore HC, Gelman GN-6, and Sartorius SM 138 06 (green) membranes yielded the highest fecal coliform recovery in chlorinated effluents, while the J-M radiation membrane gave the lowest recovery. Colony size also varied with respect to membrane type, with the Nuclepore membrane yielding the largest colonies. An average of 93.2% of the 1002 blue colonies isolated from all the filters was verified. Membrane characteristics and previous studies on factors which influence membrane performance are discussed. (Schulz-FIRL)
W78-03581

STRONTIUM-90 CONCENTRATIONS IN THE BOTTOM BRINE AND SEDIMENTS OF LAKE SIVASH AS DEPENDENT ON THE HYDROCHEMICAL ENVIRONMENT, (IN RUSSIAN),
V. P. Barannik, V. A. Zhorov, and V. N. Markelov.
Okeanologiya 16(6), p 995-1001, 1976.

Descriptors: *Strontium-90, *Lake sediments, *Bottom brine, Radioisotopes, *Radioactivity, Pollutant identification, Ions, Salinity, Sulfates, *USSR(Sivash Lake).

The bottom brine and sediments from the eastern Sivash Lake (USSR) were analyzed for the basic components, 90 Sr and total beta activity. 90 Sr accumulated in the bt tom brine due to the formation of soluble Sr complexes as salinity increased to 6.6%. At Greater than or equal to 6.6% salinity, sulphates of Group II precipitate and carry part of 90 Sr into the sediments. Total activity is maximal in the sediments from the South Strait, whereas southward and northward, it is lower. A correlation was found between the content of SO 42- and total beta activity. --Copyright 1978, Biological Abstracts, Inc.
W78-03611

WATER MONITOR SYSTEM: PHASE I TEST REPORT,
National Aeronautics and Space Administration, Houston, TX. Lyndon E. Johnson Space Center.
R. E. Taylor, and E. L. Jeffers.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-13909, Price codes: A06 in paper copy, A01 in microfiche. Report No. NASA TM X-58179, JSC-11020, October 1976. 115 p, 27 fig, 10 tab, 11 ref, 1 append. 644-02-01-41-72.

Descriptors: *Pollutant identification, *Utilities, *Effluents, *Water quality standards, *Sampling, *Monitoring, *Waste water treatment, Waste water(Pollution), Water reuse, Analytical techniques, Chemical analysis, Bioassay, Sensors.

Wastewater recycling and reuse will become a common practice in the future. Because of spacecraft developments in these areas, NASA can contribute to solutions related to wastewater. NASA's commitment to an integrated utility system for power generation, water processing, waste management, and use of residual energy for utility functions led to a program to develop a water monitoring system (WMS). The WMS was

developed on the premise that successful reclamation in integrated utility systems or community treatment facilities is dependent on adequate and timely verification of water quality. The application of the WMS has been modestly scaled for early use as an effluent monitor in wastewater reclamation. Initially is was decided that 25 sensors would be required for effluent monitoring and that 25 parameters can provide a final water quality definition at a treatment plant outfall. This report describes the WMS, the assembly and test of a breadboard system at the Johnson Space Center, and an on-line real-time feasibility demonstration through monitoring and data collection in the wastewater treatment facility. Recommendations are to develop additional automation, reduce susceptibility to contamination, improve reliability of fluid flow to the sensors, reduce biosensor conditioning, upgrade total water quality determination, and use commercial digital incremental recorders in the data acquisition system. The final phase of the program will be system demonstration in a community wastewater treatment installation. (Wares-IPA)
W78-03663

DISCRIMINATION OF PARTICULATES FROM OIL IN CONTAMINATED WATER UTILIZING THE ANGULAR INTENSITY DISTRIBUTION OF SCATTERED LIGHT,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
B. Friedman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 261, Price codes: A02 in paper copy, A01 in microfiche. Research and Development Report No. MAT-76-23, December 1976. 9 p, 6 ref. 2862-164, Task 17509.

Descriptors: *Oil wastes, *Analytical techniques, *Oil pollution, *Pollutant identification, Water pollution, Analysis, Monitoring, Mathematical studies, Mathematical models, *Light scattering technique, *Particulate discrimination, Angular intensity.

A major difficulty in the utilization of light-scattering techniques for the accurate determination of the concentration of oil in water is interference due to the presence of particulate matter. The question which this report addresses is whether or not measurements of the angular-intensity distribution of scattered light can be used to discriminate between particulates and oil in water and thus eliminate such interference. In the mathematical model studied, it was assumed that the oil present consisted predominantly of free-floating transparent spheres, that particles and spheres are illuminated by a beam composed of parallel rays of light, and that the particles and spheres are larger than a few wavelengths of the monochromatic light used. When these size conditions hold for a system of particles having a range of sizes, the combined light scattering can be treated approximately as a combination of classical diffraction and geometrical transmission and reflection, allowing computational simplification. Since both the surface of a sphere and a random assembly of irregular particle surfaces offer about equal probabilties of diffraction, reflection, and refraction, it was concluded that there is minimal chance of developing a oil-in-water monitor based only on light-scattering angular-intensity distribution measurements. (Wares-IPA)
W78-03664

TRACE ANALYSIS OF ARSENIC BY COLORIMETRY, ATOMIC ABSORPTION AND POLAROGRAPHY,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
L. H. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 652, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-036, April 1977. 37 p, 5 fig, 8 tab, 38 ref. (TVA Report E-EP-77-3). E-AP 78-BDH, EHA 553, D5-E721.

Descriptors: *Pollutant identification, *Analytical techniques, *Polarographic analysis, Analysis, Water pollution, Water sampling, Colorimetry, Arsenic compounds, Thermal powerplants, Atomic absorption.

A differential pulse polarographic method was developed for determining total arsenic concentrations in water samples from ash ponds at steam-electric generating plants. After digestion of the sample and isolation of arsenic by solvent extraction, the peak current for arsenic is measured and compared to a standard curve. The effective range of concentrations for the method is from 2 to 50 micrograms/liter of arsenic. The precision and accuracy of this polarographic method for determining concentrations of arsenic in water samples were compared to two standard methods, atomic absorption and colorimetry, for observations on replicate analyses of pure standard solutions, split samples from ash ponds, standard reference samples, and standard solutions spiked with potentially interfering elements. The three methods compared favorably for the split samples; however, results of the colorimetric method for the replicate analyses were slightly negatively biased. Analysis at three concentrations showed that arsenic content can be determined by either polarography, colorimetry, or atomic absorption. There was no significant difference at the 0.05 level among the methods for split samples. The atomic absorption and colorimetric methods are more efficient, but the polarographic method is better suited for confirmatory analysis. (Wares-IPA)
W78-03665

IDENTIFICATION OF SELECTED FEDERAL ACTIVITIES DIRECTED TO CHEMICALS OF NEAR-TERM CONCERN (BENZENE, BIS(CHLOROMETHYL) ETHER, CADMIUM, HYDROGEN SULFIDE, MERCURY, PLATINUM, POLYNUCLEAR AROMATIC HYDROCARBONS, TRICHLOROETHYLENE, TRIS (2,3-DIBROMOPROPYL), PHOSPHATE).
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 979, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA 560/4-76-007, September 1976. 15 p.

Descriptors: *Pollutant identification, *Chemicals, Research and development, *Environmental effects, Toxicity, Pollutants, Ecology, Public health, Water pollution sources, Water pollution control, Economics, Cadmium, Hydrogen sulfide, Mercury, Federal government, Pollution control technology, Benzene, Bis(Chloromethyl), Ether, Platinum, Hydrocarbons, Trichloroethylene, Tris(2,3-dibromopropyl).

On-going activities of the Office of Toxic Substances of the U.S. Environmental Protection Agency are listed with respect to selected chemicals of near-term concern. The list is intended as a guide for Federal agencies and other interested organizations. The chemical substances studies pertain to benzene, bis(chloromethyl) ether, cadmium, hydrogen sulfide, mercury, platinum, polynuclear aromatic hydrocarbons, trichloroethylene, and tris(2,3-dibromopropyl) phosphate. The types of studies reported concern general pollution aspects, health and ecological effects and environmental behavior, current and projected sources, environmental levels, exposed populations, control options, regulatory actions, attendant impacts, substitutes, related costs and economic factors, and control technology. Where available, significant activities of other organizations concerning these toxic substances are included. (Wares-IPA)
W78-03666

PESTICIDE RECOVERY STUDIES FOR EVALUATION OF DEPARTMENT OF THE ARMY PESTICIDE MONITORING PROGRAM SOIL AND SEDIMENT ANALYSIS METHODOLOGY. PART I. DETERMINATION OF PESTICIDE AND POLYCLORINATED BIPHENYL RECOVERIES FROM SOIL EXTRACTED IMMEDIATELY FOLLOWING FORTIFICATION OCTOBER-DECEMBER 1976,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
J. H. Vinopal, J. F. Suprock, and T. M. White.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 782, Price codes: A02 in paper copy, A01 in microfiche. Pesticide Monitoring Special Study No. 44-0131-77, December 1976, 18 p, 11 tab, 6 ref, 3 append. 44-0131-77.

Descriptors: *Pesticide residues, Pesticide toxicity, *Monitoring, Soil analysis, Chemical analysis, Polychlorinated biphenyls, Pollutant identification, Water pollution sources, Separation techniques, Analytical techniques, Gas chromatography, *Recovery studies, Fortification.

Evaluative details and results of pesticide and polychlorinated biphenyl (PCB) recovery studies of Army Pesticide Monitoring Program soil analysis methodology are presented. The study specifically examined recoveries from soil which was extracted immediately following fortification and then carried through routine soil transfer, cleanup, concentration, and analysis procedures. The percent recovery values for eight of the nine pesticides studied and for Aroclor 1260 were essentially quantitative, ranging from 90.0 to 107.6. The recovery data clearly indicated that pesticide losses following immediate extraction of fortified soil samples, and during subsequent transfer, cleanup, concentration, and analysis steps were minimal or nonsignificant using routine Program soil analysis methodology. The requirements for further recovery studies assessing the extractability of pesticides and PCB from field or weathered residue type soil samples and from sediment samples are discussed. The appendices present analytical methods and procedures; a summary of lower limits of instrumental sensitivity, lower limits of detectability in soil, and florisil column elution behavior for pesticides and PCB; and a summary of recovery data obtained for chlordane, oxychlordane, p,p'-DDE, malathion, beta-BHC, chlorpyrifos, p,p'-DDT, mirex, dieldrin, and Aroclor 1260 using fortification, extraction, cleanup, and gas chromatographic procedures. (Wares-IPA)
W78-03667

TRACKING POLLUTANTS FROM A DISTANCE,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
S. H. Melfi, J. D. Koutsandreas, and J. Moran.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 824, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-77-007, In: Environmental Science and Technology Vol. 11, No. 1, p. 36 - 38, January, 1977. 1 HD620.

Descriptors: *Pollutants, *Pollutant identification, *Remote sensing, *Monitoring, Analytical techniques, Aerial photography, Environment, *Tracking techniques, Lasers.

Remote sensing (monitoring at a distance) is a relatively new technique that the EPA is investigating and selectively applying to track environmental pollutants. The principal advantage of remote sensing is its ability to examine the whole picture at once; it is also more cost-effective than more conventional monitoring techniques (an important consideration since resources required to perform all of the monitoring needed are unavailable). The present form and strategy of the remote sensing program is described in terms of providing opera-

tional remote sensing support and developing advanced techniques to meet critical monitoring needs. Three types of remote sensing: earth reflected differential absorption systems, airborne light detection and ranging (LIDAR) systems, and laser fluorosensing systems can be used for oxidant transport studies, plume inventories, plant siting studies, model verification, measuring inversion layer height, determining plume dimensions, positioning other monitoring platforms, supporting model efforts, characterizing oil spills, determining vegetation stress, monitoring selected water pollutants, mapping chlorophyll, and studying dye dispersion. (Wares-IPA)
W78-03670

THE FOUNDATIONS OF ORGANIC POLLUTANT ANALYSIS,
Municipal Environmental Research Lab., Cincinnati, OH.
A. A. Rosen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 309, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-76-033, In: 'Identification and Analysis of Organic Pollutants in Water,' L. H. Keith, Ed., Ann Arbor Science, Ann Arbor, MI, p. 3-14, December, 1976. 35 ref.

Descriptors: *Pollutant identification, *Pollutants, *Organic wastes, *Analytical techniques, Water sampling, Chemical analysis, Tracking techniques, X-ray analysis, Spectroscopy, Chromatography, Oil spills, Biodegradation, Pesticides, Detergents, Environmental effects, Carcinogens.

A retrospective view of the development of systematic analyses of organic pollutants in the environment is presented. Systematic analysis of organic pollutants began a quarter century ago with the decision to apply current methods of organic qualitative analysis to multigram amounts of mixed organic pollutants recovered from extremely large sample volumes, by carbon adsorption or liquid extraction. The available tools (classical organic chemical analysis, sensory methods, molecular complexes, x-ray diffraction, ultraviolet and infrared spectrometry, and primitive chromatography) have accomplished some landmark achievements in abatement of organic chemical pollution of water supplies. Such achievements include the foundation of oil spill source detection by passive labeling, analytical proof that forced the conversion of the detergency industry to biodegradable products, the first discovery of unforeseen pollution by chlorinated pesticides, and the first animal studies of carcinogenicity of organic water contaminants. Two principles for future progress in environmental analysis are stated: the need to apply chemical science as well as instrumentation, and the need to provide for wide area programming to allow for synergistic program effects. (Wares-IPA)
W78-03671

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS II. PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF 16 SUBSTANCES.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 428, Price codes: A13 in paper copy, A01 in microfiche. Technical Report 7509, December 1975. Rosenblatt, D. H., Miller, T. A., Dacre, J. C., Muul, I., and Cogley, D. R., Eds. 296 p, 2 fig, 61 tab, 1 191 ref, 13 append. 3A76270A835 (PRON 48-6-60828-01-F4-QG)/00/048.

Descriptors: *Data collections, *Chemicals, *Environmental effects, *Physical properties, Chemical properties, Biological properties, Toxicity, Pollutants, Water pollution sources, Phosphorus compounds, Arsenic compounds, Mercury, Aldrin, Dieldrin, Endrin, Volatility, Solubility, Analytical techniques, Ecology, Standards, Amphibians, Birds, Fish, Invertebrates, *Toxicology, Mustard gas, Thiodiglycol, Lewisite, Chlorate salts, Wheat rust, Dicyclopentadiene, Chlordane.

This report establishes a data base of physical, chemical, toxicological, and biological properties for: mustard gas, thiodiglycol, lewisite, lewisite oxide, methylphosphonic acid, iospropyl methylphosphonate, diisopropyl methylphosphonate, chlorate salts, wheat rust, inorganic arsenic compounds, mercury and its salts, dicyclopentadiene, aldrin, dieldrin, chlordane, and endrin. A summary is also presented of pertinent information concerning physical and chemical properties, analytical methods; mammalian toxicology; ecological considerations for wildlife, birds, fish, reptiles, amphibians, invertebrates, microorganisms, and plants; and existing standards. Individual descriptions and cooresponding tables group the pollutants studied according to: volatility, water solubility, and potential for waterborne movement through soil (based on availabel information concerning solubility and chemical stability in water); selected physical properties; standard analytical methods; important mammalian toxicological properties; ecological considerations for various animal groups, microorganisms, plants, and food chain effects; and standards pertaining to allowable daily intake, maximum contaminant levels, and threshold limit values. (Wares-IPA)
W78-03672

A REVIEW OF TRACE ELEMENT STUDIES RELATED TO COAL COMBUSTION IN THE FOUR CORNERS AREA OF NEW MEXICO,
Los Alamos Scientific Lab., NM.
L. E. Wangen, and C. L. Wienke.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6401-MS, Price codes: A04 in paper copy, A01 in microfiche. Informal Report No. LA-6401-MS, UC-90i, July 1976. 53 p, 32 tab, 40 ref, 3 append. W-7405-eng-36.

Descriptors: *Trace elements, *New Mexico, *Coals, Power systems operation, Environmental effects, Soil analysis, Fly ash, Soil contamination, Wildlife, Water quality, Fluorine, Potassium, Boron, Manganese, Chlorine, Magnesium, Sulfur, Molybdenum, *Coal combustion, *Four Corners Power Plant, Ash, Flora, Selenium.

A review of trace element studies related to coal combustion in northwestern New Mexico, which particularly emphasize the potential environmental effects of the Four Corners Power Plant (FCPP) is presented. Studies in coal, power plant bottom and precipitator ash, local soils, and local surface water systems are discussed in relation to trace element mobilization and potential environmental contamination. Three previous studies undertaken to assess trace element impacts in the vicinity of the FCPP were also identified: The Southwest Energy Study, a University of Nevada-Desert Research Station Study funded by EPA, and private efforts funded by the Arizona Public Service and Utah International, Inc. with input from other interested utility and mining groups. In-plant studies on coal and ash conclude that trace elements concentrations in coal used at the FCPP are consistent with levels in other coals, with the exception of fluorine and some inorganic matrix elements which appear to be present at higher levels. Soil analyses indicate an excess of trace elements in bottom ash and local soils compared to area soils, except that fluorine and potassium appear to be depleted in local soils as compared with area soils. Appendices contain sample handling procedures and analytical techniques for coal and ash, Four Corners soil data and analytical procedures, and Four Corners water quality data. (Wares-IPA)
W78-03674

PHOTOGRAMMETRY, WATER QUALITY, SAFETY APPURTENANCES, AND SHOULDER DESIGN.
Transportation Research Board, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 332, Price codes: A00 in paper copy, A01 in microfiche. Transportation Research Record 594, 1976. 64 p, 51 fig, 17 tab, 124 ref. Wilburn, M. C., Editor.

Descriptors: *Water quality, *Safety, *Highways, Roadbanks, Road construction, Sedimentation, Erosion control, *Remote sensing, *Pollutant identification, Transportation, *Photogrammetry.

A selection of articles on photogrammetry, water quality, safety appurtenances, and highway shoulder design are presented as they relate to transportation systems design and construction. The use of oblique airphotos in environmental planning is discussed. Another paper (abridged) deals with the value of remote sensing techniques to detect the presence of atmospheric pollutants and consequently assess their environmental impact. State-of-the-art and design practice revies of paved shoulders are presented in two separate articles. Concrete safety shape research, and the results of a crash test and evaluation of a precast concrete median barrier are also presented. Other discussions include: sediment trapping efficiency of straw and hay bale barriers and gabions; impact performance of the Minnesota 1.5-m-radius plate beam guardrail; impact design of crash cushions for nonstationary barriers; full-scale tests of a modified collapsing-ring bridge rail system; tubular three beam for upgrading concrete bridge railing; dynamic tests of breakaway lighting standards by using small automobiles; change in vehicle momentum during impact with a breakaway support; and testing of breakaway supports for signs and luminaires. (Dorfman-IPA)
W78-03676

TRACE ELEMENTS IN THE TERRESTRIAL ENVIRONMENT OF A COAL-FIRED POWERHOUSE,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
J. H. Horton, R. S. Dorsett, and R. E. Cooper.
Available from the National Technical Information Service, Springfield, VA 22161 as DP-1475, Price codes: A04 in paper copy, A01 in microfiche. Report No DP-1475, September 1977. 49 p, 23 fig, 7 tab, 33 ref, 2 append. EPA-IAGD5-B681.

Descriptors: *Trace elements, *Soil chemical properties, *Water chemistry, *Water quality, Vegetation, Groundwater, Coals, Electric power production, Ecosystems, *Pollutant identification, Pollution abatement, Fly ash, Manganese, Electrostatic precipitators, Selenium.

Estimation of the quantities of trace elements released from a coal-fired powerhouse at the Savannah River Plant, Aiken, South Carolina, prior to the addition of electrostatic precipitators, was made, after which the influence of these elements upon the surrounding terrestrial ecosystems was determined. The powerhouse operated for more than 20 years, consuming about 360 million kilograms of coal annually. Twenty-nine trace elements were measured in fly ash and in samples of soil, vegetation, and ground water collected along a 29 kilometer traverse centered on the powerhouse. These included antimony, arsenic, barium, beryllium, bromine, cadmium, cerium, cesium, chromium, cobalt, copper, europium, gallium, lanthanum, lead, manganese, mercury, molybdenum, nickel, samarium, scandium, selenium, strontium, terbium, thorium, uranium, vanadium, ytterbium, and zinc. There were statistically significant effects of the stack releases upon the concentration of barium, beryllium, copper, mercury, manganese, selenium, and strontium in soil; beryllium, cobalt, molybdenum, strontium, and vanadium in vegetation; and cobalt and manganese in ground water. Barium, mercury, strontium, and

manganese were less available to plants in fly ash than in soil; manganese in ground water and selenium in soil are the only two trace elements present in the environment in concentrations that require further consideration at present. Appendices described fly ash depositions attributable to the powerhouse studied and presented statistical regression and correlation analyses. (Wares-IPA)
W78-03677

INFLUENCE OF THE SEDIMENT/WATER INTERFACE ON THE AQUATIC CHEMISTRY OF HEAVY METALS,
New England Aquarium, Boston, MA.
For primary bibliographic entry see Field 5B.
W78-03678

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, 1976 EDITION.
National Inst. for Ocupational Safety and Health, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 295, Price codes: A99 in paper copy, A01 in microfiche. Report No NIOSH-76-191, June 1976. 2 Parts. 1,353 p, 2 fig, 5 tab, 871 ref, 9 append. 210-75-0034.

Descriptors: *Pollutant identification, *Data collections, Information exchange, Toxicity, Chemicals, Chemical properties, Public health, Biological properties, Aquatic habitats, Environment, Hazards, Chemical analysis, Safety, Legislation, *Occupational safety and health, Biomedical measurement, Dosage.

The 1976 edition of the Registry of Toxic Effects of Chemical Substances supercedes the 1975 edition of the Registry, formerly referred to as the Toxic Substances List, and is prepared annually by the National Institute for Occupational Safety and Health (NIOSH) in compliance with the Occupational Safety and Health Act of 1970. The Registry provides basic information on the known toxic and biological effects of chemical substances for use by physicians, industrial hygienists, toxicologists, researchers, and others concerned with safe handling of chemicals. However, the absence of a substance from the Registry does not indicate that it is not toxic, and drugs or therapeutic chemicals in the Registry have been included only if they have been reported to produce a noxious effect. The 1976 Registry contains 82,908 listings of chemical substances, (5,228 more than the 1975 edition). The information given on each substance includes prime name, chemical abstracts service registry number, molecular weight, molecular formula, Wiswesser line notation, synonyms, toxic dose data, cited references, aquatic toxicity, reviews, standards and regulations, and reference to NIOSH criteria documents. Appendices to the Registry contain information on occupational safety and health standards, standards completion program analytical methods, the standard for an occupational exposure to asbestos, occupational safety and health standards for carcinogens, the standards for occupational exposure to vinyl chloride, worker protection standards for agricultural pesticides, description of the NIOSH criteria documentation program, requests for health hazards evaluation, and material on aquatic toxicity. (Wares-IPA)
W78-03679

THE RELATIONSHIP BETWEEN THE BORON CONCENTRATION OF EAST LANSING MUNICIPAL WASTEWATER AND RETENTION TIME THROUGH THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT UNDER CONTINUOUS FLOW CONDITIONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
P. E. Duranceau, and F. M. D'Itri.
Available from National Technical Information Service, Springfield, VA 22161 as PB-263 774, Price codes: A10 in paper copy, A01 in microfiche. Report No. MSU-IWR-TR-76-0044, June 1976. 210 p, 31 fig, 5 tab, 70 ref, 35 append.

Descriptors: *Boron, Water quality, Water quality control, Sampling, Sewage effluents, Water pollution sources, Sewage treatment, Sedimentation, Algae, Sludge, Wells, Lakes, Running waters, Streams, Michigan, *Waste water treatment, *Pollutant identification, *Water quality management projects.

The fate of boron in East Lansing, Michigan municipal wastewater was determined as it moved through the Michigan State University Water Quality Management Project, in which sewage effluent in four man-made lakes was treated. The boron concentration was monitored at the sewage plant and at each of the lakes, and two streams connected with the project were checked periodically. Wells of varying depth were dug on the site and the boron levels of these were monitored. Algae, sediment, and sludge samples were taken, and the boron content determined. Results confirmed that conventional sewage plants do not remove boron. The concentration was constant through the plant, and the load in kg/day did not change. The amount of boron ranged from 0.1 to 0.5 mg/l, depending on the precipitation and flow rate. Sewage sludge contained from 28 to 84 ppm boron. The stream receiving discharge from Lake 4 had increasing levels of boron, and both streams showed evidence of contamination from poultry waste deposited in the area during times of heavy rainfall. The boron content of shallow wells did not change, but the boron content of the deepest wells increased over time to the levels of the shallow wells. The uptake of boron was not significant enough to change the boron/chlorine ratio of the water masses. Available boron of sediments increased over time, especially during the growing season. Boron was not being removed by the sewage treatment process, and there was no evidence of boron adsorption onto the sewage sludge. Sampling data and results are presented in the appendices. (Wares-IPA)
W78-03680

ASBESTOS FIBERS IN DISCHARGES FROM SELECTED MINING AND MILLING ACTIVITIES. FINAL REPORT PART III,
McCrone (Walter C.) Associates, Inc., Chicago, IL.
I. M. Stewart, R. E. Putscher, H. J. Humecki, and R. J. Shimps.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 288, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-001, January 1977. 44 p, 3 fig, 10 tab, 6 append. EPA-68-01-2690.

Descriptors: *Asbestos, *Pollutant identification, *Mine wastes, Water pollution sources, Copper, Gold, Effluents, Vermont, New York, California, Arizona, Montana, South Dakota, Environmental gradient, *Path of pollutants, Vermiculite, Talc.

Results of the analyses of water from point sources associated with the mining and milling of potentially asbestos bearing rocks are presented as a portion of a nationwide survey to determine the impact of point and non-point sources on levels of water-borne asbestos. Water samples were taken in and near six mining and milling operations in which the presence of asbestos minerals was suspected. Filtered samples were examined and analyzed in a combined electron microscope microanalyzer, repeating with samples selected at random as a check on reproducibility. All the locations sampled showed asbestos fibers in their effluent except at the Arizona copper mine. Waste water is recycled and not discharged at the California and Montana facilities. Findings showed that a variety of mineral ore types may have asbestos minerals associated with them and that these fibers are liberated into their effluents; and in some instances, however, the final effluent has little impact on asbestos fiber levels in the local surface water which already has high asbestos content. (Wares-IPA)
W78-03687

5B. Sources Of Pollution

ANAEROBIC PROCESSES, (LITERATURE REVIEW),
Institute of Gas Technology, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-03218

AQUATIC DISPOSAL OF DREDGED MATERIAL: RELEASE OF CONTAMINANTS DURING AND AFTER DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
R. M. Engler.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 220-235, December 1976. 23 ref.

Descriptors: *Dredging, *Disposal, *Aquatic environment, *Investigations, Navigable waters, Programs, Water quality, Turbidity, Sediments, Wastes, Water pollution, Environmental effects, Reviews, Estuaries, Coasts, Rivers, *Dredged Material Research Program.

The Corps of Engineers was authorized by Congress in the 1970 River and Harbor Act to initiate a comprehensive nationwide study to provide more definitive information on the environmental impact of dredging and dredged material disposal operations and to develop new or improved dredged material disposal practices. It was concluded from studies to date (1975) that: (1) The field evaluations are verifying results demonstrated in the laboratory investigations. (2) Water column impact during disposal appears minimal to nonexistent, and effect is predominately aesthetic in nature. (3) Leaching of toxic heavy metals from the disposal mound into the water column appears no greater than from natural sediments of similar geologic character. Chlorinated hydrocarbon release was not detected. Nutrients were released to small concentrations greater than background. (4) The major bottom impact found at disposal sites was the physical mounding of the material. Benthic recolonization of the mounds appears relatively rapid. (5) 'Bulk' or total sediment analysis does not relate to any mobile or bio-available fraction of a sediment, nor can it predict or evaluate water quality and ecological perturbations. (6) Water quality criteria and bioassay were developed for Public Law 92-500 and 92-532 and are being field-verified. (7) Toxic heavy metal uptake studies are incomplete, but initial trends suggest minimal to no impact in marine and estuarine sediments. (8) Petroleum and chlorinated hydrocarbon uptake studies are incomplete at this time; however, initial trends suggest minimal uptake from solid phase of sediments. (See also W78-09325) (Humphreys-ISWS)
W78-03234

MODELING OF OIL EVAPORATION IN AQUEOUS ENVIRONMENT,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 2D.
W78-03244

HEAVY METAL SEDIMENTATION IN SAANICH INLET MEASURED WITH 210PB TECHNIQUE,
Department of the Environment, Victoria (British Columbia). Ocean Chemistry Div.
E. Matsumoto, and C. S. Wong.

Journal of Geophysical Research, Vol. 82, No. 34, p 5477-5482, November 20, 1977. 4 fig, 4 tab, 24 ref.

Descriptors: *Sediments, *Canada, *Heavy metals, *Sedimentation rates, Sampling, Estuaries, Inlets(Waterways), Chemical analysis, Chemicals, Lead, Copper, Cadmium, Mercury, Core drilling, Core logging, On-site data collections, Model studies, Mathematical models, Sedimentology, Water pollution sources, *Saanich Inlet(British Columbia).

Two undisturbed sediment cores at 220 and 200 m in the deepest basin of Saanich Inlet, British Columbia, were collected by a box corer. In the upper 30 cm, the sediment porosity exhibited an abrupt decrease with depth due to compaction. The corrected depth of sediments without compaction was calculated. The 210Pb profiles were plotted against the corrected depth in order to determine the accumulation rate at the surface in cm/yr. The sedimentation rate in g/sq cm/yr was calculated from the accumulation rate. A sedimentation rate of 0.093 g/sq cm/yr was obtained at the end of the deep basin awar from the sill entrance and 0.27 g/sq cm/yr near the sill of the deep basin. The Pb, Cu, Cd, and Hg contents in the sediment cores appeared to decrease with depth. A present metal flux of 1.9-5.1 dpm/sq cm/yr was inferred for 210Pb, 3.6-11 micrograms/sq cm/yr for stable Pb, 6.3-14 for Cu, 0.11-0.48 for Cd, and 0.029-0.072 for Hg. When some recent measurements of heavy metal concentrations in the seawater near the sill of the deep basin of Saanich Inlet were used, a residence time in the water column of 0.08 years was inferred for 210Pb, 0.07 for stable Pb, 0.3 for Cu, 3 for Cd, and 2 for Hg. (Sims-ISWS)
W78-03245

PB210-DETERMINED SEDIMENTATION RATE, AND ACCUMULATION OF METALS IN SEDIMENTS AT A STATION IN CHESAPEAKE BAY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, and D. J. Hirschberg.
Chesapeake Science, Vol. 18, No. 4, p 379-382, December 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Sedimentation rates, *Lead radioisotopes, *Chesapeake Bay, *Sedimentation, *Chemical analysis, *Deposition(Sediments), Lead, Heavy metals, Analytical techniques, Sediments, Estuaries, Tagging, Water chemistry, Radioisotopes, Oceanography, Nickel, Copper, Chromium, *Pollutant identification, Path of pollutants, *Radiometric measurements, *Sediment deposition, *Tilghman Island, Geochemical analysis, Radiochemical analysis, Organic carbon.

This paper contained the first published radiometrically determined comtemporary sedimentation rate, a rate characteristic of the past few decades, for any part of the Chesapeake Bay estuarine system. Cores collected from a station in the main body of the Chesapeake Bay off Tilghman Island (38 deg 41 min 30 sec N, 76 deg 24 min 00 sec W) were analyzed for Pb210, organic carbon, nitrogen, and selected metals. A mean sedimentation rate of between 0.09-0.12 cm/y was inferred from the Pb210 data. The distributions of C and N are typical of many areas of the Bay. The distributions of extractable Ni, Cr, Cu, and Pb increased in the upper 10-15 cm of the core. The increases in metal concentrations over the past century or so may be a result of man's activities. (Henley-ISWS)
W78-03247

OBSERVATIONS OF THE MIXING IN THE BALTIC THERMO- AND HALOCLINE LAYERS,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
G. E. B. Kullenberg.
Tellus, Vol. 29, No. 6, p 572-587, December 1977. 6 fig, 5 tab, 32 ref.

Descriptors: *Path of pollutants, *Mixing, *Dissolved oxygen, *Diffusion, On-site investigations, Dye releases, Dye dispersion, Winds, Salinity, Temperature, Water temperature, Thermocline, Stability, Data processing, Oceans, Oceanography, *Baltic Sea, Halocline.

The vertical and horizontal mixing of a passive contaminant in the Baltic thermo- and halocline layer was investigated in a series of experiments during spring and fall. It was found that the vertical mixing is very weak. The horizontal spreading is a factor of 2-5 lower than in the surface layer. The integrated vertical transfer across the halocline layer is of the same order of magnitude as the integrated transfer in the coastal boundary zone. It was found that the wind is an essential source of energy for the mixing. The significance of the wind-forcing was demonstrated by the correlation between the fluctuations of the wind and (1) the fluctuations of the oxygen content in the deep water, and (2) the fluctuations of the stability across the halocline layer during the present century. The results supported the view that the overall decrease of the oxygen content in the deep waters is due to other factors than an alteration of water exchange characteristics. (Sims-ISWS)
W78-03254

DREDGED SEDIMENT MOVEMENT TRACING IN SAN FRANCISCO BAY UTILIZING NEUTRON ACTIVATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.
E. J. Leahy, W. B. Lane, T. M. Tami, L. B. Inman, and W. R. McLoud.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 844, Price codes: A06 in paper copy, A01 in microfiche. Technical Report N-76-1, June 1976. 25 fig, 13 tab, 10 ref, 1 append.

Descriptors: *Dredging, *Tracers, *California, *Sediments, Sampling, Spoil banks, Bays, Estuaries, Sediment transport, Dispersion, Sediment distribution, Deposition(Sediments), Channel improvement, Neutron activation analysis, Spectroscopy, Irradiation, Data processing, Analytical techniques, Sedimentology, *San Francisco Bay, Iridium, Dredged materials, Dredged material disposal.

The movement and circulation of sediments in San Francisco Bay result from the complex interactions of tidal flows, wind-wave resuspension and recirculation and variations of freshet conditions with associated sediment loads, stratification, and shifting of nodal point. This complex system is currently beyond the modeling capability of mathematical and physical hydraulic models. Thus, a program was instituted to trace physically the movement of dredged materials with the objective of quantifying the horizontal and vertical recirculation of the dredged sediment. Tracing was accomplished by tagging Bay sediments with the chemical element iridium, neutron-activating sediment samples collected from an extensive test area, and using gamm-ray spectrometry to determine the quantity of iridium and hence the amount of dredged material present. The program was successful and permitted tracing the movement of the dredged material for a period of 10 months after the introduction of traced sediments in February-March 1974 until the completion of sampling in December 1974. The Tracer Program showed that material dredged from Mare Island Strait and released at the Carquinez Strait disposal site is distributed both spatially and with depth in bottom sediments over most of the region sampled. Initial dispersion is fast, and resuspension seems to occur continuously. A portion of the dredged material is transported back to the original dredged channel. Upon redredging of the channel in September 1974, the traced sediments from the original tracing operation were detected in the study area. A general conclusion was that the movement of dredged sediments is probably more than complex than originally anticipated. (Sims-ISWS)
W78-03257

A HYDROPONIC STUDY OF HEAVY METAL UPTAKE BY SELECTED MARSH PLANT SPECIES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 2I.
W78-03258

SELECTED ASPECTS OF THE CONTROL OF TOXIC SUBSTANCES (A COMPILATION OF SPEECHES), BY THE MEMBERS OF THE STAFF OF THE OFFICE OF TOXIC SUBSTANCES.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W78-03263

FOREST VEGETATION AS A SOURCE OF BIOGENIC AND ORGANIC SUBSTANCES IN NATURAL INLAND WATERS,
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
Y. G. Maystrenko, A. I. Denisova, and G. A. Yenaki.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 418, Price codes: A02 in paper copy, A01 in microfiche. Translated from Gidrobiologicheskiy Zhurnal, Vol. 4, No. 5, 1968. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, Draft Translation 608, March 1977. 13 p, 2 fig, 2 tab, 19 ref.

Descriptors: *Inland waterways, *Forest watersheds, Vegetation, Coniferous forests, Deciduous forests, *Water pollution, Degradation(Decomposition), Chemical analysis, Wood wastes, Water pollution sources, Reservoirs, *Kiev Reservoir, Trees, USSR.

Data were collected with regard to the relative rate of release of biogenic and organic substances from flooded forest vegetation and their accumulation in water. The rate of incursion into the water medium of such substances from willow, poplar, maple, and pine trees that had been flooded was determined in a laboratory setting. Wood was placed and secured in large glass vessels, with water level kept constant by adding water from the Kiev Reservoir at the rate of natural water turnover. The ratio of wood to water was 1:100, and exposure was maintained for 300 days at 17 to 23 degrees Centigrade. Determinations were made of the content of organic carbon, nitrogen, phosphorus, permanganate and bichromate oxidizabilities, color index, free amino acids, reducing sugars, phenols, pH, oxygen, carbon dioxide, mineral forms of nitrogen and phosphorus, suspended and solute phosphates, and suspended and solute iron and silicon. These same constituents were also determined in natural water (control) from the same reservoir. Results showed that the leaf bearing trees (willow, poplar, and maple) created greater concentrations of substances in water (especially organic and ammonium nitrogen phosphorus, carbohydrates, and amino acids) than did coniferous trees (pine). The data obtained can be used when predicting the conditions of new and existing water basins. (Wares-IPA)
W78-03265

NONPOINT SOURCE CONTROL GUIDANCE CONSTRUCTION ACTIVITIES,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-03268

A TEST PARTICLE DISPERSION STUDY IN MASSACHUSETTS BAY.
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 434, Price codes: A04 in paper copy, A01 in microfiche. Technical Report ERL 374-MESA 6, September 1976. 56 p, 13 fig, 2 tab, 10 ref, 10 append. Wing, R. H. (Ed.).

Descriptors: *Dispersion, *Sediment transport, *Resources development, *Baseline studies, Massachusetts, Meteorological data, Mathematical models, Dredging, Environmental effects, *Outer Continental shelf, Environmental impact, Dredging operations, Oceanographic data, Particle dispersion, *Massachusetts Bay.

The goal of this study was to develop a predictive model to estimate, in advance of dredging operations, where the fines of a dredge plume would travel. On June 11, 1973, 2700 kg (3 tons) of small particles were released into the water column in Massachusetts Bay. Their movement was tracked for 10 days. Also, oceanographic data were collected and analyzed and a dispersion model was formulated. Final data show the plume movement to be westward toward Boston Harbor, eastward toward Stellwagen Bank and southward along the coast into Cape Cod Bay where a counter-clockwise gyre is suggested. (Sinha-OEIS)
W78-03270

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
W. D. MacLeod, D. W. Brown, R. G. Jenkins, L. S. Ramos, and V. D. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 276, Price codes: A04 in paper copy, A01 in microfiche. Technical Memorandum ERL MESA-8, November 1976. 60 p, 18 fig, 12 tab, 11 ref, 2 append.

Descriptors: *Baseline studies, *Environmental effects, *Water pollution effects, *Coasts, *Oil pollution, *Bioindicators, Sediments, Biota, Mussels, Snails, Analytical techniques, *Puget Sound, Strait of Juan de Fuca, Outer Continental Shelf, Petroleum hydrocarbons, Residual hydrocarbons, Environmental Impact.

Substantially increased petroleum tanker traffic, pipeline transport, and refining operations are anticipated in the region of Northern Puget Sound and Strait of Juan de Fuca when the Alaska pipeline comes into operation. To assess the potential future environmental impact arising from these activities current hydrocarbon baseline levels must be measured. This report presents the results of the pilot study and offers recommendations for a first year Petroleum Hydrocarbon Baseline Investigation. The pilot study has demonstrated that methodology exists to detect and measure a number of hydrocarbons in sediment, mussels (Mytilus edulis and Mytilus californianus), and a snail (Thaie lamellosa). Appendices identify critical intertidal sites for further study and recommends analytical procedures best suited to the particular environment. (Sinha-OEIS)
W78-03271

APPLICATION OF ESTIMATION THEORY TO DESIGN OF SAMPLING PROGRAMS FOR VERIFICATION OF COASTAL DISPERSION PREDICTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. De Guida, J. J. Connor, and B. Pearce.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 413, Price codes: A03 in paper copy, A01 in microfiche. Sea Grant Report No. MITSG-76-16, November 20, 1976. 36 p, 11 fig, 15 ref. SG-04-5-158-1.

Descriptors: *Path of pollutants, *Pollutant identification, *Sampling, *Dispersion, Pollutants, *Mathematical models, Water pollution sources, Monitoring, Coasts, Finite element analysis, Water resources, Environmental impact, Estimation theory, *Kalman-Bucy filtering.

The analytical framework for applying Kalman-Bucy filtering to dispersion in a coastal water body is developed. Particular emphasis is placed on quantification of the model uncertainty due to model parameters, source loadings, and velocity fields. The formulation is discretized with the Finite Element Method, and a number of comparison studies are presented. (Sinha-OEIS)
W78-03275

NUMERICAL MODELING OF DISPERSION IN STRATIFIED WATERS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
G. Christodoulou, and J. J. Connor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 379, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Technical Report No. MITSG-76-17, Index No. 76-317-Cbc, November 20, 1976. 24 p, 11 fig, 1 tab, 16 ref. SG-04-6-158-44007.

Descriptors: *Mathematical models, *Dispersion, *Coasts, Massachusetts, Stratification, Themocline, *Path of pollutants, Water pollution sources, *Massachusetts, Particle dispersion.

A numerical model is developed for the quantitative description of the dispersion process in a two-layer system which represents an approximation for a natural coastal water body during the summer season when a distinct thermocline usually exists. The formulation is based on the convection-diffusion equation, vertically integrated between the layer boundaries. Layer velocities and thickness are assumed to be obtained from a separate hydrodynamic model. The quantification of the physical processes of entrainment and mixing through the density interface as well as the horizontal dispersion mechanism is discussed. The model is applied to a particle dispersion experiment carried out recently in the Massachusetts Bay and comparisons with field data are presented. (Sinha-OEIS)
W78-03278

DETERMINATION OF THE ATMOSPHERIC CONTRIBUTION OF PETROLEUM HYDROCARBONS TO THE OCEANS,
World Meteorological Organization, Geneva, (Switzerland).
W. D. Garrett, and V. M. Smagin.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-18609, Price codes: A03 in paper copy, A01 in microfiche. Special Environmental Report No. 6, WMO-No. 440, 1976. 37 p, 4 fig, 5 tab, 60 ref.

Descriptors: *Oil pollution, *Air-water interfaces, *Environmental effects, Evaporation, Water pollution sources, Petroleum hydrocarbons, Air-sea interaction, Film spreading.

The existing knowledge concerning petroleum hydrocarbons in the marine atmosphere and procedures by which their flux from air to sea may be determined is reviewed. A sampling and analytical program is recommended in order to assess the atmospheric contribution of petroleum. The possibilities of air-sea interfacial alterations by petroleum films which could influence geophysical processes and climate are discussed to some extent. Preliminary estimation has been made for the sea-to-air flux of petroleum hydrocarbons. The recommended sampling and analysis scheme for determination of the flux of petroleum hydrocarbons at the air-sea interface will be composed of three parts and require both land and sea stations. The three phases of the program include air sampling, sea surface sampling and the collection of precipitation and dry fallout. Sophisticated analytical techniques and highly trained technicians and scientists are required because of the following task difficulties: expected low concentrations of hydrocarbons; high probability of sample contamination from a number of sources; and the need to distinguish between petroleum and biogenic forms of hydrocarbons. These factors will require relatively expensive equipment and personnel, so that sampling sites must be carefully selected to provide, at a reasonable cost, the maximum information without redundancy. (Sinha-OEIS)
W78-03285

THE PHYSICAL OCEANOGRAPHY AND WATER QUALITY OF NEW YORK HARBOR AND WESTERN LONG ISLAND SOUND,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
D. A. Jay, and M. J. Bowman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 632, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 23, Reference No. 75-7, December 1975. 76 p, 21 fig, 9 tab, 110 ref, 3 append.

Descriptors: *Water quality, *Sewage effluents, *Water pollution sources, *Estuarine environment, *Transport, Salinity, Pollutants, New York, Water resources, Waste disposal, Environmental effects, *New York Harbor, *Long Island Sound, New York Bight, Outer Continental Shelf, Ocean dumping, Physical oceanography.

The literature on the tides, currents, hydrography and hydrology of New York Harbor from 1848 to date is reviewed. Particular emphasis is placed on the relationship between water, salt and pollutant transport mechanisms in the East River, the Harbor and western Long Island Sound. An estuarine circulation in the Upper East River modifies the hydraulic regime and transports Upper East River surface water toward Long Island Sound. The observed distributions of nutrients and sewage effluents suggest that the estuarine and dispersive mechanisms in the East River transport a considerable fraction of sewage emptied into the East river to the Sound, while the advective component is expected to transport effluents into New York Harbor. Transport of sewage pollutants from the East River is probably a major factor causing the observed violations of state and federal water quality standards in western Long Island Sound. It is concluded that the East River, particularly the upper section, is a very poor location to release sewage effluents. (Sinha-OEIS)
W78-03286

BARATARIA BASIN: BIOLOGICAL CHARACTERIZATION,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-03289

LOADING OF PROCESS WATER BY DISSOLVED SUBSTANCES DURING PAPER MANUFACTURE. I. SURVEY OF STONE GROUNDWOOD PRODUCTION (UEBER DIE DURCH GELOESTE SUBSTANZEN VERURSACHTE BELASTUNG DES FABRIKATIONSWASSERS BEI DER PAPIERHERSTELLUNG. I. BESTANDSAUFNAHME BEI DER ERZEUGUNG VON STEINSCHLIFF),
Technische Univ., Darmstadt (West Germany). Inst. fuer Paperfabrikation.

L. Gottsching, W. Luttgen, and H. -L. Dalpke.
Das Papier, Vol 31, No 7, p 257-263, July, 1977. 3 fig, 6 ref, 4 tab. English summary.

Descriptors: *Pulp wastes, *Organic compounds, *Pollutants, *Inorganic compounds, Water pollution sources, Wastes, Industrial wastes, Chemical oxygen demand, Biochemical oxygen demand, Organic loading, Groundwood mills.

The characteristics arising from dissolved inorganic and organic substances in effluents from various industrial groundwood mills and from a pilot plant for producing stone groundwood are given. The pollutant load is indicated by concentration, specific initial COD, and specific initial BOD. The specific initial COD of dissolved substances is related to the value obtained from the fibrous material in order to evaluate the reduction in yield resulting from dissolution of woody material. Differences between the specific initial BOD values from the different groundwood mills are attributed to differences in preloading of the shower waters. The original COD load in pilot-plant grinding is related to the temperature of the groundwood suspension in the grinder pit. (Ward-IPC)
W78-03296

DIFFICULTY DECOMPOSED TOXIC SUBSTANCES FROM THE PULP AND PAPER INDUSTRY (SVARNEDBRYTBARA, TOXISKA AMNEN FRAN PAPPERS- OCH CELLULOSAINDUSTRIN),
Institutet for Vatten- och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W78-03306

COMPOSITION OF SPRUCE SULFATE PULP BLEACHING EFFLUENTS (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W78-03309

EFFECTS OF BLEACH PLANT EFFLUENTS FROM SULFATE PULP BLEACHING ON GROWTH AND PHOTOSYNTHESIS OF PLANKTONIC ALGAE (EFFEKTER AV BLEKERIAVLUTAR FRAN SULFATMASSABLEKNING PA TILLVAXT OCH FOTOSYNTES AV PLANKTISKA ALGER),
Institutet for Vatten- och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W78-03316

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT (VOLUME I-TEXT).
Forest Service (USDA), Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 280, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/3-77-036, April 1977. 145 p, 2 fig, 14 tab, 560 ref. 1HB617, EPA-IAG-D5-0660.

Descriptors: *Forecasting, *Water pollution sources, *Watershed management, Hydrologic cycle, Sediments, Pollutants, Model studies, Water quality control, *Wildland, Nonpoint pollution.

Three main areas are handled in an examination of non-point source pollution: mangement activity/pollutant relationship, predictive model review and state-of-the-art assessment, and an inventory of 176 wildland watersheds suitable for model validation and development. Non-point pollution is directly related to the time and space variability of the hydrologic cycle and existing terrain; furthermore, the relationship is site dependent. Impact of sedimentation from site disturbance is most common. Predictive models for non-point pollutant loading, relating spatial variability and diversity of terrain to management activities, are the most important in evaluating the potential on-site impact of planned wildland management activities. Few non-point loading models exist. The state-of-the-art is represented by process simulation models, not yet extensively used for field application. Their use will require validation and simplification. Modular model development will have the maximum utility in the decision process. The state-of-the-art at the field level lags behind that of research and is represented by regional regression models and analytical procedures. Watersheds available for non-point model validation and testing do not have long data records (less than 10 years) except on stream flow and to a lesser extent on suspended sediment. Criteria for a predictive non-point water quality model include: modular structure within comprehensive framework, ability to predict pollutant parameter loading of all orders of streams, facilitation of comparative evaluation control or management alternatives, representation of time and probability variables, representation of spatial variability of conditions and activities, and incorporation of available knowledge for use by field level scientists in the decision-making process. (Wares-IPA)
W78-03417

MERCURY DISTRIBUTION IN SOIL AROUND A LARGE COAL-FIRED POWER PLANT,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
A. B. Crockett, and R. R. Kinnison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 289, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/3-77-063, May 1977. 16 p, 2 fig, 1 tab, 17 ref. 1HDo20.

Descriptors: *Mercury, *Soil contamination, *Sampling, Air pollution, Electric power production, Coals, Water pollution sources, *Path of pollutants, Distribution, *Residues, Emissions, Power plants, Atomic absorption spectrophotometry, Four Corners(New Mexico).

Mercury distribution in the soil around the Four Corners, New Mexico coal-fired power plant was determined from 70 soil samples collected on a radial grid employing 16 evenly spaced radii and five logarithmically spaced concentric circles around the plant within 30 km of the plant. Samples were analyzed for total mercury using a Zeeman Atomic Absorption spectrophotometer. Residue levels were quite low compared to average soil residues, and no statistically valid differences in mercury residue levels were detected between circles or radii using two-way analysis of variance techniques. Since the program could not accommodate missing samples, six of the radii were dropped from the data analysis. F-ratios on the ten remaining radii indicated significant differences between circles, significant differences between radii, and significant complex interaction; attempts to subdivide the data did not successfully eliminate the interaction effects. Contours of iso-mercury concentrations showed a relative high west of the plant near the ash ponds and another just east of the plant. The fate of the 510 kg of mercury emitted per year is unknown, but it is not accumulating significantly within 30 km of the plant. Mercury emissions from U.S. coal-fired power plants amount to only 4% of the natural degassing loss in the U.S., and levels near power plants appear low. The significance of mercury emissions by power plants should be evaluated on a regional basis since evidence shows no significant local elevation of mercury in soils or air. (Wares-IPA)
W78-03418

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON NITROGEN TRANSPORMATIONS IN SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W78-03424

MONITORING HEAVY METALS AND PESTICIDES IN THE CAPE FEAR RIVER BASIN OF NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-03426

EXTENSIVE DEGRADATION OF SILVEX BY SYNERGISTIC ACTION OF AQUATIC MICROORGANISMS,
Syracuse Univ. Research Corp., NY.
H. C. Sikka, and L. T. Lu.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 101-105, December 1976. 1 fig, 15 ref. DACW 36-74-C-0068.

Descriptors: *Herbicides, *Microbial degradation, *Pseudomonas, *2,4,5-T, *Laboratory tests, *Silvex, *Achromobacter, Pesticide residues, Aquatic weed control, Degradation(Decomposition), Bacteria, Synergism.

Although the herbicide silvex had been considered very resistent to microbial degradation, a study shows it is extensively degraded by the synergistic action of two aquatic bacteria, Pseudomonas sp. and Achromobacter sp. It was also observed tht these microorganisms are able to disrupt the aromatic ring of 2,4,5-T, another recalcitrant herbicide. Neither bacteria incubated alone with the herbicide was able to degrade it, nor did an artificial mixture of the two organisms degrade silvex or 2,4,5-TCP; only when they were grown together on the agar plate were they able to degrade the chemicals. Although no explanation for this phenomenon is offered at present, it is felt that the organisms undergo some changes during their isolation from the mixed culture which results in their inability to metabolize silvex or 2,4,5-TCP. The mixed culture of Pseudomonas and Achromobacter could not use silvex as the sole carbon source, but did metabolize the herbicide in the presence of an external carbon source such as yeast extract. The mixed culture was grown in a mineral medium containing 0.2% yeast extract and 300 ppm silvex on a rotary shaker at 23C. (See also W78-03429) (Lynch-Wisconsin)
W78-03437

2,4-D IN SLOW-MOVING WATER,
University of Southwester Louisiana, Lafayette. Dept. of Plant Industry.
J. R. Barry.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 94-100, December 1976. 2 fig, 4 tab. DACW 39-74-C-0074.

Descriptors: *2,4-D, *Herbicides, *Pesticide residues, *Aquatic weed control, *Flow rates, Streamflow, Louisiana, Canals, Water pollution, Pollutants, Application rates, Flow characteristics, Slow-moving waters.

In tests of residue levels after application of the herbicide 2,4-D to six slowly-moving lateral canals near Milton, Louisiana, concentrations at various downstream locations and times were not significantly different and did not approach 0.1 ppm, the limit for potable water supply. Each canal extends at least 6.4 km, and each is fed by the same main canal. Average surface velocity varies from 0.1-0.32 m/sec, and average stream velocity is 0.0557-0.182 m/sec. Five canals were sprayed on opposite sides in strips 166 m long by 3 m wide (0.6 m on the bank and 2.4 m into the stream); at canal 5, a 0.2-ha

area was sprayed from bank to bank (but only on the water). Application rates were 1.82 kg ai/ha at three canals and 3.63 kg ai/ha at the other three, including canal 5. Water samples of .75 liters were taken at .5-48 hrs after application, at eight sites on each canal: above application site, at site, and .0915, .403, .805, 1.6, 3.2, and 6.4 km below lower end of site. While theoretical 2,4-D levels in all canals exceeded the 0.1 ppm limit, water sample analyses showed averages well below 0.1 ppm. Although highest 2,4-D levels were expected at the application site or just below, these levels were not statistically different from locations above the site or well downstream. Dilution, absorption by plants or silt particles (filtered out), or less than ideal sampling sites may account for anomalies in the results. (See also W78-03429) (Lynch-Wisconsin)
W78-03442

THE STRUCTURE OF THE SPRING THERMAL BAR IN LAKE SUPERIOR, II,
Michigan Technological Univ., Houghton. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2H.
W78-03447

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
F. J. Molz, and V. D. Browning.
Ground Water, Vol 15, No 6 p 409-415, November-December 1977. 8 fig, 2 tab, 20 ref. OWRT B-048-ALA(2), A-051-ALA(1).

Descriptors: *Landfills, *Vegetation effects, *Leachate, Lysimeters, Vegetation, Grasses, Trees, Effects, Pollutants, Evapotranspiration, Stabilization, Solid wastes, Waste disposal, Water pollution, Chemical oxygen demand, Groundwater, Path of pollutants.

Six types of vegetation were established successfully on lysimeters containing sanitary landfill materials. The vegetation grew well, with the roots penetrating several refuse layers within one year. Leachate analysis indicated that vegetation and evapotranspiration reduced leachate volume and increased the rate of refuse decomposition. This was accompanied by production of a more potent leachate and a substantial increase in cumulative chemical oxygen demand. Therefore, this study suggested more potential groundwater pollution in a shorter period of time when vegetation is planted on a landfill. The net effect of evapotranspiration on the stabilization of any particular landfill will be the result of a complex interaction involving climate, vegetation, soil type, cover material, landfill geometry, and other variables. This makes extrapolation of these results to a particular field situation rather difficult. (Sims-ISWS)
W78-03448

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 5. BASIC PETROCHEMICALS INDUSTRY,
Radian Corp., Austin, TX.
For primary bibliographic entry see Field 5D.
W78-03457

ACCURATE CALCULATION OF TRANSPORT IN TWO DIMENSIONS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
F. M. Holly, Jr, and A. Preissmann.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY11, Proceedings Paper 13336, p 1259-1277, November 1977. 9 fig, 1 tab, 3 ref, 2 append.

Descriptors: *Path of pollutants, *Advection, *Diffusion, *Tidal waters, *Mass transfer, *Numerical analysis, Water pollution sources, Estuaries, Mathematics, Computers, Oceans, *Finite difference technique, Two-point higher order method, Error analysis.

Numerical calculations of pure advection based on interpolating polynomials evaluated using both the dependent variable and its derivatives were shown to be highly accurate. In one dimension, explicit methods of fourth or higher order are possible using information at only two computational points; a formal error analysis of the fourth-order method is corroborated through demonstrative calculations. Comparisons with other methods demonstrated that the two-point, fourth-order method is significantly more accurate than methods of fourth or higher order which use interpolations based on four or five computational points. Extension of the principle to advection-diffusion calculations in two dimensions demonstrated excellent accuracy. The two-point higher order principle was shown to have direct applicability to the calculations of two-dimensional advection and diffusion in tidal environments at a time scale of several tidal cycles. (Singh-ISWS)
W78-03463

DISPERSION OF A PASSIVE CONTAMINANT IN OSCILLATORY FLUID FLOWS,
Washington Univ., Seattle. Dept. of Oceanography.
L. H. Larsen.
Journal of Physical Oceanography, Vol. 7, No. 6, p 928-931, November 1977. 4 fig, 6 ref. NSF DES74-22711.

Descriptors: *Dispersion, *Estuaries, *Pollutants, *Model studies, Mathematical models, Flow, Tides, Tidal water, Salinity, Salts, Boundary layers, Shear, Velocity, Fluid mechanics, *Path of pollutants, Water pollution sources, Oscillatory flow.

In an effort to ascertain the relative importance of velocity shear and phase, dispersion in an osicillatory boundary layer was considered. Although salt is not strictly a passive contaminant, the model considered is relevant to the induced transport of salt in a tidal estuary. The results indicated a transport directed toward higher concentrations near a boundary whenever the velocity phase near that boundary leads the interior flow. (Sims-ISWS)
W78-03466

SEEPAGE FROM OXIDATION PONDS,
Tahal Water Planning for Israel Ltd., Tel Aviv. Dept. of Sewage Reclamation.
E. Idelovitch.
Progress in Water Technology, Vol. 9, No. 3, p 683-689, 1977. 3 fig, 3 tab, 6 ref.

Descriptors: *Seepage, *Oxidation lagoons, *Water loss, Seepage control, Clays, Soils, Hydrology, Foreign countries, Foreign research, Dunes, *Israel, Clay-lined bottoms.

Operation of the 120-ha Dan Region oxidation ponds in Israel during the period 1970-1974 showed that seepage from ponds constructed on sand dunes without any bottom lining declined by one order of magnitude within 3 to 4 years; average seepage rates diminished from several centimeters to a few millimeters per day and reached similar values to those of seepage from ponds constructed with clay-lined bottoms. This effect was believed to be due to the thin layer of sludge deposited on the bottom of the ponds. The sludge seals the interspaces between soil particles. Yearly water losses from the Dan Region oxidation ponds were estimated in 1975 at some 2.5 m or 3 million cu m. The yearly water losses correspond to an average seepage rate of 7 mm/day and represent about 15% of the present capacity of the ponds. (Lee-ISWS)
W78-03472

FIRST ANNUAL REPORT ENVIRONMENTAL PROTECTION AGENCY/CORPS OF ENGINEERS TECHNICAL COMMITTEE ON CRITERIA FOR DREDGED AND FILL MATERIAL,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03481

NUMERICAL MODEL RESULTS OF DREDGED MATERIAL DISPOSAL AT TEN PROPOSED OCEAN DISPOSAL SITES IN THE HAWAIIAN ISLANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
B. H. Johnson, and B. W. Holliday.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A040 605, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper No. H-77-6, May 1977. 44 p, 4 fig, 2 tab, 5 ref, 2 append.

Descriptors: *Dredging, *Spoil banks, *Oceans, *Hawaii, *Pacific Ocean, *Model studies, Mathematical models, Dispersion, Sediments, Sediment transport, Currents(Water), Suspended solids, Sedimentology, Disposal areas, Dredged material disposal.

A numerical model has been developed by Tetra Tech, Incorporated. The model traces the movement of dredged material disposed in the aquatic environment and has been employed at 10 proposed ocean disposal sites in the Hawaiian Islands. The primary objecitve of the model applications was to provide a qualitative description of the behavior of the disposed material, with a corresponding estimate of how much of the material reached the bottom of each of the 1000-yd-radius disposal sites. In addition to model results, a brief description of the numerical model and the rationale for selection of the basic input data at the Pacific Ocean disposal sites were presented. Results from the study indicated that for the particular input data used, at most of the sites the majority of the material will leave the disposal site as suspended sediment rather than being deposited on the bottom. (Sims-ISWS)
W78-03483

EQUILIBRIUM OPERATION OF SUBSURFACE ABSORPTION SYSTEMS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-03507

FERRIC CHLORIDE TREATMENT REDUCES RIVER'S PHOSPHOROUS DISCHARGE,
Indiana Univ. at South Bend. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-03508

WASTE WATER SURVEY OF A PARTIALLY SEWERED CITY,
T. A. Mahmood, S. A. Kanbar, and S. Ahmed.
Journal of the Institution of Engineers (India), Vol 57, Part EN 3, p 103-107, June, 1977. 4 fig, 4 tab, 10 ref.

Descriptors: *Outfall sewers, *Municipal wastes, *Water analysis, *Path of pollutants, *Industrial wastes, Flow characteristics, Hydrographs, Flow profiles, Waste water disposal.

A field study was conducted to examine quantitative and qualitative aspects of waste water in Mosul, Iraq, a city with an estimated population of 350,000. Much of the industrial and domestic waste water generated in the city is discharged to the Tigris River without treatment. During June, July, and August, 1972, bi-hourly flow measurements were taken at the city's 10 major outfalls.

Additional parameters measured during the survey included BOD and a deoxygenation constant. Minimum, maximum, and average flow rates were computed for each station. Individual hydrographs were calculated to illustrate daily variations in waste water flow. The hydrographs indicated that one peak in waste water flow occurred in areas that were predominantly residential, while multiple peaks occurred in areas which had mixed commercial and residential uses. The per capita waste water flow for Mosul averaged 280 liters/day. Waste water analyses were conducted with bi-hourly samples which were mixed to produce a flow-proportioned, 25-hr composite sample. Characteristics examined included total, suspended, and settleable solids; BOD; organic nitrogen; organic, ammonia, and nitrate nitrogen; chloride; pH; fat; alkalinity; total bacteria; and coliform bacteria. Analyses indicated that the waste water was primarily domestic in origin. (Schulz-FIRL)
W78-03559

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
R. W. Johnson, I. W. Duedall, R. M. Glasgow, J. R. Proni, and T. A. Nelsen.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2063-2073, October, 1977. 11 fig, 1 tab, 13 ref.

Descriptors: *Sludge disposal, *Analytical techniques, *Mapping, *Suspended solids, *Monitoring, Atlantic Ocean, Waste water disposal, Environmental effects, Regression analysis, Chlorophyll, Remote sensing, Measurement, Path of pollutants, Waste water treatment.

Since large quantities of waste are dumped into the apex of the New York Bight and little is known about the dispersion of these wastes in coastal waters, studies were conducted to quantitatively map waste water sludge plumes on the basis of water quality properties and remotely sensed data. The testing program took place after a 2-day moratorium on sludge dumping in the Bight apex. Aircraft remove sensing and two surface vessels were used to map three waste water sludge plumes on September 22, 1975, with comparisons of suspended solids and chlorophyll-a concentrations obtained by the sea-truth and remote measurements. Spectral signatures were determined to allow specific identification of sludge plumes. Multiple regression techniques, including stepwise regression analysis, were used to reduce the remote sensing data. The statistical analyses indicated that calibrated regression equations were adequate for mapping the sludge plume by remote sensing with respect to suspended solids. For chlorophyll-a, however, interference with analyses and plume mapping was attributed to possible fluorescent characteristics of the waste water dump material. Comparison of data obtained for line and spot plumes revealed similar spectral characteristics. (Schulz-FIRL)
W78-03564

POLYCYCLIC AROMATIC HYDROCARBONS IN AGRICULTURAL SOIL (POLYZYKLISCHE, AROMATISCHE KOHLENWASSERSTOFFE IN LANDWIRTSCHAFTLICH GENUTZTEN BODEN),
Mainz Univ. (West Germany). Hygiene Inst.
H. Kunte.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung 1: Originale, Reihe B, Vol 164, No 5-6, p 469-475, 1977. 2 fig, 3 tab, 19 ref.

Descriptors: *Fertilizers, *Organic compounds, *Soil amendments, *Soil analysis, *Sludge disposal, Environmental effects, Path of pollutants, Waste water disposal.

Since sewage sludge used to amend agricultural soils may contain considerable amounts of polycyclic aromatic hydrocarbons (PAH), studies were conducted to establish baseline concentrations of these substances in soils. Fifty soil samples were collected at various locations throughout West Germany and analyzed for six PAH forms, including fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)-perylene, and indeno (1.2.3-cd)pyrene. The average concentration of benzopyrene for 74% of the samples ranged from 2-50 ppm, while the total PAH concentration was 50-500 ppm. Higher values were attributed to extraneous sources of PAH. Previous studies on the cncentration of benzo(a) pyrene in soils are reviewed. (Schulz-FIRL)
W78-03566

DISSOLVED SOLIDS IN WASTEWATER,
Connecticut Univ., Stors.
H. E. Klei, D. W. Sundstorm, and A. J. Perna.
AIChE Symposium Series, Vol 73, No 166, p 380-383, 1977. 2 tab, 11 ref.

Descriptors: *Municipal wastes, *Dissolved solids, *Filtration, *Heavy metals, *Industrial wastes, Phosphorus compounds, Waste water treatment, Pollutant identification, Reverse osmosis, Ion exchange.

Characteristics of dissolved solids in municipal and industrial waste waters are reviewed. Total dissolved solids concentrations are normally measured by evaporation to dryness of the filtrate obtained after passing the sample water through a 0.2-0.45-micron membrane filter. Since most industries contribute heavily to the total dissolved solids cncentration of combined municipal and industrial waste, pretreatment of an industrial waste by ion exchange or reverse osmosis is suggested. Expected concentrations in municipal waste water of total, volatile, and fixed dissolved solids and of various contributing cations, anions, and organics are listed in tabular form. Components of industrial waste water are listed according to the particular type of industry. (Schulz-FIRL)
W78-03567

LEAK TESTING WITH DYED LIQUID TRACERS,
Shannon-Glow Inc., Los Angeles, CA.
J. R. Alburger.
Materials Evaluation, Vol. 35, No. 12, p 60-64, December, 1977. 6 ref.

Descriptors: *Analytical techniques, *Tracking techniques, *Fluorescent dye, *Tracers, Path of pollutants, Marking techniques, Dye concentrations, Fluorescence, Pollutant identification, Materials testing, Leakage, Sewers, Inflow, Waste water treatment.

Dyed liquid tracers have been used in a wide variety of applications, ranging from charting flow patterns in rivers to discerning leaks in pipelines. Fluorescent dyes have been used as an alternative to non-fluorescent visible color dyes which lose their tinctorial power rapidly by dilution. Fluorescent dyes, which can often be detected in extremely dilute solutions, generally fall into two categories: sensitizer dyes and color-former dyes. The sensitizer dyes exhibit strong fluorescence in thin films. The color-former dyes are normally used in conjunction with sensitizer dyes to shift the color response by cascading fluorescence. Bulk fluorescence is used in leak detection when the use of high tracer dye concentrations required for the thin-film mode is considered impractical. Dye tracers have been used to map water seepage in soil and to trace leaks in encapsulated electronic components and lead-through wires. Heating units and evaporative dyes have been used in conjuction with micro-leaks associated with surface porosity. The various dyed liquid leak tracer materials and processes are summarized. (Schulz-FIRL)
W78-03580

HEAVY METALS TRANSPORT MODEL IN A SLUDGE-TREATED SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
R. C. Sidle, L. T. Kardos, and M. T. van Genuchten.
Journal of Environmental Quality, Vol 6, No 4, p 438-443, October-December, 1977. 5 fig, 4 tab, 25 ref.

Descriptors: *Heavy metals, *Mathematical models, *Soil amendments, *Sludge disposal, *Path of pollutants, Soil chemical properties, Drainage effects, Soil investigations, Waste water disposal, Groundwater, Leachate, Percolation.

A one-dimensional solute transport model was developed to describe the movement of Cu, Zn, and Cd in sludge-amended soils. Freundlich adsorption isotherms were used to describe the adsorption of the cationic forms by the soil. The miscible displacement of chloride ions through undisturbed soil cores was used to determine the dispersion coefficient. A 17-month simulation period, with sludge inputs during the first 37 days and between the 168th and 196th days, was initiated to test the model's ability to predict the movement of Cu, Zn, and Cd in 15- and 120-cm soil percolates. Although the model predicted virtually no movement of the metals at either depth, field Cu, Zn, and Cd at 15 cm and 121, 305, and 800%, respectively, at the 120-cm depth. Accelerated movement of metals at times of high hydraulic loading through interconnecting soil channels was suggested as contributing to the large discrepancy between the predicted and observed values. Since the more highly soluble chelated forms of heavy metals may be transported to greater depths than their cationic counterparts, a partitioned model for metals transport was tested. The data generated indicated that mechanisms other than simple chelation are responsible for metals movement through soils. (Schulz-FIRL)
W78-03590

PYROLYSIS PROCESS FOR TREATING SEWAGE SLUDGE CONTAINING CHROMIUM,
NGK Insulators, Ltd., Nagoya (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W78-03594

PLANKTON INVESTIGATIONS IN ISHIKARI BAY, HOKKAIDO, ZOOPLANKTON BIOMASS DURING THE SUMMER AND AUTUMN OF 1975, (IN JAPANESE),
For primary bibliographic entry see Field 2L.
W78-03595

WASTEWATER TREATMENT THROUGH SOIL -- WITH SPECIAL REFERENCE TO SEPTIC TANK EFFLUENT TREATMENT,
ADI Ltd., Frederiction (New Brunswick).
For primary bibliographic entry see Field 5E.
W78-03620

SIMULATION OF QUALITY OF URBAN DRAINAGE EFFLUENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
J. Marsalek.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 564-579, 1976. 2 fig, 4 tab, 12 ref.

Descriptors: *Simulation analysis, *Water quality, *Urban drainage, *Urban runoff, *Storm water, *SWMM model, Effluents, Rainfall, Model studies, Equations, Pollutant loadings, Water quality data, Stepwise multiple linear regression, Storm sewers, Systems analysis.

The unsatisfactory performance of quality simulation models creates a need to re-examine basic assumptions and reformulate such conceptual models. Herein, some experience with the simulation of quality of urban runoff by means of the Storm Water Management Model (SWMM) of the U.S. EPA is summarized. An explanation for poor agreement between the simulated and observed runoff quality data is sought by a multivariate analysis of storm water data. For satisfactory modeling of runoff quality, the accuracy of modeling the total pollutant loadings is of primary importance, followed by the distribution of these loadings in time. Using the data of 19 storm water events for a test catchment, total pollutant loadings for four parameters are treated as multivariate data and their dependence on various factors is studied. From 83% to 92% of linear variation in the loadings is explained by linear variation in the antecedent dry period, the first parameter to enter a stepwise multiple regression analysis. The same parameter appears to be the most significant in the analysis of a random subset (10 events) of the data set discussed. No physically meaningful relationship is found between the total loadings and the total runoff volume, rainfall intensity, and antecedent storm rainfall. (Bell-Cornell)
W78-03641

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
S. C. Chapra.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE2, p 147-161, April 1977. 5 fig, 3 tab, 39 ref.

Descriptors: *Water quality control, *Water management(Applied), *Great Lakes, *Forecasting, *Eutrophication, *Phosphorus, Lakes, Mathematical models, Equations, Simulation analysis, Oligotrophy, Effluents, Systems analysis, Path of pollutants.

A model based on conservation of mass is developed to simulate total phosphorus budgets for the Great Lakes. Phosphorus loadings are generated from variables indicative of human development, such as population and land use. The loadings are input to a budget model that can be solved for total phosphorus concentration as a function of time. A historical simulation is generated from census information for the period 1800 to 1970 and compares favorably with present measurements. The historical profiles indicate a dramatic increase in human impact on Lakes Erie, Ontario, and Michigan from 1950 to 1970 due to point sources. Projections indicate that, if point source effluents are reduced to 1 mg/l of total P by 1980, all the lakes will show some improvement in trophic condition. However, the analysis also indicates that control of diffus sources, particularly in Lake Erie, will be necessary of oligotrophy is the ultimate goal. (Bell-Cornell)
W78-03643

FAUNA AND DENSITIES OF MOLLUSCS IN SOME MOUNTAIN WATERS IN THE SURROUNDINGS OF DOMBAS (SOUTH NORWAY), (IN GERMAN),
Gesamthochschule Duisburg (West Germany).
W. Hinz.
Norw J Zool. 22(3), p 221-229, 1974.

Descriptors: *Mountain waters, Air pollution effects, Sulfuric rain, Sulfuric snow, Bivalves, *Dombas(Norway), Gastropod, Gyraulus-acronicus, Lakes, *Mollusks, Precipitation, Streams, Valvata-piscinalis, Water pollution.

In the south of Norway, 4 lakes and 3 streams situated at a height of 372-1227 m above sea-level were investigated malacologically and quantitatively with the Elkman-Birge grab, some other habitats were investigated qualitatively. Ten species of Sphaeriidae and 5 spp. of gastropods were found. The number of bivalves was between 0-10.4 animals/225 cm2. Exceptionally it was higher (up to 36.6 specimens/225 cm2) in flat marshy banks. Apart from Gyraulus acronicus in marshy shores of lakes (up to 3.5 animals/225 cm2) and an abundance of Valvata piscinalis, gastropods were not important with regard to the number of the individuals. The importance of the densities of molluscs for the critical examination of the pollution of waters by sulphuric rain and snow in southern Scandinavia is pointed out.--Copyright 1975, Biological Abstracts, Inc.
W78-03669

TRACKING POLLUTANTS FROM A DISTANCE,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-03670

THE FOUNDATIONS OF ORGANIC POLLUTANT ANALYSIS,
Municipal Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-03671

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS II. PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF 16 SUBSTANCES.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-03672

A REVIEW OF TRACE ELEMENT STUDIES RELATED TO COAL COMBUSTION IN THE FOUR CORNERS AREA OF NEW MEXICO,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 5A.
W78-03674

TRACE ELEMENTS IN THE TERRESTRIAL ENVIRONMENT OF A COAL-FIRED POWERHOUSE,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5A.
W78-03677

INFLUENCE OF THE SEDIMENT/WATER INTERFACE ON THE AQUATIC CHEMISTRY OF HEAVY METALS,
New England Aquarium, Boston, MA.
T. R. Gilbert, A. M. Clay, and D. A. Leighty.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 268, Price codes: A05 in paper copy, A01 in microfiche. Report No AFCEC-TR-76-22, June 1976. 81 p, 7 fig, 35 tab, 57 ref, append. 2103. F29601-75-C-0062.

Descriptors: *Trace elements, *Water analysis, *Water chemistry, *Sediment-water interfaces, *Chromium, *Cadmium, Groundwater, Mechanical properties, Adsorption, Phytoplankton, Water treatment, Pollutant identification, Path of pollutants, Sedimentation, *Heavy metals, Water pollution sources, *Silver, Mechanisms, Desorption.

The mechanisms controlling the transport of the three heavy metals cadmium, chromium, and silver in natural water systems were evaluated following a review of the scientific literature and laboratory studies of adsorption/desorption behavior and the interaction of these metals with phytoplankton. In fresh water, chromium as chromate is not appreciably taken up by model inorganic or organic particulates, but after reduction to Cr(III) it is rapidly and irreversibly taken up by clay particles, hydrous iron oxide, and phytoplankton. Cadmium and silver are more reversibly adsorbed by clay particles, are strongly adsorbed by hydrous manganese oxide, and are concentrated by phytoplankton. Once a part of reducing bottom sediments, the availability of all three metals to the aqueous phase is further reduced so that they are not released by short term resuspension. Results indicate that prolonged resuspension of anoxic sediments in an aerated water system can result in the reintroduction of cadmium to the water column, but chromium and silver, once a part of the sediment layer, are not likely to reenter the aqueous phase. The appendix presents the calculation method for concentration factors. (Wares-IPA)
W78-03678

ASBESTOS FIBERS IN DISCHARGES FROM SELECTED MINING AND MILLING ACTIVITIES. FINAL REPORT PART III,
McCrone (Walter C.) Associates, Inc., Chicago, IL.
For primary bibliographic entry see Field 5A.
W78-03687

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATIONS - VOL. 2: SURRY POWER PLANT UNITS 1 AND 2,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-03697

BASELINE STUDY PROGRAM, NORTH PUGET SOUND BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL. II BIBLIOGRAPHY,
Beak Consultants Inc., Portland, OR.
J. W. Buell, and V. W. Kaczynski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 292, Price codes: A20 in paper copy, A01 in microfiche. Report No. WA/DOE/BR-75/02, 200 p, 1975. 500 ref.

Descriptors: *Bibliographies, *Reviews, *Publications, *Baseline studies, Documentation, Data collections, Oil pollution, Water quality, Water quality standards, Environmental effects, Sounds, Oil, *Washington, Water pollution effects, *Puget Sound(Wash).

An annotated bibliography of current available literature on the ecology of the significant biological resources of Puget Sound and on the effects of oil spills and petrochemical products on those biota. It is intended for use in conjuncion with composite fact sheets and contains all consulted sources used in obtaining information for the fact sheets. Certain references of general interest on the subject of oil pollution and marine organisms are also included. (Klein).
W78-03698

5C. Effects Of Pollution

BACTERIAL CONTROL OF AQUATIC ALGAL POPULATIONS,
Medical Coll. of Ohio at Toledo.
For primary bibliographic entry see Field 5G.
W78-03201

'INNOVATIVE' ASSESSMENT TECHNOLOGY ALLOWS MORE ACCURATE PREDICTION.
Canadian Pulp and Paper Industry, Vol. 30, No. 16, p 14-16, November, 1977. 3 fig.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Evaluation, *Forecasting, *Environmental effects, Canada, Industrial wastes, Waste water treatment, Aquatic life, Salmon, Toxicity, Fish, Bioassay, Effluents.

The environmental impact assessment for the Donohue-St. Felicien kraft mill in northern Quebec, Canada, involved innovative assessment technology, including predictive research, extrapolation of existing literature, and subjective professional judgment. The critical environmental issues revolved around the land-locked Atlantic salmon population. Good spawning habitats were found upstream of the mill site. However, the stretch of the Ashuapmouchouan River at the mill site was a poor spawning area through which the salmon passed quickly during migration. All rainbow trout and varieties of Atlantic salmon tested survived in 80% concentrations of simulated treated effluent. Avoidance experiments using rainbow trout and land-locked salmon indicated no preference or avoidance at effluent concentrations of 5% or less. The river would average 0.5% effluent concentration and increase to 2% during the lowest flow in a 20-year period. It was concluded that the mill will not adversely affect the aquatic environment. (Snyder-FIRL)
W78-03209

ORGANIC BIODEGRADATION IN HYPERSALINE WASTEWATER,
E. M. Davis, J. K. Petros, and E. L. Powers.
Industrial Wastes, Vol 23, No 1, p 22-25, January/February, 1977. 4 fig, 4 tab, 4 ref.

Descriptors: *Biodegradation, *Saline water, *Salt tolerance, *Industrial wastes, *Activated sludge, Bacteria, Sewage bacteria, Biological treatment, Resistance, Waste water treatment.

Since various manufacturing processes generate hypersaline waste water, studies were conducted to examine the viability of activated sludge organisms in a hypersaline environment. Specific objectives included the isolation and/or identification of bacterial species capable of surviving in highly saline aqueous systems, the acclimation of salt tolerant bacteria to hypertonic waste streams, and the quantification of activated sludge processes for treatment of hypersaline industrial wastes. Laboratory experiments with synthetic wastes and ethylene glycol as a carbon nutrient source examined growth characteristics of four identified species of bacteria, six saltwater isolates, and two industrial unit operation seed cultures. Salt tolerance studies at concentrations ranging from 5% to 12% indicated that Bacterium T-52 and a bacterial isolate from Great Salt Lake were capable of growth at 12% salt concentrations. Bench-scale studies were then conducted with continuous-feed activated sludge units. A reduction in the pH of the waste water from 10 to a level of 7-8 was required before any of the bacteria exhibited signs of functional metabolism. Reductions in TOC and BOD were measured at various nutrient levels and salinities. (Schulz-FIRL)
W78-03220

EVALUATION OF SAFETY FACTORS WITH RESPECT TO OCEAN DISPOSAL OF WASTE MATERIALS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
T. F. Zapatka, and R. W. Hann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 400, Price codes: A06 in paper copy, A01 in microfiche. Sea Grant Program Report No. TAMU-SG-77-202, November 1976. 102 p, 8 fig, 11 tab, 77 ref. SG-04-6-158-44012.

Descriptors: *Toxicity, *Hazards, *Estuaries, *Waste disposal, *Water pollution effects, Ecosystems, Safety factor, Pollutants, Industrial wastes, Municipal wastes, Radioactive waste disposal, Solid wastes, *Ocean dumping, Marine environment, Environmental impact, Outer Continental Shelf, Military wastes.

Assessment of the risk and consequent environmental harm to the oceans is essential if ocean dumping is to be continued. The available literature, bioassay studies, and pertinent research concerning chronic effects and the risk they impose on the marine ecosystem were studied. The correlation between acute and chronic toxicities for known hazardous materials were investigated and defined. This relationship is vital for the determination of an appropriate safety factor to be used in evaluating allowable discharges or concentrations in the marine environment. The variables defined to be of most importance are: stage of development, concentration of toxicant, time of exposure, specific or non-specific reactions, lifetime of ratios for different conditions and situations or at least the ratios of acute to chronic toxicities for various classes of materials were determined. (Sinha-OEIS)
W78-03269

A PILOT STUDY ON THE DESIGN OF A PETROLEUM HYDROCARBON BASELINE INVESTIGATION FOR NORTHERN PUGET SOUND AND STRAIT OF JUAN DE FUCA,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 5B.
W78-03271

SPORT FISHING IN WESTERN DELAWARE BAY: ASSESSMENT OF CRITICAL AREAS (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Coll. of Marine Studies.
R. W. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 854, Price codes: A02 in paper copy, A01 in microfiche. Report to National Science Foundation, Research Applied to National Needs (RANN) No. CMS-RANN-2-75, 1975. 23 p, 4 fig, 7 tab, 4 ref. G141896.

Descriptors: *Estuaries, *Fisheries, *Delaware, *Sport fishing, Recreation, Economics, Water quality control, Baseline studies, Oil pollution, *Delaware Bay, Environmental assessment, Resources management.

Sport fishing in Delaware Bay is very important to the region's economy and recreation. Sport fishing pressure is greatest in the lower bay, espicially in areas associated with the channel running through the Ship Anchorage or lightering area. These five areas account for almost half of the total fishing pressure, with the Ship Anchorage by far the most important one. Trawl survey data also show this area had the highest total fish and weakfish densities of those areas sampled. The Ship Anchorage and associated areas should be protected to maintain their natural attributes, in spite of physical characteristics which might make them desirable for industrial development. A coastal ocean site which does not support a good sport fishery and is not within easy reach of small boats might be used for such projects as oil transfer and port development, if necessary. Even though the technical capability to build ports at ocean sites exists, productive estuaries can not be built. Though the cost of ocean port islands may be enormous, such approach is still more reasonable than permitting the deterioration of irreplaceable natural areas such as estuaries. (Sinha-OEIS)
W78-03277

IMPACTS OF OUTER CONTINENTAL SHELF ACTIVITIES: LAFOURCHE PARISH, LA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
G. Happ, V. R. Bennett, W. H. Burke, III, W. H. Conner, and N. J. Craig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 412, Price codes: A08 in paper copy, A01 in microfiche. Final Report to Louisiana State Planning Office, August 1976. 152 p, 17 fig, 17 tab, 96 ref, 3 append. LA- SPO-76-13.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Oil spills, *Water pollution effects, Louisiana, Drainage patterns(Geologic), Eutrophication, Erosion, Ecosystems, Navigation, Transportation, Mineral industry, Land use, *Outer Continental Shelf, Environmental impact, Mineral extraction.

Three categories of activity studied in relation to Outer Continental Shelf (OCS) development are mineral extraction, navigation and transportation. Environmental impacts of OCS activities are described in terms of hydrocarbon discharge, altered drainage patterns, eutrophication, subsidence, erosion, direct land loss, changes in salinity and turbidity, and disruption of flora and fauna. The major environmental impacts of OCS activities are OCS employment-derived population increases, OCS use of pipeline ditches and navigational canals, and potential oil spills. OCS-use of oil and gas pipeline canals, and dredging of landfill, along with muck disposal, spoil banks are other sources of environmental impact upon Lafourche Parish. Direct land loss resulting in loss of primary production of marshes and swamps has a direct impact on the economy of the area. On the basis of preliminary data guidelines for OCS-related activities are suggested. (Sinha-OEIS)
W78-03288

BARATARIA BASIN: BIOLOGICAL CHARACTERIZATION,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
L. M. Bahr, and J. J. Hebrard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 807, Price codes: A08 in paper copy, A01 in microfiche. Sea Grant Publication No. LSU-T-76-005, May 1976. 155 p, 3 fig, 43 tab, 66 ref, append.

Descriptors: *Ecosystems, *Baseline studies, *Aquatic life, *Wetlands, *Water pollution sources, Ecology, Environmental effects, Estuaries, Marshes, Beaches, Physical processes, Chemical processes, Coastal marshes, Salt marshes, Bayous, Swampts, Aquatic habitats, *Nutrient transport, *Barataria Basin(LA), Coastal Zone Management, Outer Continental Shelf.

The biological characterization of the Barataria Basin includes a functional description of biological processes at both the ecosystem (basin) level and the habitat level, as well as summaries of research on distribution and abundance of animal groups. Water represents the prime integrating feature of the total ecosystem. The importance of rainfall, tidal flow, wind, temperature, storms, meandering of streams, and discharge from the Mississippi River is emphasized in relation to distributions of organisms and nutrients and also as a vehicle for pollutants. On the habitat level, swamp forests, fresh marshes, brackish marshes (including the intermediate marsh) saline marshes, beaches, and other elevated areas (i.e., chenieres, natural levees, and spoil banks) are discussed in terms of probable energy pathways by classification of organisms as producers, primary consumers (herbivores and detritivores), or secondary consumers (carnivores), with emphasis on water and its relationship to nutrient transport. (Sinha-OEIS)
W78-03289

TOXICITIES OF BLEACHING EFFLUENTS UNDER FINNISH CONDITIONS

(TOXICITETEN HOS BLEKERIAVLOPPSVATTEN I FINSKA FORHALLANDEN),
Finnish Pulp and Paper Research Inst., Helsinki.
O. Seppovaara.
Nordforsk Miljovardssekretariatet Publikation No. 2, p 113-125, 1976. 5 fig, 12 ref, 6 tab.

Descriptors: *Bleaching wastes, *Toxicity, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Europe, Pine trees, Neutralization, Mixing, Humus, Fish, Water pollution effects, Pulp wastes, Pulp and paper industry, Waste dilution, Effluents, *Finland, Kraft mills, Birch trees(Betula).

After a general introduction to operating and effluent data for the 18 pulp mill bleach plants in Finland, known toxic substances present in bleaching effluents are reviewed along with the relatively low toxicity tolerances of Finnish receiving waters. Acute toxicity testing with bleaching effluents from a birch kraft pulp mill and a pine kraft pulp mill showed significant toxicity in the effluents from the chlorination and birch-kraft-mill hypochlorite stages, which could be reduced by neturalization or mixing with the rest of the mill effluent or by dilution with humus-containing water. Also considered are the effects of sublethal concentrations of toxic substances on fish. (Speckhard-IPC)
W78-03305

DIFFICULTY DECOMPOSED TOXIC SUBSTANCES FROM THE PULP AND PAPER INDUSTRY (SVARNEDBRYTBARA, TOXISKA AMNEN FRAN PAPPERS- OCH CELLULOSAINDUSTRIN),
Institutet for Vatten- och Luftvardsforskning, Stockholm (Sweden).
L. Landner.
Nordforsk Miljovardssekretariatet Publikation no. 2, p 127-150, 1976. 2 fig, 16 ref, 9 tab. In Swedish.

Descriptors: *Pulp wastes, *Toxicity, *Biodegradation, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Fish, Organic compounds, Pine trees, Bleaching wastes, Oxygen demand, Aerated lagoons, Condensates, Kraft mills, Slimicides.

This discussion on difficulty decomposed toxic substances in pulp and paper industry effluents covers substances stemming from the wood raw material, the determination of the degradability of different effluents and effluent components, the determination of the compounds in the effluents responsible for toxic effects, the determination of substance accumulatability in fish, and toxic substances stemming from chemical additives. Tables list the organic compounds in the evaporator condensate from a kraft pulp mill, the organic compounds in bleaching effluent from a pine kraft pulp mill effluents, low-molecular weight organic compounds in the inflow and outflow from a kraft-mill aeration pond, toxic components in the effluent from softwood kraft pulp mills, and toxicity to fish of slime-control agents. (Speckhard-IPC)
W78-03306

EFFECTS OF BLEACH PLANT EFFLUENTS FROM SULFATE PULP BLEACHING ON GROWTH AND PHOTOSYNTHESIS OF PLANKTONIC ALGAE (EFFEKTER AV BLEKERIAVLUTAR FRAN SULFATMASSABLEKNING PA TILLVAXT OCH FOTOSYNTES AV PLANKTISKA ALGER),
Institutet for Vatten- och Luftvardsforskning, Stockholm (Sweden).
L. Landner, and T. Larsson.
Svensk Papperstidning, Vol. 80, No. 12, p 371-378, 380, September 10, 1977. 6 fig, 17 ref, 11 tab. English summary.

Descriptors: *Bleaching wastes, *Algae, *Water pollution effects, *Photosynthesis, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Microorganisms, Aquatic life, Phytoplankton, Marine algae, Fish food organisms, Water pollution.

Bleach plant effluents are an important source of persistent colored organic water pollutants. The effects of these compounds on primary phytoplankta (which are the basis of fish production in the sea) were investigated in laboratory studies, using stabilized (long-term aerated) chlorination and alkaline extraction effluents from softwood kraft pulp (free from easily degradable substances), plus an ion-exchanged alkaline extraction effluent. Results indicated that a natural algal population (such as that occurring normally in the Baltic Sea) responds to such exposures by reduced photosynthesis and primary production. A significant drop in primary production was recorded in the presence of extraction-stage effluent diluted 1000-fold, and of chlorination-stage or treated extraction-stage effluents diluted 100-fold. This detrimental effect of bleaching effluents was only partly connectable with their light-absorbing capacity, and involved a direct inhibition of algal cells. (Brown-IPC)
W78-03316

STUDIES ON THE MUTAGENIC PROPERTIES OF BLEACHING EFFLUENTS,
Swedish Forest Products Research Lab., Stockholm.
P. Ander, K.-E. Eriksson, M.-C. Kolar, K. Kringstad, and U. Rannug.
Svensk Papperstidning, Vol. 80, No. 14, p 454-459, October 10, 1977. 3 fig, 15 ref.

Descriptors: *Bleaching wastes, *E. coli, *Salmonella, *Water pollution effects, Wastes, Industrial wastes, Water pollution source, Effluents, Pulp and paper industry, Pulp wastes, Aquatic microorganisms, Pathogenic bacteria, Microorganisms, Biodegradation, Genetics, *Mutagenicity.

Commercial and laboratory-prepared effluents from the bleaching of softwood kraft pulps were tested for mutagenicity towards a streptomycin-dependent strain of Escherichia coli and different histidine-requiring mutant strains of Salmonella typhimurium. None of the tested effluents caused mutations in E. coli, but chlorination-stage effluents caused mutations in 2 Salmonella strains (TA 1535 and 1537). A weak mutagenic activity was also shown by concentrated hypochlorite-stage effluent. These results clearly show that chlorination-stage effluents from kraft pulp bleach plants contain mutagenic compounds and indicate that both alkylating and intercalating mutagenic substances are present. The addition of liver microsomes decreased the mutagenic activity indicating that the mutagenic compounds are partly degradable in the liver. (Brown-IPC)
W78-03317

SEWAGE FUNGUS GROWTH IN RIVERS RECEIVING PAPER MILL EFFLUENT,
Research Association for the Paper and Board, Printing and Packaging Industries, Surrey (England).
J. C. Roberts.
Water Research, Vol. 11, No. 8, p 603-610, 1977. 6 fig, 15 ref, 7 tab.

Descriptors: *Pulp wastes, *Aquatic fungi, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Carbohydrates, Effluents, Pulp and paper industry, Foreign countries, Organic compounds, Flocculation, Chemicl precipitation, Sewage treatment, Waste water treatment, Sphaerotilus, Aquatic microorganisms, Aquatic bacteria, United Kingdom, Monosaccharides, Glucose, Starch.

The results of this investigation show that starch and its degradation products are likely to be the major cause of sewage fungus growths in the river below a paper mill in the United Kingdom. The mill produces paper for printing and wrapping and uses no chemical wood pulping process. Imported wood pulp and recycled paper are the only sources of cellulose fiber. Analysis of effluent composition showed an average value of 67% carbohydrate in the dissolved organic material. Effluent which had undergone primary treatment (chemical flocculation and settlement) was used to determine that a high percentage of the carbohydrates, in the form of polysaccharides, had molecular weights from about 2,000 to over 10,000. Surprisingly the predominant monosaccharide obtained by hydrolysis was glucose. This suggests that most of the polysaccharides do not originate from the disintegration and beating of chemically produced wood pulps (which yield mostly xylans), but from starch used for surface sizing of waste paper. Soluble oxidized starch and high-molecular weight polysaccharides (molecular weight over 10,000) are shown to be readily utilized by Sphaerotilus, the dominant bacterium found in the sewage fungus community. (Du Vall-IPC)
W78-03323

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 22-24 OCTOBER 1975, CHARLESTON, S.C.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W78-03429

POSSIBLE EFFECTS OF THE INTRODUCTION OF THE WHITE AMUR INTO LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel, and T. D. Fontaine, III.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24, October 1975, Charleston, S.C., p 64-84, December 1976. 11 fig, 3 tab, 8 ref.

Descriptors: *Biocontrol, *Aquatic weed control, *White amur, *Lake Conway(FL), *Hydrilla verticillata, Florida, Lakes, Ecosystems, Model studies, Nutrients, Phosphorus, Phytoplankton, Eutrophication, Ctenopharyngodon idella, Monosex fish.

A preliminary model was developed to predict ecological effects of introducing monosex white amur fish (Ctenopharyngodon idella) into Lake Conway, Florida in the winter of 1977 to control the submersed macrophyte Hydrilla verticillata. Four simulations were run: (1) hydrilla allowed to grow unrestrained; (2) herbicide added; (3) white amur introduced; and (4) use of both herbicide and white amur. The lowest standing stock of hydrilla occurs with (4), and the highest with (1); standstock is seven times less using herbicide and amur than under no management. None of the programs completely eliminate hydrilla, as tubers and turions continue to be produced. A phytoplankton bloom occurs with (4) due to increased availability of phosphorus, resulting from diminished uptake with the decline in standing stocks of vegetation. Reduction in hydrilla-caused shading by the use of herbicide results in the best growth of native submersed plants. All management efforts decrease algal periphyton due to reduction of their main substrate, the hydrilla. Native fish show best growth under no management; periphyton supply seems to control fish population. Shallow-level detritus accumulation is least with (3) and (4), and greatest with (1). Amur actually assimilate less than 0.2% of the hydrilla, however, with the rest going to the detritus. (See also W78-03429) (Lynch-Wisconsin)
W78-03440

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II - FINAL REPORT (APPENDIX, LISTING OF REFERENCES),
Stanford Research Inst. Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-03456

ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. VOL II - ROCKY MOUNTAIN REGION CASE STUDIES,
Enviro Control, Inc., Rockville, MD.
W. Nelson, G. Horak, A. Hale, Z. Parkhurst, and M. Lewis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 471, Price codes: A16 in paper copy, A01 in microfiche. Report No. FWS/OBS - 76/30, August 1976. 373 p, 58 fig, 3 tab, 144 ref. 049-75, 14-16-0008-956 FWS.

Descriptors: *Dams, *Reservoir releases, *Flow control, *Habitats, *Water management(Applied), Hydrology, Fish, Wildlife, Diversion, Relative rights, Riparian rights, Arizona, Colorado, Montana, New Mexico, Utah, Wyoming, *Fish and Wildlife Service, Instream flow, Minimum flow.

Individual analyses of changed flow regimes below dams, impact statements on fisheries, and methodologies used to assess flow requirements for 49 dams and diversions in the Rocky Mountain region in Arizona, Colordao, Montana, New Mexico, Utah, and Wyoming are presented. Analysis of each project is based on a description of the project in terms of location, geographic relationships, terrain, native wildlife and biology, structures, hydrology, proposed or recommended flow regimes, and estimates of effect or results of changed flow regimes on fisheries and biology. Constraints on recommendations, i.e., the lack of hydrologic data or recognition of demand for diversionary use of water, are recognized where applicable. Based upon analytical results, recommendations are made for altering flow regimes to reduce sedimentation, support habitat, and assist irrigation projects. In most cases, if was concluded that a suitable aquatic habitat could be maintained by adjusting flow regimes to meet seasonal or specified demands, e.g., fishery development. The effect of downstream water rights on changes in flow regimes was also considered where appropriate. (Wares-IPA)
W78-03459

LAKE CONSTANCE: ENDANGERMENT AND POSSIBILITIES FOR REHABILITATION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
H. -J. Elster.
Naturwissenschaften 64(4), p 207-215, 1977.

Descriptors: Lakes, *Eutrophication, *Primary productivity, *Phosphates, Oxygen content, Hypolimnion, Water pollution control, Pollution abatement, Sewage, *West Germany(Lake Constance).

Lake Constance (West Germany) has become eutrophic due to increased sewage and, particularly, phosphate input. Primary production has increased, the O2 content of the hypolimnion decreased. The consequences for the whole ecosystem are discussed. Implementation of both technical (sewage- treatment plants with phosphate precipitation) and political (local planning for the whole drainage area of the lake) measures is necessary to insure recovery of the lake; these were initiated some years ago.--Copyright 1978, Biological Abstracts, Inc.
W78-03464

THE EFFECT OF SLUDGE DIGESTION ON VIRUS INFECTIVITY,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
A. Eisenhardt, E. Lund, and B. Nissen.
Water Research, Vol 11, No 7, p 579-581, 1977. 3 fig, 12 ref.

Descriptors: *Viruses, *Bioassay, *Anaerobic digestion, *Viricides, *Disinfection, Sludge digestion, Microorganisms, Sewage treatment, Analytical techniques, Pilot plants, Sludge treatment, Waste water treatment.

Virus inactivation during anaerobic sludge digestion was investigated in laboratory experiments with cocksievirus B3. A virus suspension was added to an experimental digester which was operated to simulate the operation of a full-scale digester. Three control series including pasteurized sludge, Hank's solution at 32C, and calf serum at 32C, were set up at the same virus concentration and pH (7.0). Inactivation rates determined for the four systems over a two-week period indicated that inactivation was fastest in pasteurized sludge. The inactivation rate for Hank's solution was lower than for pasteurized sludge and higher than for calf serum. An increase in temperature from 32C to 35C increased the inactivation rate for all four systems. Virus determinations for supernatants of centrifuged sludges indicated that some virus was bound to the sludge, since solids' virus determinations were 1.0 log units higher than supernatants'. Additional studies indicated that inactivation rates were not influenced by the initial virus concentration over a range of 4 log units. It was suggested that virus inactivation was partially controlled by biochemical factors instead of purely biological phenomena. (Schulz-FIRL)
W78-03517

OBSERVATIONS ON THE OVERWINTERING GAMBUSIA AFFINIS (THE MOSQUITO FISH) IN TOKUSHIMA CITY, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Parasitology.
Y. Hirose.
Jpn J Sanit Zool 27(3), p 311-312, 1976.

Descriptors: *Mosquito fish, *Japan(Tokushima City), Sewers, Municipal wastes, Water quality, Hydrogen ion concentration, Biochemical oxygen demand, Dissolved oxygen, Minerals, Sex, Temperature, Water pollution.

G. affinis wintering in the sewer system in Showacho, Tokushima-shi, Japan were studied. The average body length of 34 male fish was 21.5 plus or minus 1.9 mm, that of 73 female fish 22.5 plus or minus 3.3 mm, and that of 28 young fish 15.5 plus or minus 0.8 mm. The average body weight of male fish was 157.5 plus or minus 41.6 mg, that of female fish 197.9 plus or minus 91.1 mg, and that of young fish 65.9 plus or minus 0.8 mg. Seventy-one female fish of the total 73 had immature eggs. The water temperature of the sewer system where the fish were found was above 9 degrees C. The water quality was studied in terms of pH, dissolved Oz, transparency, NOz- ammonium N, Pi, biochemical Oz demand, alkylbenzene sulfate, hardness and Cl-. The fish were observed to winter in the mud in the bottom of the shallow water as sewer water.--Copyright 1978, Biological Abstracts, Inc.
W78-03583

PHYTOPLANKTON OF THE BRITAJIAN RESERVOIR (THE NORTHERN DONETS RIVER), (IN RUSSIAN),
Kharkov State Univ. (USSR).
R. P. Zhupanenko.
Gidrobiol Zh 12(6), p 24-29, 1976.

Descriptors: *Phytoplankton, Reservoir, Algae, *USSR(Britajian Reservoir), Biomass, *Cyanophyta, *Diatoms, Protococcaceae, Seasonal.

The phytoplankton of the Britajian reservoir (USSR) includes 274 spp. and intraspecific taxa of algae among which Diatomeae and Protococcaceae are the most numerous. Clearly pronounced seasonal changes in the phytoplankton are detected; changes in species composition were 148 ssp. in spring, 236 in summer, 227 in autumn, and 57 in winter. As to the number and biomass, Cyanophyceae were predominant in summer, and Diatomeae in spring and autumn. Annual changes in the phytoplankton are observed. Dominant species which are indicative of a sanitary-biological state (water for drinking, etc.) are of primary importance.--Copyright 1978, Biological Abstracts, Inc.
W78-03603

THE INFLUENCE OF WARM WATERS OF THE KONAKOVO HYDROELECTRIC POWER STATION ON THE INFECTION LEVEL OF YOUNG ROACH WITH MYXOSPORIDIANS, (IN RUSSIAN),
Leningrad State Research Inst. Lake River Fish Industry (USSR).
V. P. Solomatova, A. V. Luzin, and A. A. Yarmolinskii.
Parazitologiya (Leningr) 10(6), p 514-518, 1976.

Descriptors: *Thermal pollution, Seasonal, Water pollution effects, *Roach, Heated water, Hydroelectric powerplants, USSR, Chloromyxum-legeri, *Myxidium-rhodei, Myxobolus-spp, Sphaerospora-poljanskii, Zschokkella-costata.

Data are given on the effect of warm waters of the Kanokovskaya hydro-electric power station (USSR) on the infection level of the roach young with myxo-sporidians. One year old specimens (1641) of roach were examined. Myxobolus dispar, M. Muelleri, M. emmachili, M. obesus, M. pseudodispar, Myxobolus sp. I, Myxobolus sp. II, Myxidium rhodei, Chloro-myxum legeri, Zschokkella costa ta and Sphaerospora poljanskii are reported from the warm water zone while in the gulf beyond the warm zone M. muelleri, M. nemachili, M. pseudodispar, Myxobolus sp. I, M. rhodei, C. legeri and Z. costata were recorded. Only C. legeri and Z. costata larvae were recorded. Their development was studied. In warm water the developmental period from plasmodium to spore in C. legderi was accelerated from 20 days to 15 days. In winter in the warm water zone sporeformation of many species of myxosporidians takes place. Infection with plasmodial stages remains high and indicates continuous active feeding of the young even in winter.--Copyright 1978, Biological Abstracts, Inc.
W78-03612

ZOOPLANKTON OF THE LOWER VOLGA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Astrakhan (USSR).
S. N. Kushnikova.
Gidrobiol Zh. 10(6), p 70-74, 1974.

Descriptors: Copepods, Dams, *Lower Volga(USSR), Plankton, Rotifers, *Zooplankton, *Crustaceans, Hydroelectric power plants, *Post-impoundment, Reservoirs.

Data are presented on the qualitative composition of zooplankton of the Lower Volga (USSR) in 1968-1970. There were 6, 8 and 7 spp. of copepods in 1968, 1969 and 1970, respectively; cladocerans 10, 13 and 8; and rotifers 20, 15 and 17. The qualitative composition of zooplankton of the Lower Volga in 1968-1970 did not differ substantially from that during the 1st years after streamflow control by a dam. After construction of the Vologograd hydroelectric station the role of crustaceans in the plankton increased considerably. Crustaceans were carried away from the

reservoir, and the current velocity and suspended matter of the river decreased. There is 1 population peak at the recession of the flood, due to the development of Cladocera. The content of zooplankton decreases downstream from the dam and crustaceans are replaced by rotifers.--Copyright 1975, Biological Abstracts, Inc.
W78-03618

FEEDING OF THE PERCH AND RUFF IN THE DISCHARGE ZONE OF THE KURAKHOVO STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Kiev State Univ. (USSR).
M. F. Polivannaya.
Gidrobiol Zh. 10(6), p 84-86, 1974.

Descriptors: *Cooling ponds, Electric powerplants, Thermal pollution, Heated discharge, *Heated water, Fish diets, *Perch, Plankton, *Fish reproduction, *Ruff, Ukrainian-SSR, USSR, Zooplankton.

Investigations of the feeding of the perch and ruff in the cooling pond of the Kurakhovo state region electric power station on the Volchya River in the Ukrainian SSR (USSR) established the following facts. Fattening occurs year-round, including the reproduction period. A large part of the diet of the fishes is composed to zooplankton, different species of which predominate in the heated and unheated parts of the cooling pond. As a rule the ponderal index of the fishes is greater in the heated part.--Copyright 1975, Biological Abstracts, Inc.
W78-03622

INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Centre for Community Water Supply, The Hague (Netherlands).
B. C. Zoeteman.
Annals of the New York Academy of Sciences, Vol 298, p 561-573, 1977. 2 fig, 6 tab, 24 ref.

Descriptors: *Water reuse, *Public health, *Organic compounds, *Waste water disposal, *Potable water, Path of pollutants, Chemical wastes, Environmental effects.

Since much of the world's water supplies contains some proportion of sewage effluent which enters drinking water through indirect reuse, more extensive investigations into the health effects relating to direct and indirect reuse of waste water for human consumption have been recommended. Health risks associated with organic contaminants in tap water may be assessed by identification of the individual chemicals and by examination of the toxicologic properties of individual and combined chemicals, or by evaluating the characteristics and effects of the water as a whole. The principal organic contaminants found in drinking water in the United States are described. European studies on health aspects of organic contaminants in drinking water have included a survey of organic contaminants in tap water of 20 major cities in the Netherlands; preparation and toxicologic screening of concentrates of organics in drinking water; and epidemiologic studies. Studies concerned with source identification of drinking water contamination and with regulatory programs on environmental chemicals in Europe are described. (Schulz-FIRL)
W78-03627

ASSESSMENT OF ENVIRONMENTAL IMPACT ON THE AQUATIC ENVIRONMENT WITH LIMITED DATA,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
P. E. Flatt, and C. D. D. Howard.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 435-444, 1976. 1 fig, 4 ref.

Descriptors: *Assessment, *Aquatic environment, *Pipelines, Effects, Simulation analysis, Rainfall-runoff relationships, Construction, Frequency analysis, Data collections, Streams, Hydrologic aspects, Equations, Watersheds(Basins), Mathematical models, Systems analysis, *Environmental impact, *Limited data, Hydrologic behavior, Kinematic wave method.

The aquatic physical setting and the potential impact of construction of a northern pipeline on the aquatic environment were investigated using limited field data and office calculations. Hydrological behavior of all streams crossed by the pipeline was assessed using a kinematic wave method of analysis applied to a conceptual watershed model. Topographic data and an analysis of precipitation and snowmelt were the only inputs to this model. The Universal Soil Loss equation was applied with parameters estimated from the hydrological analysis, surficial geological maps and areal photographic interpretation. For each catchment, the area of disturbance, estimated from proposed construction plans, was used to calculate potential erosion rates and suspended sediment concentration increases. Data were used only to verify the analysis. A watershed classification system reflected the flood potential of each stream in terms of climatological and topographical parameters. Results indicated that watersheds having a large fraction of their drainage area disturbed by the project will require special attention if adequate environmental protection is to be achieved. (Bell-Cornell)
W78-03639

TOTAL PHOSPHORUS MODEL FOR THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-03643

WATER BIRDS AND THEIR WETLAND RESOURCES IN RELATION TO OIL DEVELOPMENT AT STORKERSEN POINT, ALASKA,
Iowa State Univ., Ames. Dept. of Animal Ecology.
R. D. Bergman, R. L. Howard, K. F. Abraham, and M. W. Weller.
Department of the Interior, Fish and Wildlife Service, Resource Publication No 129, 1977. 38 p, 10 fig, 14 tab, 58 ref.

Descriptors: *Wetlands, *Oil fields, *Alaska, *Classification, *Environmental effects, *Brood stock, *Water pollution effects, Oil, *Water birds, Wildlife, Shorebirds, Wading birds, Tundra, Conservation, Invertebrates, Waterfowl, Hatching, Aquatic plants, Wildlife habitats, Nesting cover, Food habits, Oil pollution, Breeding populations, Tundra birds, Storkersen Point(Alas).

During a 5-year study of the bird populations on the Alaskan Coastal Plain, 25 of the 72 species recorded were breeding. To provide insight into habitat use and to devise systems for protecting key habitats, wetlands were classified on the basis of size, depth, vegetation, and water chemistry into eight classes related to bird use. To determine factors influencing class use and to understand the food relationships and problems of pollution of wetlands, invertebrate populations were examined in major freshwater wetlands. There is a strong relationship between the presence of emergent Arctophila and Carex and high invertebrate populations. Peak populations coincide with peak hatching of shorebirds and ducks. It is concluded from limited sampling of bird food habits that invertebrates constitute the major food source for many bird species. Retention of large breeding populations of tundra birds is uncertain with the disturbance and change that comes from oil development. Preservation should include: large tracts where no oil development occurs, small and well-distributed units of about 42 sq km which should be left undisturbed but which should not prevent oil removal, and protection of key production units from pollutants even in areas of intense development for oil. (Steiner-Mass)
W78-03657

IDENTIFICATION OF SELECTED FEDERAL ACTIVITIES DIRECTED TO CHEMICALS OF NEAR-TERM CONCERN (BENZENE, BIS(CHLOROMETHYL) ETHER, CADMIUM, HYDROGEN SULFIDE, MERCURY, PLATINUM, POLYNUCLEAR AROMATIC HYDROCARBONS, TRICHLOROETHYLENE, TRIS (2,3-DIBROMOPROPYL), PHOSPHATE).
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5A.
W78-03666

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS II. PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF 16 SUBSTANCES.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-03672

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, 1976 EDITION.
National Inst. for Ocupational Safety and Health, Rockville, MD.
For primary bibliographic entry see Field 5A.
W78-03679

OXYGEN CONSUMPTION IN THE PROSOBRANCH SNAIL VIVIPARUS CONTECTOIDES (MOLLUSCA: GASTROPODA) - II. EFFECTS OF TEMPERATURE AND PH,
Michigan Univ.-Flint. Dept. of Biology.
M. J. Buchingham, and D. E. Freed.
Comparative Biochemistry and Physiology, Vol. 53A, 1976, p 249-252, 2 fig, 2 tab, 26 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution, Temperature, :Metabolism, Hydrogen ion concentrations, *Snails, Energy budget, *Oxygen consumption(Mollusks).

This paper continues a group of articles on the relationships of environmental parameters to the energy budgets or metabolism in Viviparus contectoides and reports specifically on the effects of acute changes in water temperature and pH on oxygen consumption in the species. Data showed that metabolic rate is directly dependent on temperature with males having a rectilinear relationship between weight-adjusted oxygen consumption and females having a curviliner relationship. The mean values in this relationship were higher for males than for females. With increasing temperature, Q10 values decreased for males and increased for females. The rate of oxygen consumption was related to pH due to increasing and decreasing levels of metabolic activity at different pH values. This population lives at the trough pH (8.1) which is energetically more favourable. The species is capable of existing at the two peak values (7.1 and 8.9) but it is energetically stressful for them to do so. (Chilton-ORNL)
W78-03696

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNI-

CAL SPECIFICATIONS - VOL. 2: SURRY POWER PLANT UNITS 1 AND 2,
Oak Ridge National Lab., TN.
S. M. Adams, P. A. Cunningham, D. D. Gray, and K. D. Kumar.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NUREG/TM-70, Price codes: A10 in paper copy, A01 in microfiche. Report No. ORNL/NUREG/TM-70 (Vol. 2 of ORNL/NUREG/TM-69), February 1977. 265 p, 90 fig, 26 tab, 50 ref, 1 append. W-7405-eng-26.

Descriptors: *Environmental effects, *Monitoring, Powerplants, *Nuclear powerplants, Hydrothermal studies, Ecology, Regulation, Virginia, James River basin(Va), Surry Power Plant(Va), Nuclear Regulatory Commission.

Analysis of hydrothermal and ecological monitoring data collected from 1973 through 1975 as part of a program for the Office of Regulatory Research of the U.S. Nuclear Regulatory Commission is presented. Hydrothermal analysis includes a discussion of models used in plume predictions prior to plant operation and an evaluation of the present hydrothermal monitoring program. Ecological analysis includes validation of impacts predicted in the Final Environmental Statement using the operational monitoring data. Specific recommendations are made for improvement of both monitoring programs. (Chilton-ORNL)
W78-03697

BASELINE STUDY PROGRAM, NORTH PUGET SOUND BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL. II BIBLIOGRAPHY,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 5B.
W78-03698

THE SILVER FLOWE. II FEATURES OF THE VEGETATION AND STRATIGRAPHY OF BRISHIE BOG, AND THEIR BEARING ON POOL FORMATION,
Hull Univ. (England). Dept. of Plant Pathology.
D. J. Boatman, and R. W. Tomlinson.
The Journal of Ecology, Vol. 65, No. 2, p 531-546, July, 1977. 5 fig, 3 tab, 17 ref.

Descriptors: *Ponds, *Bogs, *Peat, Stratigraphy, Vegetation, Plant growth, Growth rates, *Bogs, *Brishie Bog(Scotland), *Silver Flowe(Scotland), Sphagnum papillosum, Sphagnum cuspidatum, Calluna vulgaris, Bryophytes.

A study of the vegetation and stratigraphy of Brishie Bog in the Silver Flowe National Nature Reserve in southwestern Scotland indicates that growth characteristics of Sphagnum papilosum and S. cuspidatum are responsible for permanent pool formation. Areas of high percentage cover of S. papillosum, the most common species in the bog's eastern lobe. Stratigraphical evidence from core samples shows that at low-lying sites S. papillosum and S. cuspidatum alternately constitute important components of the vegetation. The weak-stemmed S. cuspidatum can often be seen lying horizontally across part of an S. Papillosum carpet, and where sufficiently dense can smother and kill S. papillosum locally. Hollows and pools seem to be suboptimal for S. cuspidatum growth, and peat formation will be low; unless the area is reinvaded by S. papillosum, the surface will become progressively lower and eventually form a permanent pool. Subsequent flooding of low-lying sites between neighboring pools may lead to the formation of long narrow pools parallel to the contours. It appears that where hummocks occur, the conditions have fluctuated between those of hummocks and S. papillosum carpets, and where hollows or pools occur they have fluctuated between conditions of hollows and carpets. A method was developed for determining the rate at which sphagnum surfaces rise by comparing the age of adventitious Calluna vulgaris roots and the depth at which they occur in the sphagnum carpet. (See also W75-02511)
W78-03699

LIMITATIONS OF MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN. II. WAVE ACTION, SEDIMENTS, AND WATERFOWL GRAZING,
Saint Andrews Univ. (Scotland). Dept. of Botany.
B. P. Jupp, and D. H. N. Spence.
Journal of Ecology, Vol. 65, No. 2, p. 431-446, July 1977. 3 fig, 5 tab, 31 ref.

Descriptors: *Waves, *Waterfowl, *Biomass, *Phosphorus, *Eutrophication, Phytoplankton, Lakes, Nutrients, Grazing, Sediments, Light penetration, *Macrophytes, *Loch Leven(Scotland), Potamogenton filiformis, Potamogenton pectinatus.

Limitations on the growth of the two most important submerged macrophytes in Loch Leven, Scotland, were shown to adversely affect the ecological diversity of this internationally important site for waterfowl and renowned brown trout fishery. The paper reports that protection from wave action and from waterfowl grazing by Perspex tubes and wire enclosures led to increased biomass levels, with findings corrobaroated by transplant experiments between a sheltered and exposed site. Up to 80 percent of the end of season biomass differences could be attributed to the effects of wave action and the remainder to waterfowl grazing. Consistent reduced light attentuation and the consequent availability to attached macrophytes of a deeper water column. It is recommended, therefore, that input of available phosphorus be reduced in order to control the phytoplankton blooms, upon which light attentuation ultimately depends. In addition creation of shallow lagoons and breakwaters in certain locations would decrease exposure of macrophytes to wave action. (Coyle-Wisconsin)
W78-03700

5D. Waste Treatment Processes

STARCH RECOVERY EXCEEDS 90% WITH LIQUID CYCLONE SYSTEM.
Chemical Processing, Vol. 40, No. 13, p 104, November, 1977. 1 fig.

Descriptors: *Pulp and paper industry, *Adhesives, *Biochemical oxygen demand, *Treatment facilities, Centrifugation, Reclamation, Binders, Industrial wastes, Waste water treatment, Waste water disposal.

Starch-based adhesives are frequently used to bond various layers of paperboard in corrugated boxes. When starch applicators are washed, a large amount of starch enters the wash water. The large biochemical oxygen demand (BOD) load on disposal systems may overload in-plant systems and result in stiff penalties if waste waters are discharged into municipal sewage systems. A system manufactured by Dorr-Oliver Inc. of Stanford, Connecticut, uses hydrocyclones to remove the starch and recover the waste water for reuse. After the slurry is strained, a two-stage hydrocyclone is used for clarification. Several 10-mm cyclones are arranged in parallel and enclosed in a single, pressurized stainless steel housing. Typical maximum feed rates are around 30 gpm. This system permits reuse of large quantities of process water, reduces the cost of treatment, and reduces the BOD surcharge. Maintenance requirements are low because the only moving parts are the centrifugal pumps and a self-cleaning strainer. (Snyder-FIRL)
W78-03202

WASTE TREATMENT PROCESS NOW AVAILABLE IN CANADA.
Water and Pollution Control, Vol. 115, No. 12, p 18-19, December, 1977.

Descriptors: *Oxidation, *Canada, *Industrial wastes, *Organic wastes, *Recycling, Waste water treatment, Pulp and paper industry, Incineration, Sludge disposal, Equipment.

The WETOX waste treatment process has been made available to Canadian industry through the Ontario Research Foundation. The wet-air oxidation process has been used to treat industrial waste streams containing 2-20% organics, producing excess energy for plant operations at concentrations greater than 5%. The process yields sterile products, including water, carbon dioxide, and inorganic materials. Successful demonstrations of wet air oxidation have encompassed the automotive, pulp and paper, steel, textile, oil, and food processing industries. The system is also being evaluated for treatment of military wastes and municipal sewage sludges. (Schulz-FIRL)
W78-03203

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS OF DYESTUFF INDUSTRY,
Arlabs Ltd, Bhatghar (India).
C. U. Tahiliani.
Indian Chemical Journal, Annual Number, p 99-100, 1977. 1 tab.

Descriptors: *Textiles, *Separation techniques, *Recycling, *Dyes, *Industrial wastes, Chemical wastes, Liquid wastes, Waste water treatment, Dyestuff wastes.

Various aspects of the recovery and reuse of materials from dyestuff manufacturing wastes which may contain vat dyes, solubilized vat dyes, rapid fast and rapidogens, disperse and reactive dyes, and dyestuff intermediates are discussed. Gaseous pollutants such as HBr, H2S, and HCL from the manufacture of dyestuffs are recovered with scrubbers. Liquid pollutants include various organic solvents and concentrated sulfuric acid which may also contain zinc. Solid wastes include sodium zincate, copper sulfide, and lead peroxide. (Schulz-FIRL)
W78-03204

RECOVERY AND REUSE OF MATERIALS FROM DYESTUFF INDUSTRY,
V. J. T. Inst., Bombay (India). Dept. of Public Health Engineering.
B. L. Mahabal.
Indian Chemical Journal, Annual Number, p 97-98, 1977.

Descriptors: *Acids, *Iron compounds, *Recycling, *Dyes, Sludge treatment, Effluents, Industrial wastes, Textiles, Waste water treatment, Organic acids, Waste water disposal, Dyestuff manufacturing wastes, Acetic acid, Sulfuric acid.

Since dye wastes can be resistant to conventional treatment methods and since raw materials, including water, are increasingly more expensive, the recovery of useful materials from dye waste waters has been considered. Although the recovery of the dye itself is not considered feasible because of the varying quality and quantity of dye waste batches, other substances used in dyeing may be recovered. Iron powder is used to produce amino compounds as intermediates in the manufacture of various dyestuffs. The resulting ferrous-ferric oxide sludge can be settled in a sedimentation tank and converted to ferrous and ferric sulfate by reaction with sulfuric acid, another common industrial waste. The recovered iron salts can be used in various processes such as the production of iron oxide pigment. Recovery of sulfuric and acetic acids from dye manufacturing wastes is described. (Schulz-FIRL)

W78-03205

TEXTILE INDUSTRY EFFLUENTS--INSTRUCTIONS FOR PRACTICAL USE (TEXTIL-ABWASSER--WEGLEITUNG FUER DIE PRAXIS).
For primary bibliographic entry see Field 5G.
W78-03206

NEW PROCEDURE FOR TREATING INDUSTRIAL EFFLUENTS AT THE CHEMICAL COMPLEX AT SAINT-FONS, LYON (PROCEDE NOVEAU POUR LE TRAITEMENT D'EFFLUENTS INDUSTRIELS DU COMPLEX CHIMIQUE DE SAINT-FONS A LYON),
H. Esselborn, and C. De Bouille.
La Technique Moderne, No. 3, p 48-49, March, 1977. 1 fig.

Descriptors: *Denitrification, *Pilot plants, *Textiles, *Neutralization, *Biological treatment, Incineration, Aerobic treatment, Chemical wastes, Industrial wastes, *Waste water treatment.

Rhone-Poulenc Industries, Rhone-Poulenc Textiles, and Ciba-Geigy decided to treat in a common installation the wastes produced at their factories. The installation, built jointly by Lurgi S. A. Paris and the Compagnie Internationale des Eaux, is described. Biological treatment is the primary method used, and three pilot plants were established to determine the most effective treatment combinations. Preliminary treatment consists of neutralization, decantation, and homogenization. Aerobic-anaerobic purification combined with denitrification is the second stage, chosen over other biological methods because nitrates can be entirely eliminated; energy savings are realized by using the oxygen from nitrates for biological oxidation; denitrification can be achieved at a slightly acid pH; sludge is reduced by about 15%, thus reducing costs for conditioning and incineration; and the alkalinity produced during denitrification can be used to neutralize residual sulfuric acid. Finally, this two-stage method is more stable than any one-stage biological treatment method. (Blits-FIRL)
W78-03207

CONCENTRATING WOOL CONTAMINANTS.
Water and Waste Treatment, Vol. 20, No. 9, p 52, September, 1977.

Descriptors: *Textiles, Equipment, *Industrial wastes, *Centrifugation, Detergents, Treatment facilities, Separation techniques, Waste water treatment.

The CSIRO division of Textile Industry of Geelong, Australia, has developed a new scouring process for the concentration of wool contaminants in a low-volume, high-solids sludge and for the recovery of wool wax. Conventional techniques for treatment of wool scouring wastes with chemical flocculation are expensive, since the wool wax and dirt suspension in the scouring liquor is extremely stable. For the CSIRO Lo-flo scouring process, the amount of water input to the scouring machine is kept at a minimum to reduce the overall volume of waste water produced. The scour liquor is first heated and passed to a decanter centrifuge for removal of the grease. Detergent is then added and the scour liquor is recycled through the heater, centrifuges, cooler, and mixing tank. Sludge at about 50% solids is produced with the centrifuge and up to 80% of the grease on the wool is recovered by the decanter centrifuge. The Lo-flo unit is marketed as a complete package unit with pumps, flow controllers, heaters, drive motors, and a control panel. (Schulz-FIRL)
W78-03208

'INNOVATIVE' ASSESSMENT TECHNOLOGY ALLOWS MORE ACCURATE PREDICTION.
For primary bibliographic entry see Field 5C.
W78-03209

ECONOMICS OF WASTE DISPOSAL--A CONTRACTOR'S VIEW,
For primary bibliographic entry see Field 5E.
W78-03210

WATER CONSERVATION IN TEXTILE FINISHING,
Tootal Fabric Div. Research, Cheshire (England).
P. A. Rennison.
Americal Dyestuff Reporter, Vol. 66, No. 11, p 48-50, November, 1977. 1 fig.

Descriptors: *Textiles, *Water consumption, *Water reuse, *Costs, *Effluents, Industrial water, Filtration, Bleach wastes, Operation and maintenance, Waste water treatment.

Process modifications and water conservation can be used in the textile industry to lower costs for fuel, waste water treatment and disposal, and water supplies. Although many textile mills still obtain water from municipal sources, increasing demands on municipal water supplies in England have led to the need for alternate supplies for industrial purposes. Much of the water used by the Tootal Fabric Division for industrial purposes. Much of the water used by the Tootal Fabric Division in Tootal, England, is obtained from non-municipal sources and treated by the plant prior to use in dyeing processes. A program was initiated by Tootal to examine all steam and water heating systems with respect to energy conservation. Water conservation and waste treatment practices at three plants operated by Tootal are described. Counterflow washing systems installed at a large print works reduced water consumption by as much as 75%. Various studies are being conducted at the plant to evaluate methods for reducing effluent permanganate levels which had become elevated as a result of reductions in water consumption. Process modifications at a small dyeing and finishing plant reduced the total effluent volume by 40%. (Schulz-FIRL)
W78-03211

ACID MINE DRAINAGE TREATS SEWAGE DUMPED IN STREAMS.
For primary bibliographic entry see Field 5G.
W78-03212

AUTOMATIC WATER-TREATMENT PLANT.
Colliery Guardian, Vol. 225, No. 10, p 794-795, October, 1977. 2 fig.

Descriptors: *Iron compounds, *Mine water, *Lime, *Flocculation, *Coal mine wastes, *Treatment facilities, Coal mines, Automatic control, Water treatment, Coagulation, Neutralization, Industrial wastes, Waste water treatment.

A continuously operating, nearly automatic water treatment plant at the Silverdale Colliery in Newcastle under Lyme, England, is attended only during the daytime, and by one person. It has been fully operational since early 1976, reducing the iron content on 2,600 cu m/day of mine water from about 200 ppm to lower than 2 ppm. The treatment process consists of aeration and chemical precipitation with lime. A rotary-drum, belt-discharge, vacuum filter with cloth washing and discharge facilities is used to dewater the sludge from two NCB deep-cone thickening tanks. Control relays and timers energize the drain pump, the bin activator, lime feed, and the two desludging valves. A portion of the treated water is reused for mining operations. (Snyder-FIRL)
W78-03213

PRE-INSULATED PIPING SYSTEM USED FOR WATER AND TAILINGS AT CANADA'S FIRST ARCTIC MINE.
For primary bibliographic entry see Field 8G.
W78-03214

PURIFICATION PLANT FOR TANNERY EFFLUENTS--INDUSTRIAL APPLICATION (STATION D'EPURATION SUR EFFLUENTS DE TANNERIE-REALISATION INDUSTRIELLE),
B. Vulliermet, and M. Aloy.
La Technique Moderne, No. 1, p 19-20, 23-26, January, 1977. 8 fig, 4 ref.

Descriptors: *Tannery wastes, *Oxidation, *Screens, *Oxidation lagoons, *Centrifugation, Sulfur compounds, Sludge treatment, Industrial wastes, Waste water treatment.

A pilot plant study for treating tannery wastes was undertaken and later applied on a full industrial scale. The goals were to solve problems associated with the usual physico-chemical or biological treatment methods: odors, foaming, final sludge discharge, and corrosion of metal structures. The following estimations were made for the industrial application: at 25 tons/day of salted cowhide and 2500-3000 cu m/day of homogenized effluent, BOD5 would be 700 plus or minus 100 mg/liter, COD 1800 plus or minus 200 mg/liter, and suspended solids 1500 plus or minus 300 mg/liter. A collector measuring 400 m by 800 mm transported effluent to the head of the plant. A description of the plant's operations covers the screening system; the desulfurization process using catalytic oxidation; homogenization and decantation; aerated lagooning in two stages; thickening; and centrifugation. The plant was able to produce a treated effluent containing a maximum BOD5 of 90 mg/liter, maximum COD of 450 mg/liter, and maximum suspended solids of 90 mg/liter. The pH measured 7-7.5 and the toxicity level was at mot 1 mg/liter/Equitox. (Blits-FIRL)
W78-03215

OXYGEN DIFFUSION AND FERMENTATIONS,
Merck Chemical Co., Rahway, NJ.
M. L. King, and J. L. Gainer.
AIChE Symposium Series, Vol. 73, No. 167, p 1-5, 1977. 4 fig, 2 tab, 13 ref.

Descriptors: *Fermentation, *Microorganisms, *Industrial wastes, *Cultures, *Oxygenation, Actinomycetes, Aerobic bacteria, Growth rates, Diffusivity, Permeability, Waste water treatment.

Since industrial fermentation processes are ultimately controlled by the rate at which nutrients are made available to microbial cells, a study was conducted to examine whether the molecular diffusivities of solutes through a solution could be enhanced by the addition of certain compounds such as crocetin. In the studies, crocetin was added to fermentation cultures which contained Bacillis subtilis and Streptomyces griseus in a nutrient broth. Procedures used in sample preparation are described. The studies indicated that the specific growth rate of B. subtilis was not affected by the presence of crocetin below cell concentrations of 10-100 million cells/ml. Above that concentration, however, the crocetin fermentation continued to grow until it was at a level 25% greater than the control. With S. griseus specific growth rates were 20-30% greater than that of the control. The use of crocetin to increase oxygen transport and thereby increase microorganism yields in fermentation and waste treatment processes is suggested. (Schulz-FIRL)
W78-03216

INDUSTRIAL EFFLUENT CONTROL AND CHARGES,
For primary bibliographic entry see Field 5G.
W78-03217

ANAEROBIC PROCESSES, (LITERATURE REVIEW),
Institute of Gas Technology, Chicago, IL.
S. Ghosh, M. L. Packer, A. C. Roess, J. R. Conrad, and E. M. VanRyzin.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1019-1040, June, 1977. 125 ref.

Descriptors: *Anaerobic conditions, *Anaerobic digestion, *Microbial degradation, *Nitrification, *Fermentation, Denitrification, Energy, Analytical techniques, Biodegradation, Methane, Sludge digestion, Industrial wastes, Farm wastes, Activated carbon, Soil water-plant relationships, *Reviews, Chemical reactions, *Waste water treatment, *Bibliographies.

Literature pertaining to anaerobic processes in industrial, municipal, and natural waste treatment systems is reviewed. Studies on the microbiology and mechanisms of anaerobic processes encompass anaerobic degradation products of phloroglucinol, fermentative metabolism, digestion of amylose, decomposition of algal material, glucose metabolism, yeast fermentation, analytical procedures, methane generation, environmental effects, biochemical mechanisms in anaerobic digestion, growth rates of anaerobic cultures, and a variety of other subject areas. Studies on anaerobic degradation in soils are reviewed for chlorinated hydrocarbons, mercuric chloride, oil pollutants, and the production of methane and hydrogen sulfide. Various studies on denitrification in natural soil-water systems are described. A survey of laboratory and fullscale studies on waste water denitrification is presented. Recent process developments are reviewed, including the use of anaerobic filters for sanitary landfill leachates, upflow reactors for anaerobic digestion and the effects of activated carbon and various compounds on anaerobic treatment efficiency. Process applications are described for industrial wastes, agricultural wastes, refuse, and the use of anaerobic processes to produce food, fuel, and fertilizer from waste products. (Schulz-FIRL)
W78-03218

ORGANIC BIODEGRADATION IN HYPERSALINE WASTEWATER,
For primary bibliographic entry see Field 5C.
W78-03220

EARTHWORMS TO AID SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W78-03221

WATER CLARIFICATION BY FLOTATION,
Water Pollution Research Lab., Stevenage (England).
R. A. Hyde, D. G. Miller, R. F. Packham, and W. N. Richards.
Journal of the American Water Works Association, Vol 69, No 7, p 369-374, July, 1977. 4 fig, 2 tab, 44 ref.

Descriptors: *Clarification, *Flotation, *Separation techniques, *Pilot plants, *Water treatment, Waste water treatment, Industrial water, Industrial wastes, Municipal wastes, Coagulation, Design data, Aeration, Foaming, Gravity, Flocculation.

Flotation has been applied to solids separation in the water and waste water treatment industries, as well to mineral processing for metal concentration and for other industrial processes. General processes in water clarification by flotation include bubble generation, bubble attachment, and solids separation. Dispersed-air flotation systems are usually equipped with impellers to disperse, aerate, and agitate the processed liquid for froth flotation with surface-active agents or foam flotation with porous media. In dissolved-air flotation agitation is not employed and bubbles are generally smaller, 0.1 mm or less in diameter, for use in vacuum or pressure flotation. Electrolytic flotation, in which electrolysis is used to generate bubbles, is suggested for use on large volumes of waste water with low concentrations of suspended solids. Previous applications of flotation for water and waste water treatment are reviewed. Laboratory and pilot plant studies at the Water Research Center in England are described. Laboratory studies indicated that flotation was adequate for clarification of natural waters without chemical addition. Pilot plants evaluated clarification of natural waters without chemical addition. Pilot plants evaluated flotation systems consisting of a flash-mixer four-stage tapered mechanical flocculation unit followed by a flotation tank and rapid gravity anthracite-sand filters for treatment of raw water from the Thames River. The Water Research Center is currently conducting full-scale studies at five treatment works in England. (Shulz-FIRL)
W78-03223

GRANULAR MEDIA FILTRATION SAVES TREATMENT COSTS; HELPS MEET EPA STANDARDS,
G. Mace.
Water and Sewage Works, Reference Number, p 70-72, 74-75, April, 1977. 6 fig, 2 tab.

Descriptors: *Filtration, *Porous media, *Filters, Costs, Equipment, Design criteria, Oily water, Operation and maintenance, Suspended solids, *Waste water treatment, Industrial wastes, *Water quality standards, Granular media filtration.

Granular media filters have been used to produce effluents with suspended solids concentrations as low as 1-15 mg/liter. Various aspects of filtration are discussed, including operation, filter sizing and media selection, treatment of backwash waters, and recent innovations in filter technology. The use of multi-media filters such as dual media anthracite-sand filters is described. Five options in granular media filters include vertical gravity, deep media vertical gravity or pressure, horizontal, concrete gravity, and upflow gravity or pressure filters. An economic comparison of vertical gravity, horizontal, and concrete filters at 5000-gpm flow is presented. Considerations in sizing and layout are discussed with respect to the nature of the industrial effluent, maintenance requirements, and filtrate quality. The treatment of backwash waters which contain the entire volume of suspended solids filtered out of the bed is discussed, as well as the recovery of valuable products. Recent design improvements in granular media filters include: a low profile arrangement for shallow media gravity filters; tri-media filters for algae; turbidity meters for filter control; and the use of underdrain nozzles, air metering tubes, and air scouring to remove up to 60 mg/liter oil and 200-250 mg/liter suspended solids. (Schulz-FIRL)
W78-03224

LEATHER TANNING AND FINISHING WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
J. F. Scaief.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 922, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-230, September 1976. 45 p, 2 fig, 1 tab, 24 ref.

Descriptors: *Tannery wastes, *Waste treatment, *Reviews, *Effluents, *Water quality standards, Pilot plants, Recycling, Sludge treatment, Waste water treatment, Waste water disposal.

A state-of-the-art review of research and recent literature on waste management in the leather tanning and finishing industry is presented. EPA-Sponsored projects which are described include the use of activated sludge treatment for chrome tannery wastes, treatment of sole leather vegetable tannery wastes, anaerobic-aerobic lagoon treatment for vegetable tanning wastes, and secondary waste treatment for a small diversified tannery. Waste water management projects outside the jurisdiction of the EPA include studies on tannery effluent control, treatment, water quality, and disposal; water pollution reduction in cattlehide processing; chrome tanning systems; recycling of unhairing liquor; protein recovery from lime-sulfide effluent; alternative approaches to unhairing; liming and tanning without effluent; chemical treatment for beamhouse wastes for a small tannery; effects of flocculants on sedimentation of unhairing effluents; waste water treatment options; and pilot studies on the application of high rate biological filters in the leather tanning industry. On-going EPA projects include studies on aerobic biolgical treatment, sludge dewatering and disposal, and effluent reuse; removal and recovery of sulfide; and leather tannery waste management through process change, reuse, and pretreatment. (Schulz-FIRL)
W78-03225

TREATMENT OF METAL FINISHING WASTES BY SULFIDE PRECIPITATION,
Permutit Co., Princeton, NJ.
R. M. Schlauch, and A. C. Epstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 284, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-049, February 1977. 86 p, 11 fig, 11 tab, 7 ref.

Descriptors: *Chemical precipitation, *Sulfides, *Heavy metals, *Calcium hydroxide, *Industrial wastes, Metals, Copper, Cadmium, Nickel, Zinc, Sludge disposal, *Waste water treatment, Waste water disposal.

Heavy metals in metal finishing water were precipitated by the Sulfex process of ferrous sulfide addition and by conventional treatment with calcium hydroxide. Laboratory- and bench-scale tests were performed to determine chemical and physical requirements for the precipitation of the heavy metals and dewatering of the resulting sludges. Pilot plant tests were conducted to confirm the laboratory results and provide operating data. The Sulfex process is technically viable and more effective than conventional calcium hydroxide precipitation for removing copper, cadmium, nickel, and zinc. Operating at pH 8.0-9.0, the Sulfex process results in a total chromium concentration less than or equalling that from conventional hydroxide precipitation. Sulfex can remove hexavalent chromium in one step. Effluent quality from both processes depends on the type and concentration of complexing agents in the influent. (Snyder-FIRL)
W78-03226

INCLINED SCREEN FOR WASTE WATER PURIFICATION (SCHRAEGSIEB ZUR ABWASSERREINIGUNG),
U. Slanina.
Allgemeine Papier-Rundschau, No. 24/25, p 882, 884, June 20, 1977. 2 fig, 2 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Screens, Filters, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Equipment, Water reuse, Closed systems.

The use of the Bauer Hydrasieve in cleaning papermaking effluents in connection with the closing of papermaking water circuits is briefly described. The apparatus includes no moving parts, the liquid/solids separation being effected on a stationary inclined wire screen of special design. (Speckhard-IPC)
W78-03290

FINE SCREENING AT THE INLET--A WAY TO REDUCE CONSTRUCTION AND MODERNIZATION COSTS OF SMALL CLARIFIER INSTALLATIONS (FEINSIEBUNG IM ZULAUF--EIN WEG ZUR SENKUNG VON NEUBAU- UND

SANIERUNGSKOSTEN KLEINERER KLAERANLAGEN),
Morszeck (G.) Engineering Consultants (West Germany).
W. Schottler, and R. Schinke.
Allgemeine Papier-Rundschau, No. 27, p 945-946, July 5, 1977. 1 fig, 1 illus.

Descriptors: *Screens, *Waste water treatment, Municipal wastes, Pulp wastes, Waste treatment, Water pollution treatment, Performance, Equipment, Water pollution control, Wastes.

A brief report is presented on the trial performance of a drum-type screen (trade-named Roto-Klar) in fine screening municipal sewage prior to clarification. The drum-type screen is shown to eliminate the need for a sand trap and a preclarifier basin while improving the operating reliability of the clarifier. Possible use of the screen in treating paper industry effluents is mentioned. (Speckhard-IPC)
W78-03291

TREATMENT AND COMBUSTION OF EFFLUENT SEDIMENT AT THE SVETOGORSK MILL (OPYT OBRABOTKI I SZHIGANIYA OSADKOV STOCHNYKH VOD NA SVETOGORSKOM KOMBINATE),
Svetogorskii Kombinat (USSR).
A. P. Kubenskii, N. P. Panchekhin, Yu. I. Kuklev, and A. I. Kochetkov.
Bumazhnaya Promyshlennost, No. 5, p 25-26, May, 1977. 1 fig, 1 tab.

Descriptors: *Sludge treatment, *Activated sludge, Burning, Wastes, Waste treatment, Water pollution control, Filters, Dewatering, Sludge disposal, Incineration, Solid wastes, Water pollution sources, Pulp and paper industry, Sludge, Lime, Sedimentation, Fly ash, Pulp wastes, Ferric chloride, Soviet Union(USSR).

Equipment for the treatment and combustion of excess activated sludge and sediment from primary and secondary sedimentation tanks has been installed recently at the effluent treatment plant of the Svetogorsk pulp and paper mill. It consists of three vacuum filters, three disk presses, and two furnaces where combustion takes place in a fluidized bed of sand. The mill produces 20,000 cu m of fibrous sediment and 27 tons of excess sludge daily. The excess activated sludge goes to primary sedimentation tanks and is then concentrated in radial thickeners. The sediment with a moisture content of 95-97% goes to the flocculator of the vacuum filter, where ferric chloride and lime are added. The sediment then passes into the vat of the vacuum filter and disk press where its moisture content is reduced to 70-75%. The dewatered sediment is then directed to the furnace (or first to a dryer if its moisture content is too high). The primary air in the furnace is heated with flue gases to 800-900C. The flue gases from the furnace pass through primary air heaters and then are washed to separate the ash. The ash is dewatered to a moisture content of 40-50% in a vacuum filter and conveyed to a dump. The purified gases are released into the atmosphere. (Stapinski-IPC)
W78-03293

WASTE RECOVERY: ZINC RECOVERY FROM RAYON PLANT SLUDGE,
Avtex Fibers, Inc., Front Royal, VA.
L. B. Bowen, J. H. Mallinson, and J. H. Cosgrove.
Chemical Engineering Progress, Vol 73, No 5, p 50-54, May, 1977. 2 fig, 2 tab.

Descriptors: *Zinc, *Sludge treatment, Wastes, Industrial wastes, Water pollution sources, Virginia, Heat treatment, Crystallization, Dewatering, Calcium sulfate, Iron, Chemical precipitation, Corrosion, Sludge, *Rayon, Zinc hydroxide, Zinc sulfide, Zinc sulfate.

In the production of rayon, viscose is spun into a sulfuric acid bath to regenerate the cellulose in fiber form. Zinc sulfate is added to the bath to retard regeneration and allow an increase in the amount of stretch of the fibers. A 7-step process is described for the recovery of Zn hydroxide from the sludge basins at Avtex Fibers Inc. in Front Royal, Virginia. A small dredge feeds sludge from the lagoon into the waste treatment facilities. Following heat treatment at 280-300F to crystallize the amorphous sludge particles, the sludge is dewatered in a filter press. In the solution which is filtered to remove Ca sulfate, organic solids, and other impurities. Finally Fe(II) is oxidized by hydrogen peroxide, precipitated with NaOH, and filtered from the Zn sulfate solution. The filtrate is stored and reused in the rayon plant. Problems with corrosion in the system after the sludge press and blinding of the press cloths are described. (Swichtenberg-IPC)
W78-03295

LOADING OF PROCESS WATER BY DISSOLVED SUBSTANCES DURING PAPER MANUFACTURE. I. SURVEY OF STONE GROUNDWOOD PRODUCTION (UEBER DIE DURCH GELOESTE SUBSTANZEN VERURSACHTE BELASTUNG DES FABRIKATIONSWASSERS BEI DER PAPIERHERSTELLUNG. I. BESTANDSAUFNAHME BEI DER ERZEUGUNG VON STEINSCHLIFF),
Technische Univ., Darmstadt (West Germany). Inst. fuer Paperfabrikation.
For primary bibliographic entry see Field 5B.
W78-03296

METHOD FOR TREATING PULPING EFFLUENT, (IN JAPANESE),
K. Tanaka.
Japanese Patent, Kokai 55701/77. May 7, 1977. 3 p.

Descriptors: *Pulping wastes, *Waste water treatment, *Chemical precipitation, *Patents, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Iron, Magnesium, Zinc, Aluminum, Calcium, Cations, Polymers, Coagulation, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Effluents, *Lignosulfonates, Tin.

Lignin derivatives (such as lignosulfonate salts), water-soluble metallic compounds (Fe, Mg, Sn, Zn, Al, and Ca compounds), and cationic polymers as coagulants are added to the pulping effluent to precipitate out the solid waste. A significant (up to almost tenfold) reduction in BOD and COD can be obtained by this treatment. (Lim-IPC)
W78-03299

THE APPLICATION OF REVERSE OSMOSIS TO THE PRIMARY TREATMENT OF PULP SPENT LIQUOR,
National Taiwan Univ., Taipei. Dept. of Chemical Engineering.
S.-Y. Huang, and T. Chiu.
Journal of the Chinese Institute of Chemical Engineers, Vol. 7, No. 1, p 33-43, 1976. 11 fig, 12 ref, 2 tab.

Descriptors: *Pulp wastes, *Lignins, *Waste water treatment, *Reverse osmosis, *Sulfite liquors, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Membrane processes, Membranes, Separation techniques, Pulp and paper industry, Effluents, Spent sulfite liquors, Lignosulfonic acids, Cellulose acetate.

Laboratory studies were made on the reverse osmosis treatment of lignosulfonic acids and spent liquor. Using cellulose acetate membranes and an average liquid velocity of 1.55 cm/sec, the water flux and salt rejection were 0.5-0.6 cu m/sq m and 97%, respectively. Water flux was increased to 0.75 cu m/sq m by increasing the average liquid velocity to 2.6 cm/sec. Turbulence promoted by fluidization of glass beads within the cell increased the water flux and salt rejection, especially at low liquid velocities. (Buchanan-IPC)
W78-03300

DECOLORIZATION OF KRAFT WASTE LIQUOR WITH WHITE-ROT FUNGI. I. SCREENING OF THE FUNGI AND CULTURING CONDITION FOR DECOLORIZATION OF KRAFT WASTE LIQUOR,
Tokyo Univ. (Japan).
T. Fukuzumi, A. Nishida, K. Aoshima, and K. Minami.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol. 23, No. 6, p 290-298, June, 1977. 6 fig, 8 ref, 6 tab.

Descriptors: *Bleaching wastes, *Color, *Fungi, *Waste water treatment, Nutrients, Lignins, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Effluents, Pulp and paper industry, Waste treatment, Pigments, Pulp wastes, Carbohydrates, Ligninolytic fungi, Glucose, Ethanol.

In attempts to decolor kraft bleach plant effluents (especially those from the first alkaline extraction stage after chlorination) by cultivation of ligninolytic fungi, 25 species of tropical white-rot and 10 species of Japanese isolates (Sundmand's test) were screened for color-removing ability. Five fast-growing species (Schizophyllum, Trametes, Ganoderma, Tyromyces, and Tinctoporia) were further evaluated. Tinctoporia species cultivated with addition of saccharides was able to remove 99% of effluent pigments and to brighten the waste liquor to a faint clear yellow. Among different carbon sources tested, glucose or ethanol addition to the effluent gave the best color removal. (Brown-IPCX)
W78-03302

STATE-OF-THE-ART TREATMENT OF WASTES GENERATED BY THE PULP AND PAPER INDUSTRY,
Jordan (Edward C.) Co., Inc., Portland, ME.
B. A. Patrie, and W. H. Parker, III.
New England Water Pollution Control Association Journal, Vol. 10, No. 2, p 145-165, October, 1976. 4 fig, 2 ref, 5 tab.

Descriptors: *Waste water treatment, *Effluents, *Pulp and paper industry, Wastes, Industrial wastes, Pulp wastes, Waste treatment, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Oxidation lagoons, Aerated lagoons, Activated sludge, Biological treatment, Sludge disposal, Incineration, Color, Lime, Coagulation, Chemical precipitation, Tertiary treatment, Turbidity, Suspended solids, Colloids, Dissolved solids, Flocculation, Ion exchange, Chlorination, Ozone, Nutrients, Sands, Filtration, Spills, Nitrification, Denitrification, Aluminum sulfate, Kraft mills.

This discussion of effluent treatment methods is directed toward the kraft mill. With some modifications these methods may also be economically applied to the neutral sulfite semichemical and sulfite processes in which some form of chemical recovery and combustion of black liquor residues is practiced. Savealls and clarification are used for primary treatment in kraft mills; BOD reduction methods include aerated stabilization basins, activated sludge treatment, and rotating biological surface (disk) systems. Ultimate sludge disposal is by land disposal, incineration, or and external treatment methods. Internal techniques include the Rapson process (completely closed pulp bleaching and chemical recovery system), processes to replace kraft pulping, internal spill control, alteration of the bleaching sequence, and oxygen bleaching. External treatment methods for color reduction include lime treatment, lime mud

treatment, and alum coagulation and precipitation. Advanced waste water treatment systems for removal of turbidity, colloidal and suspended solids, dissolved salts and solids, refractory organics, and nutrients include coagulation and flocculation followed by settling; sand or mixed-media filtration; reverse osmosis, ammonia stripping, biological nitrification-denitrification; ion-exchange; activated carbon treatment, Chlorination; and ozonization. (Witt-IPC)
W78-03303

NEW REFLECTIONS ON CLOSED CYCLES IN THE PAPER AND BOARD INDUSTRY (REFLECTIONS NOUVELLES SUR LES CYCLES FERMES DANS L'INDUSTRIE DU PAPIER ET DU CARTON),
Sulzer Freres S. A., Winterthur (Switzerland).
M. Morgeli.
Papier, Carton et Cellulose, Vol. 26, No. 7, p 34-38, July, 1977. 8 fig, 9 ref.

Descriptors: *Water reuse, Recycling, Pollution abatement, Water pollution control, Foreign countries, Europe, Salinity, Water conservation, Recirculated water, Industrial water, *Pulp mills, *Paper mills, *Board mills, Closed systems.

Closing of water cycles in pulp, paper, and board mills is reviewed and discussed, particularly from the point of view of problems with high salt concentrations and biological activity in the recirculated water. Possibilities for controlling each of these problems are outlined, and an example is described of a Swiss paper mill with closed water cycle. (Speckhard-IPC)
W78-03307

STUDY OF DISSOLVED OXYGEN LEVEL IN PULP MILL EFFLUENTS (SLEDOVANIE KYSLIKOVEHO REZIMU V ODPADOVYCH VODACH Z VYROBY BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
J. Lalik, and L. Balhar.
Papir a Celulosa, Vol. 32, No. 5, p V9-V11, V15, 1977. English summary.

Descriptors: *Pulp wastes, *Bleaching wastes, *Dissolved oxygen, *Reaeration, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Biochemical oxygen demand.

To study effluent reaeration rates, waste waters from magnefite (magnesium-base sulfite) pulping and bleaching (chlorination and alkaline extraction) stages were mixed with BOD test dilution water and placed in beakers equipped with dissolved oxygen (D.O.) probes and mixers. Two mixer velocities were used, corresponding to reaeration rates of 7.89 and 20.86/day, respectively. The test was run for 65 hr during which the D.O. level was recorded. The D.O. vs. time curves, espceially those obtained with bleachery effluents, did not conform to the Streeter-Phelps equation, since they showed two D.O. minima instead of one expected from the Streeter-Phelps equation. (Trubacek-IPC)
W78-03308

PAPER MILL EFFLUENT CLARIFIED WITH IMMOBILIZED ALPHA-AMYLASE,
Agricultural Research Service, Peoria, IL. Northern Regional Research Lab.
K. L. Smiley, B. T. Hofreiter, J. A. Boundy, and S. P. Rogovin.
Proceedings 3rd International Biodegradation Symposium, August 17-23, 1975, Kingston, Rhode Island, p 1001-1011. Published 1976. 3 fig, 16 ref, 2 tab.

Descriptors: *Waste water treatment, *Enzymes, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Suspended solids, Flocculation, Pulp wastes, Pulp and paper industry, Effluents, Waste treatment, Resins, *White water(Paper machines), Alpha-amylase, Aluminum sulfate.

A simulated fine-paper machine white water was treated with alpha-amylase immobilized on an adsorbent resin. Approximately 78% of the suspended solids was removed from the treated white water after settling 4.3 hr following treatment with 75 ppm alum. The process is technically feasible for rendering industrial effluents susceptible to flocculation with nominal levels of alum. Descriptions are given of the simulated white water, amylase immobilization of the protein-adsorbent resin, design of a fluid-bed reactor, and extrapolation of results to mill-scale operations. (Buchanan-IPC)
W78-03310

IDENTIFICATION AND REMOVAL OF TOXIC MATERIALS FROM KRAFT AND GROUNDWOOD PULP MILL EFFLUENT,
B. C. Research Ltd., Vancouver.
J. M. Leach, J. C. Mueller, and C. C. Walden.
Process Biochemistry, Vol. 10, No. 1, p 7-10, January/February 1976. 3 fig, 37 ref, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, *Waste identification, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Bleaching wastes, Pulp and paper industry, Effluents, Water reuse, Biological treatment, Aerated lagoons, Microorganisms, Activated sludge, Costs, Suspended solids, Color, Oxygen, Aeration, Activated carbon, Foam separation, *Kraft mills, *Groundwood mills.

Toxic constituents present in kraft and groundwood pulp mill effluents and kraft bleach plant (caustic extraction stage) effluents are briefly reviewed. Since many of the major toxic constituents in pulp mill waste streams are of natural origin, modifications to existing production techniques will probably be of limited benefit in reducing effluent toxicity. Considerable efforts are being made to recycle process waters. However, external waste water treatment is presently the most practical method for toxicity removal at existing pulp mills. Biological detoxification of pulp mill effluents is accomplished by the attack of microorganisms on the toxic substances. Several biological processes, including aerated lagoons, activated sludge systems, Unox process (which uses oxygen in place of air for oxygenating the waste) two-stage Zurn-Attisholz process, and the rotating biological disk system are being investigated or are in use. Activated carbon treatment and foam separation provide alternatives to conventional primary-secondary treatment. Apart from their excessive cost in most instances, these processes usually remove only one sorce of pollution from the waste (e.g., suspended solids, color) and must be used in combination with one or more other processes in order to effect complete treatment. (Witt-IPC)
W78-03311

TWO-STAGE PULP MILL EFFLUENT TREATMENT: CHEMICAL WITH LIME AND BIOLOGICAL BY THE ACTIVATED SLUDGE METHOD (OCZYSZCZANIE SCIEKOW CELULOZOWYCH W UKLADZIE DWUSTOPNIOWYM: CHEMICZNYM - ZA POMOCA WAPNA I BIOLOGICZNYM - METODA OSADU CZYNNEGO),
Technical Univ. of Warsaw (Poland). Inst. Zaopatrzenia w Wode i Budownictwa Wodnego.
M. Apolinarski, M. Roman, Z. Ulaska, E. Skowyrski, and J. Zielinski.
Przeglad Papierniczy, Vol. 33, No. 5, p 178-181, May, 1977. 5 fig, 7 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Lime, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Sedimentation, Carbon dioxide, Neutralization, Aeration, Chemical oxygen demand, Color, Biochemical oxygen demand, Pulp and paper industry, Effluents, Biological treatment, Oxygen, Kraft mills.

A study of two-stage effluent purification was conducted in a model installation at the Ostroleka kraft mill during a 6-week period in October-November and 6 weeks in March-April of the next year. The process consists in treatment of the crude effluent with a 10% solution of lime flowing at a rate of 0.4 liter/min, sedimentation during 1.5 hr, saturation with carbon dioxide, 8 hr sedimentation in a secondary sedimentation tank, neutralization, and treatment with activated sludge for an aeration time of 5 hr. The optimum dosage of lime determined in preliminary experiments was 2-3 g/ou dm. The chemical treatment achieved average reductions of 54% in COD, 65% in oxidizability, 88% in color, and 42% in 5-day BOD. The combined purification effect was an 83% reduction of COD, 83% reduction of permanganate oxidizability, 90% reduction of color, and 93% reduction of BOD. Purification with lime, when carried out in a suitable manner, does not affect the subsequent biological process. (Stapinski-IPC)
W78-03312

NEW ENGLAND TISSUE MILL RECYCLES 73% OF ITS WHITE WATER EFFLUENT,
Marcal Paper Mills, Inc., Elmwood Park, NJ.
E. D. Clark.
Pulp and Paper, Vol. 51, No. 9, p 80-82, August, 1977. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Water reuse, *Water conservation, Industrial water, Wastes, Pulp and paper industry, Effluents, Maine, Costs, Chemicals, Sludge treatment, Dewatering, Suspended solids, Biochemical oxygen demand, Turbidity, Hydrogen ion concentration, Temperature, Polymers, Cations, Oil, Recycling, Flotation, *White water(Paper machines), Tissue paper mills.

The 3 Yankee fourdriniers at Marcal Paper Mills' tissue plant in Mechanic Falls, Maine, use 2.2 million gallons of water/day, but 73% of this is water recycled directly from the effluent treatment plant to the fresh-water storage tank. A schematic diagram is presented of the effluent treatment plant. Two dissolved-air flotation units supplied by Permutit Co. and two 80-inch gravity concentrators (from Ecodyne) with primary and secondary sludge-dewatering screens handle the mill flow completely. The chemical costs for cationic polymer average $85 and $40/day for the flotation units and the concentrator, respectively. Data are presented on the suspended solids, BOD, turbidity, pH, temperature, sludge consistency, and oil and grease contents of treated, untreated, and discharged effluents. (Swichtenberg-IPC)
W78-03313

ROLE PLAYED BY ZETA POTENTIAL IN EFFLUENT TREATMENT AND ITS CONTROL,
Pen Kem Inc., Croton-on-Hudson, NY.
J. G. Penniman.
Pulp and Paper, Vol. 51, No. 9, p 112-115, August, 1977.

Descriptors: *Waste water treatment, *Zeta potential, *Coagulation, *Suspended solids, *Dewatering, *Sludge, Wastes, Waste treatment, Flocculation, Colloids, Iron compounds, Organic compounds, Hydrogen ion concentration, Instrumentation, Polymers, Water pollution treatment, Water pollution sources, Effluents, Aluminum compounds.

The role of zeta potential in the coagulation of suspended solids in the primary and secondary clarifiers and in the dewatering of sludge is investigated. If maximum efficiency is to be obtained in the clarifier, the suspended particle size

must increase rapidly. To accomplish flocculation the negative zeta potential of the colloids is decreased by the addition of primary coagulants (viz., positively charged Al or Fe ions and high-molecular weight organic polymers). Bridging by these coagulants also increases the settling rates. Optimum pH control is important, since zeta potential becomes more positive as the pH is lowered. Instrumentation is described for measuring zeta potential. (Swichtenbery-IPC)
W78-03314

SPECIFIC ENERGY CONSUMPTION FOR ENVIRONMENTAL PROTECTION IN THE (SWEDISH) PULP AND PAPER INDUSTRY: QUESTIONNAIRE RESULT (SPECIFIK ENERGIFORBRUKNING FOR MILJOVARD INOM MASSA-OCHPAPPERSINDUSTRIN: RESULTAT AV EN ENKAT),
IVL-Konsult A. B., Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W78-03315

BLEACH PLANT FILTRATE RECOVERY,
Erco Envirotech Ltd., London (Ontario). (Assignee).
D. W. Reeve, G. Rowlandson, and W. H. Rapson.
United States Patent No. 4,039,372. August 2, 1977. 10 p, 13 claims, 2 fig.

Descriptors: *Bleaching wastes, *Water reuse, *Patents, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Pulp and paper industry, Effluents, Neutralization, Pulp washing, Recycling, Pollution abatement, Water pollution control, Sodium hydroxide.

This invention relates to a pulping and bleaching system in which the bleaching and extraction stages yield an aqueous acid filtrate and an aqueous alkaline filtrate, and provides procedures for recycling these filtrates. Part of the acid filtrate is neutralized with fresh aqueous NaOH and used for washing the digested pulp in a washing stage immediately prior to passing the washed pulp to the bleaching system. The remainder of the acid filtrate is introduced as an aqueous medium into the spent pulping liquor recovery cycle (e.g., to the lime kiln scrubber) at a point after burning of the spent liquor, while excluding this remaining acid filtrate from the recycled pulping liquor. Part of the alkaline filtrate is used as wash water for washing the pulp in the earlier stages of the washing system, before the stage using the acid filtrate. The remainder of the alkaline filtrate is used in diluting regenerated pulping liquor to the desired concentration. (Lynch-IPC)
W78-03322

MATHEMATICAL METHODS FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03420

MIXED INTEGER PROGRAMMING MODELS FOR WATER RESOURCES MANAGEMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-03421

CHLORINE INJURY TO FECAL COLIFORM BACTERIA IN TREATMENT PLANT EFFLUENTS,
Montana State Univ., Bozeman. Dept. of Microbiology.
A. K. Camper, and G. A. McFeters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 676, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Research Report Number 86, September 1977. 76 p, 6 fig, 10 tab, 50 ref. OWRT A-099-MONT(1), 14-34-0001-7056.

Descriptors: *Bacteria, *Coliforms, *Chlorine, E. coli, *Waste water treatment, *Chlorination, Absorption, Resipiration, Cytological studies, Fecal coliforms.

Injury induced in E. coli cells by chlorination was studied from a physiological standpoint. The chlorination procedure consisted of exposure of cells directly to 0.5 mg/l chlorine in pH 6.5 water for timed intervals up to sixteen minutes at 22 - 25C. Predictable and reproducible injury was found to occur. The injury inflicted on the E. coli cells by the chlorinated environment was reversible under certain nutrient conditions such as in overlay broth. Oxygen uptake experiments showed that chlorinated cells undergo a decrease in respiration. Uptake of metabolites was inhibited by chlorine injury as shown with experiments using 14C labeled glucose and algal protein hydrolysate. The results indicate that reversible injury occurs in E. coli cells exposed to commonly used concentrations of chlorine. Further, findings suggest that the previously accepted mechanism of chlorine damage (aldolase inactivation through sulfhydryl oxidation) is invalid and that impairment of the normal transport physiology of the cell envelope should be considered. (Stuart-Mont St)
W78-03422

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON NITROGEN TRANSPORMATIONS IN SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W78-03424

WATERHYACINTHS - A NUISANCE OR A BENEFIT,
National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
For primary bibliographic entry see Field 5G.
W78-03443

INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 5. BASIC PETROCHEMICALS INDUSTRY,
Radian Corp., Austin, TX.
T. B. Parsons, C. M. Thompson, and G. E. Wilkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 224, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-023e, January 1977. 145 p, 10 fig, 63 tab, 223 ref, 3 append. 1AB015; ROAP21AFH-025, 68-02-1319, Task 34.

Descriptors: *Water pollution, *Chemical wastes, *Industrial wastes, Industrial production, Chemical engineering, Organic compounds, Hydrofracturing, Natural gas, Assessments, Environmental effects, Processes, Petrochemistry, Natural gas liquids, *Petrochemicals industry.

A catalog was developed to aid in defining the environmental impacts of U.S. industrial activity in the basic petrochemicals industry. Entries for the basic petroleum industry include information on companies that treat hydrocarbon streams from the petroleum refining industry, as well as natural gas liquids from the oil and gas reproduction industry. From these raw materials, feedstocks are produced for the organic chemicals industry. The products are pure or mixed chemicals which are used as solvents or chemical intermediates. The basic petrochemicals industry is described by six operations composed of related processes, characterized in four chemical trees, six process flow sheets, and 28 process descriptions for olefins, butadine, benzene/tolunes, naphtalene, cresols and cresylic acids, and normal paraffin. For each process description, available data are presented on input materials, operating parameters, utility requirements, and waste streams. Related information on raw materials, products, and producers of basic petrochemicals with production locations is presented in the appendices. (Wares-IPA)
W78-03457

LABORATORY STUDY OF AERATION AS A FEASIBLE TECHNIQUE FOR DEWATERING FINE-GRAINED DREDGED MATERIAL.
Environmental Engineering Consultants, Inc., Stillwater, OK.
For primary bibliographic entry see Field 5E.
W78-03480

FEASIBILITY STUDY FOR A SEWAGE SYSTEM IN THE CITY OF BLANTYRE IN MALAWI (FEASIBILITY-STUDIE FUER DAS ABWASSERSYSTEM DER STADT BLANTYRE IN MALAWI),
K. Bucksteeg.
Wasser und Abwasser Bau-intern, No 8, p 158-160, 1977. 2 fig.

Descriptors: *Sewerage, *Costs, *Feasibility studies, *Industrial wastes, *Municipal wastes, Sewers, Treatment facilities, Construction, Waste water treatment.

Results are presented on a fact-finding mission in connection with a feasibility study concerning a modern sewage system in Blantyre, Malawi, a rapidly growing city with 165,000 inhabitants and expanding industry. Due to the orographic conditions, the city has three independent sewage systems with waste water treatment facilities for some 75,000 inhabitants. The existing biological waste water treatment plants are over loaded and poisoned by industrial effluents. A considerable and increasing portion of the inhabitants live in huts in areas unsuitable for canalization. The construction of a new sewage system was rejected in view of the high cost (10,000,000 DM). Training of the operating personnel and installation of a waste water laboratory were recommended. (Takacs-FIRL)
W78-03493

PIPEWORK FLEXIBILITY,
For primary bibliographic entry see Field 8G.
W78-03495

GLASS REINFORCED CONCRETE PIPES.
For primary bibliographic entry see Field 8F.
W78-03497

SEWAGE CHANNEL BAR SCREEN RAKE--RAISABLE BY CHAIN ALONG REARWARD SWIVELLING CARRIER ON CANTILEVER WITH POWER CYLINDER DRIVE.
German Patent DS 2524-776. Issued October, 20, 1977. Derwent German Patents Abstracts, Vol. Y, No. 43, p 4, December, 1977.

Descriptors: *Screens, *Patents, *Equipment, *Design data, *Waste water treatment, Filtration, Sewage treatment.

A patent has been issued for a channel bar screen rake which includes a collecting rake mounted at the influent end of a waste water treatment plant. A comb is placed parallel to the rectilinear rake on its downstream side so that the teeth of the comb extend upstream through the rake. The direction of the comb teeth can be reversed to allow cleaning of the mechanism. The rake structure is equipped with a comb support which allows sliding and pivoting of the rake in a downstream direction as well as vertical motion of the comb within its support plane. A cantilever arm with a length equal to the protruding length of the comb teeth from the support is mounted on the downstream side of the support to allow pivoting. (Schulz-FIRL)

W78-03498

REMOVING PHOSPHATES FROM EFFLUENT BY THE ACTIVATED SLUDGE PROCESS--WITH COUNTERCURRENT EXTN. OF THE PHOSPHATE CONTG. SLUDGE.
French Patent ZA 7605-966. Issued August 2, 1977. Derwent French Patents Abstracts, Vol. Y, No. 43, p 3, December, 1977.

Descriptors: *Phosphates, *Activated sludge, *Nutrient removal, *Aeration, *Patents, Sludge treatment, Biochemical oxygen demand, Separation techniques, Waste water treatment.

A patent has been issued for an activated sludge process to remove phosphate from BOD-containing waste water. The phosphate-containing influent is mixed with activated sludge and oxygen-containing gas in an aeration zone. Mixing facilitates the reduction of the BOD content of the influent and the removal of phosphate by microorganisms present in the activated sludge. The phosphate-enriched sludge is separated from the phosphate-free liquid in the mixed liquor and passed to an anaerobic stripping zone for release of the phosphate into the remaining liquid. The phosphate-enriched liquid is withdrawn from the upper section of the stripping zone while the phosphate-depleted sludge is recycled to the aeration zone. The process has been improved through the addition of counter-current stripping of the sludge phosphate by maintaining the sludge in the stripping zone for a period of 2-10 hours. A low phosphate, low solids stripping medium which is added to the lower section of the stripping zone flows up through the settling solids. Phosphate from the settling solids is then transferred to the stripping medium. The stripping medium should have a suspended solids concentration of less than 200 mg/liter and should be introduced at a flow rate of 0.7-2.0 times the rate that the phosphate-enriched liquid is withdrawn. (Schulz-FIRL)
W78-03499

AERATION TANK FOR ACTIVATED SLUDGE TREATMENT OF WASTE WATER--IS SMALLER AND REQUIRES LESS POWER FOR A GIVEN TREATMENT CAPACITY.
French Patent ZA 7605-207. Issued August 31, 1977. Derwent French Patents Abstracts, Vol. Y, No. 43, p 1-2, December, 1977.

Descriptors: *Activated sludge, *Aeration, *Patents, *Equipment, *Sludge treatment, Liquid wastes, Design data, Waste water treatment.

A basin for aerating mixed liquor in an activated sludge system has been patented. The basin consists of an elongated, rectangular tank equipped with inlet and outlet ends. Means for supplying waste water and recycled sludge to the tank are provided. Aerator units are located at various intervals along the length of the basin to aerate the mixed liquor as it flows through the tank to the outlet end. Staggered partitions extend from alternate side walls across at least part of the width of the tank to form liquid passes with a length to width ratio of 0.59-1.70. The liquid flow paths created by the partitions emcompass 30-80% of the wetted cross-sectional area of the basin. The aerator units should have mixing factors within the range of 20-450. The partitioning creates an effect of liquid staging with more than one liquid stage per actual liquid pass. (Schulz-FIRL)
W78-03500

ELIMINATION OF NITROGEN CPDS. FROM WASTE WATER--BY DOWNWARDS PASSAGE THROUGH BIOLOGICAL TREATMENT UNITS IN A SUITABLE ATMOS.
French Patent FR 2336-354. Issued August 26, 1977. Derwent French Patents Abstracts, Vol. Y, No. 43, p 5, December, 1977.

Descriptors: *Nitrification, *Patents, *Equipment, *Nutrient removal, *Nitrogen compounds, Ammonium compounds, Biological treatment, Biodegradation, Anaerobic conditions, Waste water treatment.

A biological treatment process has been patented for the removal of organic nitrogen compounds, nitrates, nitrites, and ammonium compounds from waste water. A pipe conducts the waste water into a distribution chamber and then through a series of superimposed units for the removal of oxygen and the biological reduction of nitrates. The waste water then passes into an evacuated gas distribution chamber where nitrogen is introduced through a tube in a reverse direction to that of the waste water flow. The superimposed units are filled with innoculated porous media which have been treated with a nutrient suitable for supporting nitrifying bacteria. Overflow tubes conduct waste water from one unit to the next in the column. (Schulz-FIRL)
W78-03501

VERTICAL AXIS AERATING ROTOR FOR WASTE WATER--CAN BE OPERATED AT HIGHER SPEEDS THAN PREVIOUS INVERTED CONE TURBINE ROTORS.
French Patents FR 2337-580. Issued September 9, 1977. Derwent French Patents Abstracts, Vol. Y, No. 45, p 3, December, 1977.

Descriptors: *Aeration, *Equipment, *Patents, *Rotors, *Turbine blades, Design data, Hydraulic equipment, Waste water treatment.

A patent has been issued for a high-speed rotor for waste water aeration. The rotor consists of a flat, preferably circular, plate which rotates in a horizontal plane about a vertical axis. The underside of the rotor is equipped with several, angularly spaced blades which extend radially toward the periphery of the rotor. The blade depth is shallowest at the blade's ends, yielding a crescent shape. Each blade is fitted with a wing-like plate which extends from both sides of the blade's crest to its outer edge. The blade itself extends beyond the perimeter of the circular rotor. Four right-angle vertical plates which coincide with the central axis of the rotor act as baffles to prevent turbulence in the lower section of the tank. The rotor can reportedly be operated at higher speeds than conventional inverted cone turbine rotors. (Schulz-FIRL)
W78-03502

STUDIES ON SEPARATION OF ALGAE FROM STABILIZATION POND EFFLUENTS BY COAGULATION,
National Environmental Engineering Research Inst. (India). Zonal Lab.
C. A. Sastry, M. N. Rao, and A. V. Rao.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 3, p 91-94, June, 1977. 8 tab, 6 ref.

Descriptors: *Algae, *Flocculation, *Coagulation, *Feeds, *Nutrient removal, Chemical precipitation, Separation techniques, Polyelectrolytes, Oxidation lagoons, Ponds, Microorganisms, Municipal wastes, Sewage treatment, Waste water treatment.

India's sunny climate and the economy of the process have led to the widespread use of waste stabilization ponds as a means of waste water treatment in India. Algal cell material produced in the ponds is suggested as a source of protein for animal feed supplements. Coagulation of algae in stabilization pond effluents with nirmali (Strychnos potatorum) seed extracts and alum was investigated with effluents obtained from the Shahpura Oxidation Ponds in Bhopal, India. The four 201 x 50 x 1-m ponds are each divided into two equal primary and secondary units and are designed to treat a total of 3 mgd of municipal wastes from Bhopal. Algal species observed in the test effluents are listed. In studies with alum doses of 120-240 mg/liter and effluents containing 250,000-267,000 algae per ml, 95-97% of the algae was coagulated with an alum dose of 240 mg/liter. In studies with flocculation times of 5-30 min, optimum algae removal was obtained with a flocculation time of 20-25 min and a settling time of 30 min. Algae removal was also investigated with polyelectrolytes at doses of 0-10 mg/liter using Magnifloc 990, Separan NP 10, Wisprofloc, and nirmali seed extract. While nirmali seed was more effective than the other agents, polyelectrolytes used alone were not as effective in coagulating algae as the alum. Studies on the use of nirmali seed extract in conjunction with alum indicated that 98-99% removal of algae could be obtained with an alum dose of 180 mg/liter and a nirmali seed extract dose of 8 mg/liter. (Schulz-FIRL)
W78-03504

TREATMENT FACILITIES EXPANDED AT DENVER SEWAGE DISTRICT.
Water and Wastes Engineering, Vol. 14, No. 9, p 94, September, 1977.

Descriptors: *Treatment facilities, *Aerobic treatment, *Sewage treatment, *Screens, *Sludge disposal, Pumps, Clarification, Aeration, Municipal wastes, Methane, Equipment, Waste water treatment.

A $37-million expansion project for the Central Waste Water Treatment Plant was designed by CH2M Hill and Culp Wesner Culp for the Metropolitan Denver Sewage Disposal District No. 1. The project increased the total treatment capacity from 98 mgd to 170 mgd, and increased the primary capacity by 150% and the secondary capacity by 75%. Additions to the primary treatment facility included three continuous rake bar screens and conveyor belt; two grit washers and classification units; two hoppers for temporary holding of screenings and grit; two gravity grit basins; four center-feed clarifiers with grease removal; and six piston sludge pumps. Secondary treatment is provided by six vertical propeller low lift pumps, eight three-chambered aeration basins, rim collection clarifiers with grease removal, six pumps for return activated sludge, two pumps for waste activated sludge, and eight aerobic digesters. The aerobic digesters were added to reduce the volume of sludge handled and to stabilize the product for agricultural use. The digesters include a gas mixing system and a heat exchange system, so that methane produced during digestion can be used to maintain a sludge temperature of 95F. The digested/stabilized sludge product from the sludge drying and distribution system will be used as a soil conditioner and fertilizer. (Schulz-FIRL)
W78-03505

DEVELOPMENTS IN THE TREATMENT OF EFFLUENT,
Hudson (Robert) (Raletrux) Ltd., Leeds (England).
A. Waud.
Water Services, Vol. 81, No. 978, p 510, August, 1977.

Descriptors: Equipment, *Screens, *Sludge treatment, *Construction materials, *Design data, Settling basins, Filters, Sewage treatment, Waste water treatment.

A series of tank scrapers and screens has been manufactured by the Effluent Division of Robert Hudson (Raletrux) Ltd. of Leeds, Yorkshire, England. The Auto-Sludge rectangular scraper was developed for use in storm water tanks, sludge holding tanks, primary and secondary settling tanks, and rectangular clarifiers. The scrapers are equipped with a self-contained drive unit, can be totally submerged during operation, and do not require routine maintenance. The Bio-Screen range of solids removal screens and the Roto-

Sludge range of rotating half-bridge scrapers for circular tanks are also produced by Hudson. The Bio-Screen can be used in most shallow channels which are rectangular in cross-section, with either a bar screening surface and rake mechanism or a perforated plate screen surface and brush mechanism. Special features of the Bio-Screen include the adjustable angle of the screen surface and the specially-designed closed circuit winch for removing and elevating screenings. The Roto-Sludge includes a special scum removal device, a tripod central support with a universal bearing arrangement, and a box girder design for the rotating bridge. (Schulz-FIRL)
W78-03506

FERRIC CHLORIDE TREATMENT REDUCES RIVER'S PHOSPHOROUS DISCHARGE,
Indiana Univ. at South Bend. Dept. of Chemistry.
L. L. Garber.
Water and Sewage Works, Vol. 124, No. 10, p 54-57, October, 1977. 2 fig, 5 tab, 16 ref.

Descriptors: *Nutrient removal, *Phosphorus, *Phosphates, *Tertiary treatment, *Water analyses, Monitoring, Water pollution control, Clarification, Flocculation, Rivers, Effluents, Path of pollutants, Waste water treatment.

The effects of the addition of a tertiary system for phosphorus removal to the South Bend waste water treatment plant on the water quality of the St. Joseph River in Indiana were investigated. Concentrations of ortho-phosphate P, polyphosphate P, and organic P were measured in grab and composite samples collected at six sites along the St. Joseph River from September 1974 to August 1975. Phosphorus removal at the South Bend plant was accomplished by precipitation with ferric chloride and flocculation of the produced solids with an anionic polyelectrolyte. The 48-mgd system included two 200-ft dia upflow clarifiers. A typical ferric chloride dosage of 5.8 mg/liter was added to the effluent from the secondary clarifiers. The anionic polyelectrolyte was then added to the waste water as it flowed into the base of the upflow clarifiers. The low variation in phosphorus levels for samples obtained at various sites throughout the city indicated that municipal wastes did not present a significant contribution to the phosphorus levels in the river during dry weather flow. Before the addition of phosphorus removal at the South Bend plant, the treatment plant effluent was reported as increasing the orthophosphate levels in the river by 88%. After the addition of tertiary treatment, plant effluent caused only nominal increases in orthophosphate and organic phosphate levels and a slight decrease in polyphosphate levels. (Schulz-FIRL)
W78-03508

STUDY DISCLAIMS CONTACT STABILIZATION SUPERIORITY OVER SINGLE TANK AERATION,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
D. Thirumurthi.
Water and Sewage Works, Vol. 124, No. 10, p 86-93, October, 1977. 4 fig, 12 tab, 16 ref.

Descriptors: *Activated sludge, *Aeration, *Solids contact processes, *Stabilization, Pilot plants, Biological treatment, Sewage treatment, Nutrient removal, Organic wastes, Organic loading, Waste water treatment.

Laboratory-scale studies were used to compare the two-tank aeration activated process (contact stabilization) with the single-tank system (high rate, conventional, and completely mixed processes). Five tests were performed with synthetic waste water and treatment plant influent under batch and continuous conditions. In the first test, contact stabilization was compared with the conventional process. The second and third tests compared the biosorption process with high rate or modified activated sludge process under short-term aeration. The fourth and fifth tests evaluated single-tank and two-tank activated sludge processes under constant and variable hydraulic loads, respectively. Results of the various tests conducted in this study and of previous laboratory and pilot plant investigations are presented. The study concluded that reaeration of the return sludge in a two-tank aeration activated sludge system did not always significantly enhance the BOD or COD removal rates. The single-tank aeration process was better at absorbing mild shocks induced by fluctuating hydraulic and organic loads. The positioning of aeration tanks before and after secondary settling basins offers process flexibility with the use of the reaeration tank as a temporary storage facility. A contact stabilization unit is suggested as resulting in a higher organic load removal per unit volume of aeration tank than a conventional activated sludge process. (Schulz-FIRL)
W78-03509

SLUDGE DEWATERING--A TASK THE RIGHT EQUIPMENT MAKES EASIER.
The American City and County, Vol 92, No 10, p 49-52, October, 1977. 1 fig, 1 tab.

Descriptors: *Dewatering, *Drying, *Sludge treatment, *Filtration, *Filters, Centrifugation, Separation techniques, Lagoons, Design data, Sewage treatment, Waste water treatment.

Various methods are available for dewatering sludge produced during waste water treatment, including rotary vacuum filters, centrifuges, drying beds, lagoons, filter presses, and horizontal belt filters. Vacuum filter performance is related to the type of covering used, the size distribution of solid particles in the sludge, and the cake discharge mechanism employed. Operation of the coil vacuum filter is described. The main variables which affect sludge dewatering by centrifugation include: bowl design, length:diameter ratio, bowl angle, flow pattern, bowl speed, pool volume, conveyor design relative conveyor speed, and sludge feed rate. Various types of centrifuges are discussed, including the solid bowl countercurrent centrifuge, continuous concurrent flow solid bowl conveyor centrifge, basket centrifuges, and disc centrifuges. Design and operating criteria related to drying beds are discussed. Lagoon drying, commonly used in areas where large areas of land are available, is discussed. The filter press, in which sludge is dewatered by compression between vertical plates faced with filter cloth, is discussed. Additional types of dewatering devices which are described include moving screen concentrators, belt pressure filters, capillary dewatering systems, and rotating gravity concentrators. (Schulz-FIRL)
W78-03510

CO-DISPOSAL OF SEWAGE SLUDGE AND SOLID WASTES--IT WORKS,
Environmental Protection Agency, Washington, DC. Resource Recovery Div.
For primary bibliographic entry see Field 5E.
W78-03512

KINETICS OF CELL GROWTH AND BACTERIA PROLIFERATION IN ACTIVATED SLUDGE TREATMENT (A SEJTANYAG, ILLETVE BAKTERIUM-SZAPORULAT KINETIKAJA AZ ELEVENISZAPOS EL-JARASBAN),
F. H. Ghobrial.
Hidrologiai Kozlony, Vol 57, No 5, p 193-198, May, 1977. 4 fig, 3 tab, 10 ref.

Descriptors: *Activated sludge, *Microbial degradation, *Kinetics, *Suspended solids, *Oxidation, Energy, Microorganisms, Sewage treatment, Analytical techniques, Bacteria, Biological treatment, Waste water treatment.

Cell growth and bacterial proliferation in completely-mixed activated sludge systems with batch and continuous operation were examined using activated sludge samples from the South Pest treatment plant in Hungary. A new theoretical approach assumes that bacteria use the energy of substrate oxidation for microbial synthesis with only limited effciency, and that part of this energy leaves the system in the form of heat. The studies concluded that bacterial growth, the biological use effciency of the energy produced, and the endogenous decay factor were constant under the same physical and chemical conditions. Measurements of mixed liquor suspended solids were considered to be more practical and more easily obtained than measurements of live bacterial mass. (Schulz-FIRL)
W78-03513

HIGHLY ADVANCED SEWAGE TREATMENT (HOCHENTWICKELTE ABWASSER-REINIGUNG).
Wasser, Luft, und Betrieb, Vol 21, No 7, p 405-406, 1977. 3 fig.

Descriptors: *Tertiary treatment, *Filtration, *Filters, *Treatment facilities, *Equipment, Design data, Municipal wastes, Biochemical oxygen demand, Phosphorus, Effluents, Biological treatment, Waste water treatment.

Percolation bodies made of PLASdek blocks and their uses in municipal waste water treatment are described. The percolation bodies consist of blocks measuring 1,200 mm x 600 mm x 500 mm. They can be used for high-efficiency purification of municipal waste water, especially where chemical precipitation is required. The bacterial flora is rapidly regenerated after chemical attack. Two-stage percolation bodies with fixed nozzle or rotary disk water distribution systems have an efficiency of 90% and over in terms of the reduction of BOD and phosphorus contents. (Takacs-FIRL)
W78-03514

CENTRIFUGAL DEWATERING OF MUNICIPAL AND INDUSTRIAL SLUDGE,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 5E.
W78-03515

REST AREA WASTEWATER TREATMENT,
B. N. Lord, and G. W. Hughes.
Public Roads, Vol 41, No 2, p 53-57, September, 1977. 1 fig, 2 tab.

Descriptors: *Roads, *Public lands, *Recreation wastes, *Recreation facilities, *Sewage treatment, Treatment facilities, Septic tanks, Oxidation, Design criteria, Operation and maintenance, Waste water treatment.

In light of the number of rest areas associated with the Interstate Highway System, a study was conducted by the Federal Highway Administration to develop recommendations and guidelines for bringing existing and new rest area sanitary waste water treatment systems into compliance with the Federal Water Pollution Control Act. In the first phase of the two part study, existing treatment systems were surveyed to study types, sizes, operational characteristics, and design parameters of rest area sewage treatment systems; to evaluate the abilities of existing systems to comply with 1977 requirements; and to determine current state requirements for rest area waste water treatment. Discharge of rest area wastes was the preferred method of treatment by state highway agencies. The most common methods of treatment in use at existing rest areas were septic tanks with leach fields or sand filters, oxidation ponds, and extended aeration activated sludge package plants. A regional breakdown of rest area sewage treatment systems which were surveyed is presented. Since federal regulations require that publicly owned

treatment facilities meet requirements for secondary treatment for all point source discharges by July 1, 1977, design and operating guidelines and procedures for new facilities, as well as upgrading procedures for existing facilities, were developed in the second phase of the program. (Schulz-FIRL)
W78-03516

THE EFFECT OF SLUDGE DIGESTION ON VIRUS INFECTIVITY,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
For primary bibliographic entry see Field 5C.
W78-03517

AWARD WINNING PLANT UTILIZES SPRAY IRRIGATION,
Dufresne-Henry Engineering Corp., North Springfield, VT.
For primary bibliographic entry see Field 5E.
W78-03519

TURBINE STANDBY FOR WATER AND SEWAGE PLANTS.
For primary bibliographic entry see Field 8C.
W78-03520

THE STATUS AND FUTURE OF OZONE FOR WATER AND WASTEWATER TREATMENT,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
W. J. Lacy, and R. G. Rice.
Industrial Water Engineering, Vol 14, No 5, p 14-19, September, 1977.

Descriptors: *Ozone, *Disinfection, *Activated carbon, *Industrial wastes, *Municipal wastes, Oxidation, Chlorination, Toxicity, Hospitals, Chemical wastes, Organic wastes, Activated sludge, Aeration, Waste water treatment.

Current and prospective applications of ozone in water and waste water treatment are described. Although chlorination has been the traditional means of disinfection in sewage treatment, the potential toxic effects of chlorine to aquatic life have led to the consideration of ozone as an alternative. Sewage treatment plants in the United States which have used ozone as of 1977 are listed. The use of ozone in the oxygen-activated sludge process and in the removal of total coliforms, viruses, and dissolved solids is described. Pilot plant studies on the use of ozonation prior to activated carbon adsorption have indicated that ozonation can increase removals of dissolved organic carbon compounds, prolong the life of the carbon bed, and result in odor reduction. Current research into the substitution of ozonation for chlorination in water treatment is discussed. Current industrial applications of ozone are examined for the destruction of cyanides and polychlorinated biphenyls and for the treatment of photo-processing, military hospital, and power plant cooling waste waters. Future potentials for ozonation in the United States are evaluated. (Schulz-FIRL)
W78-03521

ENERGY GUZZLING SEWAGE PLANT WILL FUEL ITSELF.
Engineering News-Record, Vol 199, No 14, p 70-72, 76, October, 1977. 1 fig.

Descriptors: *Energy, *Fuels, *Recycling, *Costs, Water reuse, *Incineration, Dewatering, Sludge treatment, Sludge disposal, Waste water treatment.

A $70-million physical-chemical-biological waste water reclamation plant has recently been put into operation in Pacheco, California, by the Central Contra Costa Sanitary District. The facility is designed to treat an average flow of 30 mgd, of which 19 mgd are then recycled to five nearby industries for use as cooling and process water. A 1000-tpd front end resource recovery facility will produce about 605 tpd of refuse-derived fuel, as well as separate out reusable metals and glass. The refuse-derived fuel will be mixed with organic sludge and used to fuel multiple-hearth furnaces which have been modified for pyrolysis. A portion of the resulting combustible gas will be used to run the lime recovery furnace while the rest will be burned in afterburners to produce steam in waste heat boilers for 90-95% of the plant's energy needs. In addition, the recovery operation is expected to save $2,275 per day in lime costs. Before passing to the multiple-hearth furnaces, the sludge is first dewatered in two centrifuges to render a moisture content low enough for autothermic burning of the sludge. Designed by Brown and Caldwell Consulting Engineers of Walnut Creek, California, the plant is expected to more than pay back its high initial cost in fuel savings. (Schulz-FIRL)
W78-03522

EXPANSION PROGRAM GIVEN 'GO AHEAD' IN ABSENCE OF FEDERAL FUNDS,
Williams and Works, Grand Rapids, MI.
T. C. Williams.
Water and Wastes Engineering, Vol 14, No 10, p 33, 35-37, October, 1977. 1 fig.

Descriptors: *Return flow, *Treatment facilities, *Sewage lagoons, *Waste water treatment, Water treatment, Costs, Aeration, Sewerage, Municipal wastes.

With the discovery of oil and the construction of multi-million-dollar refinery in Kalkaska, Michigan, a rapid influx of new residents had seriously overloaded water and waste treatment facilities. Additions to the existing waste treatment system which consisted of a stabilization lagoon with provisions for seepage and semi-annual discharge to the Boardman River had been prohibited by the State Department of Natural Resources, The ban was later lifted after the installation of aerators, on the condition that Kalkaska would initiate a project to alleviate the overloading. Since federal funds were not available to Kalkaska's low priority project, the city council voted to intitiate a $1.3-million program to expand water and sewer systems without grant assistance. The Farmers Home Administration provided funds for local bonds to finance the project. The Farmers Home Administration provided funds for local bonds to finance the project. The water system expansion included construction of a new 700-gpm well; a 250,000-gal elevated storage tank; and approximately 4 miles of distribution mains. Expansions for waste water collection and treatment included construction of additional stabilization ponds, irrigation areas to eliminate the need for a direct discharge to the Boardman River, and approximately 4 miles of collection sewers. (Schulz-FIRL)
W78-03523

SLUDGE COMPOSTING PROJECTS IN U.S. CITIES,
Agricultural Research Service, Beltsville, MD. Biological Waster Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5E.
W78-03525

IRRADIATING DRIED SLUDGE COULD BENEFIT ENVIRONMENT, SAVE ENERGY.
Design News, Vol 33, No 19, p 42, October, 1977.

Descriptors: *Radiation, *Sludge treatment, *Disinfection, *Sewage bacteria, Sewage treatment, Irradiation, Waste water treatment.

Sandia Laboratories in Albuquerque, New Mexico, has designed a pilot facility to examine the economic and scientific aspects of treating dried sewage sludge with gamma radiation as a means of disinfecting sludge for use as a fertilizer or soil conditioner. The facility which is being built for ERDA will handle dried sludge on a continuous, flow-through basis rather than on a batch system operation. From 30 to 60 lbs of dried sludge will be placed in each of a series of conveyor-suspended buckets. The 10' high, 12' wide, and 24' long buckets will pass over a under a gamma-radiation source of one megacurie of cesium-137, a waste product of nuclear power reactors. Twenty sludge-filled buckets can occupy the radiation zone at any given time, and the radiation dosages can be varied from a few thousand rads up to several million rads by adjustments of the conveyor belt speed. The method of treatment is suggested as an effective means of disinfection which would also put to beneficial use considerable amounts of cesium-137. (Schulz-FIRL)
W78-03526

TANK ACCESSORIES IN PLASTIC.
For primary bibliographic entry see Field 8G.
W78-03528

SANITATION FOR THE DEVELOPING NATIONS.
Compost Science, Vol 18, No 5, p 21, September/October, 1977.

Descriptors: *Sewage treatment, *Foreign countries, *Septic tanks, *Domestic wastes, *Municipal wastes, Waste water treatment, Absorption, Soil disposal fields, Treatment facilities.

Methods of household waste treatment and disposal which are available to developing nations where traditional methods of sewage treatment would otherwise not be feasible are reviewed. The possibilities include bucket toilet collection systems, pit privies, communal latrines, composting toilets, septic tanks, sewage ponds, and aqua privies. Problems with public health dangers from bacteria, viruses, and parasites have led to the development of a new toilet system by the Vietnamese government. The system is actually a 'double septic tank' or a double vault toilet in which urine is separated off to soak into the ground and feces are passed to a masonry vault. One of the two units is used while the other is sealed off for a period of 45 days to produce a nutrient-rich, odorless material for use as a fertilizer. A second double vault system developed by Dr. Krisno Nimpuno of Mozambique allows the use of a small amount of flushing water to cleanse the opening. Aerobic decomposition is maintained by a filter of leaves, charcoal, and crushed limestone which lets liquids as well as kitchen garbage soak through the soil. Additional methods for waterless waste treatment and disposal are described. (Schulz-FIRL)
W78-03530

INCREASE IN STANDBY GENERATION.
For primary bibliographic entry see Field 8C.
W78-03531

COMPARISON OF BENCH, PILOT, AND FULL SCALE CARBON ADSORPTION/FILTRATION,
Schade (Willard F.) and Associates, Inc., Cleveland, OH.
W. H. Moss, and S. J. Sebesta.
AIChE Symposium Series, Vol 73, No 166, p 78-90, 1977. 9 fig, 6 tab, 9 ref.

Descriptors: *Activated carbon, *Adsorption, *Filtration, *Pilot plants, *Operation and maintenance, Treatment facilities, Biochemical oxygen demand, Municipal wastes, Clarification, Sewage treatment, Waste water treatment.

The 10-mgd Rocky River waste water treatment plant in Ohio was the site of a study to compare full scale results of a carbon adsorption/filtration process with previous bench and pilot scale studies. Bench scale studies were conducted on a scale of 0.5 gal/min and pilot scale studies on a scale of 50 gal/min. Carbon treatment performance was measured in terms of suspended solids, 5-day BOD, COD, and total phosphorus in the carbon column effluent. In addition to filtration and adsorption performance, hydrogen sulfide production in the column and column pressure loss and backwashing were evaluated for each carbon adsorption/filtration system. Results indicated that bench-scale studies are not a reliable measure of performance on a larger scale and that the carbon/adsorption filtration process was a solids limited process when applied to the treatment of chemically clarified domestic waste water. Surface filtration was the main result of treatment with an 8 x 30 mesh carbon. Adsorption efficiency was reduced by diurnal variations in flow. Hydrogen sulfide formation was effectively suppressed with the addition of sodium nitrate to the carbon filters. Biological activity was cited as the primary cause of high column headloss. (Schulz-FIRL)
W78-03532

UPFLOW-DOWNFLOW CARBON ADSORPTION,
Zurn Industries, Inc., Erie, PA. Eviro-System Div.
G. E. Strudgeon.
AIChE Symposium Series, Vol 73, No 166, p 43-53, 1977. 10 fig, 1 tab, 4 ref.

Descriptors: *Activated carbon, *Adsorption, *Filtration, *Industrial wastes, *Municipal wastes, Equipment, Porous media, Heat treatment, Waste water treatment.

An upflow-downflow carbon adsorption system developed by the Enviro-Systems Division of Zurn Industries, Inc., of Erie, Pennsylvania, has been chosen by the city of Garland, Texas, for the treatment of combined municipal and industrial wastes. The system includes series-connected columns of activated carbon which were designed to reduce the number of times the carbon must be regenerated by extending the column service cycle. The counter-current, two-bed system is arranged so that one of the beds acts as a series roughing upflow primary contactor, while the other acts as a secondary downflow polishing contactor. When the effluent quality has deteriorated to a predetermined level, the spent carbon from the secondary unit replaces the carbon in the primary unit to maximize carbon utilization. In the series operation, loadings of 0.6-0.7 lbs COD/lb carbon are possible as compared to loading rates of 0.3-0.4 lbs COD/lb carbon under parallel conditions. Costs and expected treatment efficiency are presented for a 30-mgd plant which uses lime clarification prior to activated carbon adsorption. Carbon adsorption facilities at the 30-mgd Duck Creek sewage treatment plant in Garland, Texas, will include twenty 25-ft dia columns. Carbon replacement will be required approximately every 2-4 days with regeneration in a multiple hearth furnace. (Schulz-FIRL)
W78-03533

GREYWATER FOR THE GREENHOUSE,
Clivus Multrum Inc., Cambridge, MA.
A. Rockefeller, and C. Lindstrom.
Compost Science, Vol 18, No 5, p 22-25, September/October, 1977.

Descriptors: *Soil disposal fields, *Domestic wastes, *Greenhouses, *Return flow, *Nutrient removal, Fertilizers, Waste water disposal, Waste water treatment, Sludge treatment, Irrigation practices, Soil-water-plant relationships.

Kitchen and toilet wastes can be separated from other household wastes to yield 'greywater', which is easier to treat than combined wastes and can be used for other purposes. A closed cycle of organic waste conversion/water purification/food production consisting of a Clivus Multrum, a Lindstrom roughing filter, and a lean-to greenhouse is described. Kitchen and toilet wastes in the Clivus are converted to a humus soil for the greenhouse growing beds. The stone roughing filter is used to treat household waste water for pumping into the 4- x 2-ft greenhouse soil boxes. The relatively stable and warm temperature in the greenhouse, along with the nutrient uptake by the plants, affords favorable conditions for the activity of decomposing organisms and for the purification of household waste waters. Since the amount of water introduced to the greenhouse beds is considerably more than the amount that the plants can transpirate, waste water application is actually more of a hybrid between standard subsurface irrigation and hydroponics. At the test site in Cambridge, Massachusetts, waste heat from a central gas furnace is used as a back-up heat source for the greenhouse. Crushed rock under the concrete slab floor and the warm greywater also help maintain constant temperatures in the greenhouse. (Schulz-FIRL)
W78-03534

WASTEWATER RENOVATION AND SLUDGE UTILIZATION ON LAND INCLUDING QUESTIONS OF OWNERSHIP,
Environmental Protection Agency, Chicago, IL. Office of Research and Development.
For primary bibliographic entry see Field 5E.
W78-03535

ELASTOMERIC MEMBRANES,
Dunlop Ltd., Skelmersdale (England). GRG Div.
For primary bibliographic entry see Field 8G.
W78-03536

WATER RECLAMATION AND REUSE, (LITERATURE REVIEW),
Environmental Protection Agency, Cincinnati, OH.
J. N. English.
Journal Water Pollution Control Federation, Vol 49, No 6, p 1078-1087, June, 1977. 128 ref.

Descriptors: *Water reuse, *Tertiary treatment, *Industrial water, *Return flow, Environmental effects, Fertilizers, Irrigation practices, Municipal wastes, Recycling, Waste water disposal, Waste water treatment, *Bibliographies.

Various literature pertaining to waste water reclamation and reuse is reviewed. Water resources planning and management practices which incorporate reuse are described. Experiences with the use of municipal waste water and organic wastes for irrigation, fertilization, and groundwater recharge are discussed with respect to costs and effects. Models to assess the reuse of waste water for artificial recharge and to prevent salt water intrusion into coastal aquifers are described. The use of municipal waste water for industrial purposes is examined. In-plant recycling and closed-loop systems for process waste water are reviewed for various industrial applications. Renovation of waste water to augment potable water supplies and the associated health effects are discussed. Recent technology developments in waste water reclamation are described. (Schulz-FIRL)
W78-03537

ACTIVATED SLUDGE TREATMENT, GENERATION, AND DISPOSAL,
Delaware Univ., Newark.
R. I. Dick.
AIChE Symposium Series, Vol 73, No 167, p 66-77, 1977. 2 fig, 61 ref.

Descriptors: *Activated sludge, *Environmental effects, *Sludge treatment, *Sludge disposal, Recycling, Municipal wastes, Feeds, Incineration, Dewatering, Equations, Legislation, Equipment, Waste water treatment, Nutrient removal, Waste water disposal.

Various aspects of the activated sludge process in waste water treatment are reviewed. Mathematical expressions for the amount of excess activated sludge produced at a waste water treatment plant are presented. The chemical, biological, and physical properties of waste activated sludge which may influence selection of treatment and disposal techniques are discussed. Previous studies on the treatment of waste activated sludge in combination with other sludges at a waste water treatment plant are reviewed. Reclamation of valuable substances in sludge is discussed with respect to food processing wastes, the production of animal feed supplements from municipal wastes, and the use of processed activated sludge for various agricultural purposes. Since sludge constituents which are not recycled must be returned to some sector of the environment, the effects of sludge disposal on water, air, and land are discussed. Legislation and technology related to sludge disposal practices are described. Sludge thickening, stabilization, conditioning, and dewatering methods are reviewed. (Schulz-FIRL)
W78-03538

ADVANCED WASTEWATER TREATMENT PROCESSES AT COLESHILL,
Humphreys (Howard) and Sons, Leatherhead (England).
F. Clough.
Chemistry and Industry, Vol 20, p 811-816, 1977. 2 ref.

Descriptors: *Tertiary treatment, *Activated carbon, *Lime, *Adsorption, *Treatment facilities, Design data, Filtration, Porous media, Suspended solids, Waste water treatment.

The advanced waste water treatment facilities in Coleshill, England, contain two complete treatment streams, each capable of handling average flows of 450 cu m/day with peaks of 1350 cu m/day for a total equivalent population of 5,000. One of the treatment streams was used in an evaluation of conventional physicochemical treatment with lime addition, settling, first stage recarbonation, settling, second stage recarbonation, media filtration, and activated carbon treatment. The evaluation was conducted to provide information on costs for individual and combination processes. A major advantages of lime addition is greater removal of suspended solids and BOD to reduce settling costs, although the quantity of sludge is increased and costs are incurred by the need for chemical storage and dosing facilities. When lime has been added, two-stage recarbonation is required to adjust the pH prior to activated carbon treatment. Because of its regenerating capacities, granular instead of powdered carbon is used in the activated carbon stage at Coleshill. Properties of activated carbon and operation and maintenance of the adsorption columns are described. The media filtration plant at Coleshill includes three anthracite-sand-gravel filters which can be used singly or in combination. The activated carbon plant includes three pairs of adsorption columns, sewage pumping and backwash equipment, and carbon storage facilities. (Schulz-FIRL)
W78-03539

PURIFICATION OF MUNICIPAL WASTE WATER WITH ACTIVATED CARBON AFTER WEAKLY LOADED BIOLOGICAL TREATMENT AND FILTRATION (REINIGUNG VON KOMMUNALEM ABWASSER MITTELS AKTIVOKHLE NACH SCHWACH BELASTETER BIOLOGISCHER REINIGUNG UND FILTRATION),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
P. Roberts, W. Gujer, and J. Eugster.

Vom Wasser, Vol 48, p 47-70, 1977. 13 fig, 9 tab, 9 ref.

Descriptors: *Activated carbon, *Adsorption, *Filtration, *Organic wastes, *Particle size, Porous media, Tertiary treatment, Effluents, Biodegradation, Municipal wastes, Gas chromatography, Analytical techniques, Waste water treatment.

Advanced treatment of municipal waste water is often required in Switzerland for compliance with water quality standards on dissolved organic carbon levels in effluents. The effects of operating parameters, including the brand of activated carbon, grain size, and filtration rate, on the fixed bed absorption were investigated in pilot-scale studies. Additional parameters observed during the studies included activated carbon capacity, concentration profiles, and adsorption performance. The degree of biodegradation of organic compounds during activated carbon treatment was evaluated with respect to the oxygen consumption in the carbon bed. Gas chromatography was used to examine the removal of specific organic substances by adsorption onto activated carbon. (Schulz-FIRL)
W78-03540

RECENT ADVANCES IN SEWAGE EFFLUENT DENITRIFICATION: PART I,
Water Pollution Research Lab., Stevenage (England).
P. F. Cooper, E. A. Drew, D. A. Bailey, and E. V. Thomas.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 287-300, 1977. 8 fig, 6 tab, 17 ref.

Descriptors: *Activated sludge, *Denitrification, *Pilot plants, *Nutrient removal, *Anaerobic conditions, Nitrogen compounds, Ammonia, Sludge treatment, Waste water treatment.

Results of an investigation by the Water Research Centre in England on denitrification in sewage treatment are presented. A modified activated sludge system with four compartments connected in series was used in studies to compare nitrogen removal by conventional activated sludge processes and by a modified activated sludge unit. The differences in removal of BOD, COD, and organic carbon between the two systems were insignificant. Nitrogen removal for the modified unit was 58-88% as compared with 35-45% for the conventional unit. Large-scale testing of the modified process was conducted at the Rye Meads sewage treatment works. An anaerobic zone was created in the first of four units with a four-pass plug-flow diffused-air activated sludge treatment unit. Total nitrogen was successfully reduced from 40.4 mg/liter to 21.2 mg/liter. Three additional units were connected in series. Performance of the individual units is compared in terms of reductions in ammonia and oxidized nitrogen. The percentage reduction of oxidized nitrogen was 47.7% for the first unit, 48.5% for the second unit, 52.9% for the third, and 53.7% for the fourth. (Schulz-FIRL)
W78-03541

LISNASKEA SEWAGE-TREATMENT WORKS,
Kirk, McClure and Morton, Belfast (Ireland).
W. I. D. Sanderson.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 332-339, 1977. 1 fig, 3 tab, 2 ref, 1 append.

Descriptors: *Dairy industry, *Tertiary treatment, *Activated sludge, *Settling basins, Aerobic digestion, Clarification, Treatment facilities, Municipal wastes, Industrial wastes, Sewage treatment, Aeration, Design data, Waste water treatment.

The Lisnaskea sewage treatment facility in County Fermanagh in Ireland is described. The system treats combined municipal and industrial wastes for a design population equivalent of 8,000. Treatment at the Lisnaskea plant includes a double stage pretreatment system with interstage sedimentation with Flocor towers to reduce the influent BOD concentration from a maximum of 1,500 mg/liter to a maximum of 300 mg/liter. Treatment of domestic sewage which may contain storm water includes grit removal with a Pista grit trap. The pretreated combined industrial and municipal wastes are pumped to the activated sludge plant by means of three centrifugal pumps. Preaeration mixing tanks are used to minimize the effect of shock loadings from dairy effluent. The main aeration tanks for combined wastes are serviced by a fine-bubble diffused-air system. Aerated effluent is transferred to secondary sedimentation tanks and then to tertiary upflow clarifiers. Aerobic digestion tanks are used to treat surplus sludge from the activated sludge plant. Sludge from the aerobic digestion tanks is settled in sludge consolidation tanks and piped to one of four drying beds. The BOD of domestic sewage is reduced in the final effluent from 254.9 mg/liter to 9.7 mg/liter, and the suspended solids from 222.4 mg/liter to 11.9 mg/liter. The industrial effluent pretreatment plant reduces influent BOD from 1,116 mg/liter to a concentration of 289 mg/liter in the effluent. Suspended solids are reduced from 439 mg/liter to 63 mg/liter. (Schulz-FIRL)
W78-03542

LOAD BALANCING AT SEWAGE-TREATMENT WORKS: THE SOUTHAMPTON UNIVERSITY PILOT PLANT AT MILLBROOK,
Southampton Univ. (England). Dept. of Civil Engineering.
P. R. Helliwell, and R. J. R. Reed.
Journal of the Institute of Water Pollution Control, Vol 76, No 3, p 355-372, 1977. 14 fig, 2 tab, 10 ref.

Descriptors: *Treatment facilities, *Pilot plants, *Equalizing reservoirs, *Automatic control, *Design data, Diurnal distribution, Flow control, Electronic equipment, Computer programs, Kinetics, Activated sludge, Biochemical oxygen demand, Mathematical models, Sewage treatment, Automation, Monitoring, Waste water treatment.

Load balancing in sewage treatment was investigated with a 45.4-cu-m/day pilot plant at Southampton University in Millbrook, England. The design of the pilot plant follows that of a conventional treatment plant with a diffused-air activated sludge system with the addition of an off-line balancing tank. Design data are presented for the primary sedimentation tank, activated sludge thickening tank, off-line balancing tank, aeration tank, and construction and materials. Control systems which are described include: load balancing control, influent flow control, level control, instrumentation, fail-safe arrangements, and the reactivated sludge rate. Measurements for measuring organic strength are described. Aspects of process kinetics which are discussed include: study and variable flow rates, steady and variable concentration, steady and variable load, the plug flow reactor, and the continuous stirred tank reactor. The effects of load balancing on flow, BOD, and load variations in primary and final effluents are discussed. A flow diagram for a computer program to regulate operations of a load balancing system is presented. (Schulz-FIRL)
W78-03543

BIOLOGICAL DECOMPOSITION OF REFRACTIVE COMPOUNDS AFTER CHEMICAL OXIDATION (BIOLOGISCHER ABBAU REFRAKTAERER VERBINDUNG NACH CHEMISCHER OXIDATION),
Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden-, und Lufthygiene.
W. Janicke.
Gesundheits-Ingenieur, Vol 98, No 7/8, p 208-212, 1977. 2 fig, 71 ref.

Descriptors: *Oxidation, *Chlorination, *Ozone, *Disinfection, *Biodegradation, Organic wastes, Biological treatment, Chemical reactions, Chemical degradation, Surfactants, Waste water treatment.

The chemical oxidation of stable tensides, such as tetrapropylenebenzenesulfonate (TBS) and nonylphenolethoxylate (NPE) by chlorination and ozonation, and its effect on the efficiency of the subsequent biological waste water treatment were studied under laboratory conditions. The tenside concentration in the water was about 4.8 g/liter for ozonation for 2.5 or 8 hr. The flow rate of the ozone-containing oxygen was about 200 liter/hr for TBS, and 80-100 liter/hr for NPE. The pH was maintained at the neutral point. Chlorination was performed at 10C with weak chlorine gas current for 5 hr, or with chlorinated water for 30 min. Ozone had only slight effect on TBS and on the subsequent biological treatment, while it oxidized NPE effectively and increased the efficiency of the biological treatment by about 100%. Chlorine oxidized NPE more effectively than TBS, but it also increased the efficiency of the biological degradation of the latter. (Takacs-FIRL)
W78-03544

THE PURIFICATION OF DOMESTIC WASTE WATER BY MEANS OF ACTIVATED CARBON AFTER LOW LOADING BIOLOGICAL TREATMENT AND FILTRATION (REINIGUNG VON KOMMUNALEM ABWASSER MITTELS AKTIVKHOLE NACH SCHWACH BELASTETER BIOLOGISCHER REINIGUNG UND FILTRATION),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
P. Roberts, W. Gujer, and J. Eugster.
Vom Wasser, Vol 48, p 47-70, 1977. 13 fig, 9 tab, 9 ref.

Descriptors: *Activated carbon, *Filtration, *Tertiary treatment, *Particle size, *Porous media, Filters, Carbon filters, Municipal wastes, Organic wastes, Analytical techniques, Sewage treatment, Waste water treatment.

In some instances, Switzerland's strict effluent standards necessitate advanced treatment to remove dissolved organic carbon from municipal waste water. Pilot-scale studies were used to examine the effect of operating parameters, including the brand of activated carbon, grain size, and filtration rate, on fixed bed adsorption processes. The experiments examined adsorption performance, concentration profiles, and activated carbon capacity. Data for oxygen consumption in the activated carbon bed were used to estimate the degree of biological degradation of organic compounds. Gas chromatography was used to study the removal of specific organic compounds. (Schulz-FIRL)
W78-03545

REMOVAL OF UNCOMMON TRACE METALS BY PHYSICAL AND CHEMICAL TREATMENT PROCESSES,
Municipal Environmental Research Lab., Cincinnati, OH.
S. A. Hannah, M. Jelus, and J. M. Cohen.
Journal Water Pollution Control Federation, Vol 49, No 11, p 2297-2309, November, 1977. 3 fig, 9 tab, 36 ref.

Descriptors: *Trace elements, *Heavy metals, *Coagulation, *Chemical precipitation, *Activated carbon, Pilot plants, Municipal wastes, Silver, Beryllium, Cobalt, Molybdenum, Antimony, Selenium, Tin, Titanium, Thallium, Vanadium, Lime, Iron compounds, Adsorption, Waste water treatment, Clarification.

Measurable concentrations of various trace metals which are toxic at even low concentrations can be found in domestic waste waters. Studies have been conducted to evaluate the capability of physical-

chemical processes in municipal waste water treatment for removing these metals. A research project at the EPA Environmental Research Center in Cincinnati, Ohio, utilized a 4 gpm continuous-flow pilot plant which received raw waste water from a residential suburb of the city. The plant included a rapid mix flocculator, settler with sludge storage tank, dual-media filter with backwash collection tank, and two parallel carbon adsorption systems. The raw waste water was dosed with salts of 11 uncommon trace elements, including: Ag, Be, Bi, Co, Mo, Sb, Se, Sn, Ti, Tl, and V. Metal removals by each unit process were calculated. The system was operated to provide optimum removals of suspended solids and organics rather than metals. The system was tested with three different coagulants, including lime, ferric chloride, and alum, and the metal removal efficiencies were compared. The data indicated that, with the exception of Sb and Mo, one or more of the coagulants were capable of achieving metal removals of more than 90%. For the lime system 90% removals were not achieved for Mo, Sb, and Se. In the ferric chloride system 90% removal did not occur for Co, Tl, Mo, Sb, and Se. Chemical clarification with alum removed less than 90% of Mo, Tl, Zn, Mn, Ni, Co, Cd, Sb, and Se. (Schulz-FIRL)
W78-03546

QUARTERNARY AMMONIUM THICKENING OF SEWAGE SLUDGE IN MAGNETIC FIELD,
Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
L. K. Wang, M. H. Wang, R. C. Ziegler, and M. P. Strier.
Industrial and Engineering Chemistry Product Research and Development, Vol 16, No 4, p 311-315, December, 1977. 3 tab, 24 ref.

Descriptors: *Flocculation, *Sludge treatment, *Separation techniques, *Magnetic studies, *Ammonium compounds, Coagulation, Dewatering, Sewage treatment, Activated sludge, Municipal wastes, Waste water treatment.

Since sludge handling and disposal costs comprise approximately 40% of the total cost of the activated sludge process of waste treatment, much research has been conducted in the fields of sludge thickening and volume reduction. A sludge dewatering method, involving simultaneous settling and thickening of nonmagnetic sludge by magnetic fields, is described. The technique involves chemical addition, flocculation, polarization, sedimentation, and disinfection. The process is based on the addition of finely divided iron oxide particles to the sewage sludge as both the weighing agent and the polarization-inducing agent prior to the addition of a coagulant and floc formation. The agglomerates which contain sludge solids, iron oxide, and a quarternary ammonium compound are then flocculated and passed through a magnetic field for further polarization to yield very high weight-to-surface-area floc particles. The high specific gravity of the condensed flocs results in rapid settling without the need for secondary flocculation. The addition of a quarternary ammonium compound also disinfects the settled sludge and supernatant. (Schulz-FIRL)
W78-03547

APPLICATION OF PHOTODYNAMIC OXIDATION TO THE DISINFECTION OF TAP-WATER, SEAWATER, AND SEWAGE CONTAMINATED WITH POLIOVIRUS,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
C. P. Gerba, C. Wallis, and J. L. Melnick.
Photochemistry and Photobiology, Vol 26, No 5, p 499-504, 1977. 5 fig, 2 tab, 20 ref.

Descriptors: *Viruses, *Disinfection, *Dyes, *Viricides, *Chlorination, *Light, *Oxidation, Water pollution control, Microbiology, Water reuse, Public health, Sewage treatment, Waste water treatment, Municipal wastes.

The prevalence of enteroviruses in chlorinated waste water effluents presents a major obstacle to waste water reuse. Photoreactive dyes have already been used to inactivate microorganisms in a variety of medical applications. Laboratory studies have indicated that exposure to methylene blue dye and visible light can result in photoinactivation of poliovirus in tapwater, sewage, and seawater. Exposure of poliovirus type 2 to 670 nm light in solutions containing 5 ppm methylene blue at pH 10.0 resulted in an average virus reduction of 2.5 logs. A multi-hit inactivation event was suggested by the biphasic inactivation curve produced regardless of dye concentration, pH, temperature, sensitization time, nature of suspending solution or sequence of light exposure. The rate of virus photoinactivation was increased by pre-incubation of the dye-virus mixture at 24C. Increasing dye concentrations above 10 ppm did not significantly enhance photoinactivation. In the absence of visible light, high dye concentrations in the range of 20-45 ppm did result in significant inactivation of poliovirus. Alternating light and dark periods did not significantly affect inactivation. The use of natural light sources for dye-sensitized photoinactivation is suggested as a means of reducing disinfection costs. (Schulz-FIRL)
W78-03548

MAKING OPTIMUM USE OF FILTER MEDIA IN WASTEWATER FILTRATION,
Black and Veatch, Denver, CO.
M. J. Maxwell, S. W. Work, K. D. Linstedt, and E. R. Bennett.
Water and Sewage Works, Vol 124, No 12, p 56-61, December, 1977. 9 fig, 3 tab, 19 ref.

Descriptors: *Filtration, *Filters, *Porous media, *Packed beds, *Clarification, Pilot plants, Particle size, Effluents, Suspended solids, Sands, Design criteria, Coagulation, Sewage treatment, Waste water treatment.

A two-phase pilot plant investigation was used to examine the effects of chemical pretreatment and the depth and composition of the filter media on filter performance in waste water treatment. Activated sludge effluent was obtained from the Metropolitan Denver waste water treatment and used in studies on filtration of secondary effluent and alum-coagulated secondary effluent with and without settling prior to filtration. Components of the pilot system included: a head tank, rate control valves, presedimentation tank for minimizing influent solids variations, on-line alum injection, flocculation tank, clarifier, polymer feed, filters, and an on-line turbidimeter. Various bed depths of coal, sand, and garnet were employed in the study. The filters were operated in three modes: standard clarification, high rate clarification, and plain filtration. Filtrates were analyzed for BOD, COD, suspended solids, total phosphorus, and total and fecal coliforms. Plain filtration was capable of reducing suspended solids levels in the effluent to 1-2 mg/liter over filter runs in excess of 20 hr at 6 gpm/sq ft. Although coagulation with alum and polymer addition produced a high quality effluent, rapid head loss developed because of the high solids loading and relatively weak chemical floc. In mixed media filters, the coarser coal layer was responsible for removal of most of the floc solids. The finer sand and sand-garnet media were responsible for removal of most of the high rate system. Mixed media filters were more effective than dual media filters in the high rate and standard clarification systems, although this difference was not apparent during plain filtration. (Schulz-FIRL)
W78-03549

A LOOK AT NEWER METHODS FOR DEWATERING SEWAGE SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5E.
W78-03550

FIBRE MATS FOR LANDSCAPE ENGINEERING.
For primary bibliographic entry see Field 8G.
W78-03551

CONCRETE STAVE TANKS.
For primary bibliographic entry see Field 8F.
W78-03552

COMPLETE SERVICE FOR SLURRY RECYCLING.
For primary bibliographic entry see Field 5E.
W78-03553

SUBMARINE PIPELINE FOR RIVER WEAR.
For primary bibliographic entry see Field 5E.
W78-03554

SOIL'S NATURAL PROCESSES CAN CLEAN WASTES FROM SEWAGE WATER.
Crops and Soils Magazine, Vol 30, No 2, p 23, November, 1977.

Descriptors: *Return flow, *Nutrient removal, *Soil disposal fields, *Sewage treatment, Phosphorus, Nitrogen, Soil chemical properties, Soil physical properties, Soil treatment.

Naturally occurring chemical and biological processes in soils has been recommended for waste water treatment by Clarence Lance of the United States Water Conservation Laboratory in Phoenix, Arizona. The method is suggested, in particular, for the removal of nitrogen and phosphate from waste water with possible applications in the removal of organic material and fecal bacteria from secondary sewage effluent. Studies at the Water Conservation Laboratory used soil-filled pipes as models of a land filtration system. Waste water application rates 20-30 times higher than those used for crop irrigation are considered feasible in renovation of waste water with a high-rate land filtration system. (Schulz-FIRL)
W78-03558

WASTE WATER SURVEY OF A PARTIALLY SEWERED CITY,
For primary bibliographic entry see Field 5B.
W78-03559

ULTRASONIC SLUDGE DIP STICK.
For primary bibliographic entry see Field 5A.
W78-03561

SEROLOGICAL TYPING AND CHLORINATION RESISTANCE OF WASTEWATER CYANOPHAGES,
Virginia Commonwealth Univ., Richmond. School of Dentistry.
For primary bibliographic entry see Field 5A.
W78-03562

HOW RELIABLE IS INSTRUMENTATION IN WASTEWATER APPLICATIONS,
Raytheon Co., Portsmouth, RI.
For primary bibliographic entry see Field 5A.
W78-03563

STUDY OF POLYSACCHARIDES IN ACTIVATED SLUDGE MUCILAGE (ETUDE DES POLYOSIDES DU MUCILAGE DES BOUES ACTIVEES),
Institut National de la Recherche Agronomique, Villeneuve d'Ascq (France). Station de Technologie Alimentaire.
J. P. Rideau, and J. N. Morfaux.
Water Research, Vol 10, No 11, p 999-1003, 1976. 6 fig, 18 ref.

Descriptors: *Polymers, *Activated sludge, *Flocculation, *Organic compounds, Analytical techniques, Sludge treatment, Municipal wastes, Waste water treatment, Industrial wastes.

Activated sludges from the treatment of municipal and industrial waste water were used in experiments to isolate the polymer or polysaccharide fraction in sludge. The studies revealed that carbohydrates and related compounds such as galacturonic acid and rhamnose were partially incorporated in the activated sludge mucilage. Extracellular polymers or exopolysaccharides were synthesized during the contact period of contact-stabilization and were partially incorporated in the contact period of contact-stabilization and were assimilated during sludge stabilization. Morphological features of the floc particles, as in the case of filamentous bulking, are said to be related to the activated sludge polysaccharides. (Schulz-FIRL)
W78-03565

TESTS FOR NITRIFYING AND DENITRIFYING ABILITY OF ACTIVATED SLUDGE,
New York State Dept. of Environmental Conservation, Albany.
C. Beer.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 5, p 558-564, 1977. 6 ref.

Descriptors: *Analytical techniques, *Activated sludge, *Nitrification, *Denitrification, *Sewage bacteria, Laboratory tests, Sludge treatment, Waste water treatment.

Analytical procedures are presented for the quantification of the bacterial mass of a single-stage activated sludge system designed for carbonaceous contaminant removal, nitrification, and denitrification. The test for nitrifying ability is based on the respiration activity of Nitrosomonas. The substrate-mediated test is conducted at an ammonia-N concentration greater than 2.5 mg/liter to provide for a zero order reaction. The test is 1 hr in length and is conducted on mixed liquor rather than on return sludge. The pH is optimized and mass transport difficulties are eliminated by placing the heterotrophic bacteria in a state of endogenous respiration and by increasing turbulence and dilution. The test for the percentage of denitrifying bacteria in mixed liquor solids is based on endogenous nitrate respiration and is conducted on deoxygenated return sludge. Deoxygenation is accomplished by the addition of sodium thiosulfate and anerobic conditions are maintained throughout the experiment. The denitrifying ability is based on the N03/N02-N ratio. (Schulz-FIRL)
W78-03568

VENTURI FUMES AND REQUIREMENTS FOR MEASUREMENTS TECHNIQUES FOR EXACT MEASUREMENTS OF QUANTITIES OF WASTE WATER VENTURIKANAELE UND MESSTECHNISCHE ANFORDERUNGEN FUER GENAUE ABWASSERMENGEN),
Zuellig A. G., Rheineck (Switzerland). Apparatebau fuer die Wasserwirtschaft.
For primary bibliographic entry see Field 5A.
W78-03569

THE COMPATIBILITY OF OXYGENATION CAPACITY MEASUREMENTS (VERGLEICHBARKEIT VON SAUERSTOFFEINTRAGSMESSUNGEN),
Stuttgart Univ. (West Germany). Inst. fuer Siedlungswasserbau, Wasserguetewirschaft und Abfallwirtschaft.
F. Bingel.
Wasserwirtschaft, Vol. 67, No. 6, p 168-174, 1977. 5 fig, 6 tab, 7 ref.

Descriptors: *Oxygenation, *Aeration, *Equipment, *Operation and maintenance, *Dissolved oxygen analyzers, Temperature, Model studies, Analytical techniques, Oxygen demand, Sewage treatment, Waste water treatment.

Observations on oxygenation capacity and oxygen demand of sewage are presented for use by consulting engineers and planners in the design of sewage treatment plant equipment used for aeration. Observed values for oxygenation capacity and oxygen uptake were compared with values predicted by aeration equipment manufacturers. Surveys indicated that there were often wide differences in oxygen input and actual uptake by sewage. Temperature and the degree of mixing partially explain the discrepancies. Possible sources of measurement error are described. (Schulz-FIRL)
W78-03570

DESIGN AND CONSTRUCTION OF AN ACTIVATED SLUDGE PLANT,
Engineering-Science, Inc., Cleveland, OH.
N. L. Prescan.
AIChE Symposium Series, Vol. 73, No. 167, p 78-85, 1977.

Descriptors: *Design criteria, *Planning, *Equipment, *Operation and maintenance, *Design data, Pumping, Construction, *Treatment facilities, Costs, Waste water treatment.

In the development of an activated sludge treatment facility, the construction of a final detailed design, preparation of plans and specifications, construction of the facility, and initiation of operation generally follow the establishment of design criteria and process flow sheets. An effective final design is dependent on the engineer's accurate interpretation of design criteria and on the selection of the proper equipment and constraints. Various tasks which must be completed before a final detailed design is possible are outlined. The selection of process units is usually based on the constraints set by the material to be handled, the degree of performance requirement, and operation and maintenance requirements along with economic considerations and the designer/owner preference. Pumping systems, clarification, aeration, and other process stages are discussed with respect to process units. The construction of process and instrumentation diagrams is suggested to provide an overview of the plant early in the project. Coordination of the detailed design with operations and construction is discussed. (Schulz-FIRL)
W78-03573

WASTEWATER EFFLUENT DISCHARGE TO COOLING LAKES,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-03575

INACTIVATION OF ENTERIC VIRUSES IN WASTEWATER SLUDGE THROUGH DEWATERING BY EVAPORATION,
Sandia Lab., Albuquerque, NM.
R. L. Ward, and C. S. Ashley.
Applied and Environmental Microbology, Vol 34, No 5, p 564-570, November 1977. 3 fig, 6 tab, 23 ref.

Descriptors: *Viruses, *Dewatering, *Fertilizers, *Sludge treatment, *Sludge disposal, Public health, Viricides, Ultimate disposal, Drying, Analytical techniques, Waste water treatment.

The use of waste water sludge as a fertilizer or animal feed supplement is dependent on the ability to inactivate the pathogens in the sludge without reducing its economic value. Studies were conducted to examine the effects of dewatering on the inactivated rates of enteric viruses in sludge. Raw sludge from the Albuquerque sewage treatment plant in New Mexioc was seeded before and after dewatering with Poliovirus type 1, coxsackievirus B1, and reovirus type 3. Dewatering was accomplished by evaporation at 21C. Measurements of the loss of viral plaque-forming units during dewatering indicated that the recoverable infectivity of poliovirus decreased gradually until the sludge solids content reached 65%. During evaporation from 65 to 83% solids, the virus titer decreased by more than 3 orders of magnitude. This was attributed to irreversible inactivation since viral particles were observed to have released extensively degraded RNA molecules. The inactivation of poliovirus by dewatering is supported by the significantly slower inactivation rates observed for sludge seeded after drying. Similar behavior was observed with reovirus type 3 and coxsackievirus B1, suggesting that dewatering by evaporation may be a viable method of inactivating all enteric viruses in sludge. (Schulz-FIRL)
W78-03576

IDENTIFICATION OF END PRODUCT RESULTING FROM OZONATION AND CHLORINATION OF ORGANIC COMPOUNDS COMMONLY FOUND IN WATER,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-03578

CHEMICAL MONITORING OF SEWAGE SLUDGE IN PENNSYLVANIA,
Pennsylvania Agricultural Experimental Station, University Park.
For primary bibliographic entry see Field 5A.
W78-03579

COMPARISON OF MEMBRANES FOR FECAL COLIFORM RECOVERY IN CHLORINATED EFFLUENTS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5A.
W78-03581

PERIODIC OPERATION OF AN ACTIVATED SLUDGE PROCESS,
Houston Univ., TX.
D. Sincic, and J. E. Bailey.
AIChE Symposium Series, Vol. 73, No. 167, p 135-139, 1977. 2 fig, 9 ref.

Descriptors: *Activated sludge, *Fluctuations, *Mathematical models, *Design criteria, *Model studies, Equations, Flow rates, Biological treatment, Waste water treatment.

A variety of studies have been conducted to develop a control design for the activated sludge process which would minimize the effects of disturbances on process performance and effluent quality. A mathematical modelling and simulation study of the application of periodic control to the activated sludge process is presented. The model is based on the activated sludge reactor as two ideal continuous flow stirred tank reactors. Assumptions include a constant recycle sludge concentration and a recycle substrate concentration equal to the substrate concentration in the activated sludge reactor effluent. A series of equations for the two-tank process are presented. The periodicity of the fluctuations in feed rate and composition is mathematically defined and used to modify the process variables. A variability index based on the mean square fluctuation of effluent substrate concentration about its mean is presented. Process conditions and parameters used during the calculations are defined, including recycle sludge concentration; average value and upper limit of sludge recycle flow rate; volume; sludge:substrate ratio; and the autocatalytic kinetics rate constant. The effects of optimal period control and steady control on the effluent substrate concentration are illustrated. (Schulz-FIRL)
W78-03582

NEAR OPTIMAL EFFLUENT CONTROL FOR AN EXISTING ACTIVATED SLUDGE WASTE WATER TREATMENT PROCESS,
Sherbrooke Univ. (Quebec). Dept. of Chemical Engineering.
N. Therien, S. Perdrieux, and P. Harrington.
AIChE Symposium Series, Vol 73, No 167, p 95-104, 1977. 11 fig, 2 tab, 19 ref.

Descriptors: *Mathematical models, *Activated sludge, *Aeration, *Clarification, *Sludge treatment, Equations, Pumping, Design criteria, Sewage treatment, Waste water treatment.

The waste water treatment plant for Sherbrooke University Hospital in Sherbrooke, Quebec, Canada, was the site of an evaluation of a model for predicting the dynamic behavior of the activated sludge process with respect to a control action. In this study the control action involved direct injection of active solids into the aeration unit of an activated sludge process in time in order to minimize the mean daily concentration of organic substrate flowing out of the clarifier in response to variations in the influent. In the presentation of the mathematical model for the aerator-clarifier system, differenrial equations for the substrate and biomass entering and leaving the aeration unit and clarifier are defined. A set of equations for the optimization of the control problem and for numerical synthesis of the control function are presented. Calculations indicated that a feasible control scheme for the Sherbrooke University Hospital to provide a pulse of solids in time could be realized by simply installing an on-off automatic timer activating an injection pump at the plant. (Schulz-FIRL)
W78-03585

A REVIEW OF FILM FLOW MODELING AS APPLIED TO TRICKLING FILTER SYSTEMS,
Hydroscience, Westwood, NJ.
G. J. Kehrberger.
AIChE Symposium Series, Vol 73, No 167, p 151-159, 1977. 7 fig, 20 ref.

Descriptors: *Mathematical models, *Trickling filters, *Filtration, *Porous media, *Model studies, Organic loading, Flow rates, Design data, Biological treatment, Microorganisms, Waste water treatment.

The trickling filter has been used in waste water treatment as a means of biologically removing organic carbon from municipal and industrial wastes. Microorganisms grown and maintained on the surface of the filter media receive oxygen and remove nutrients from the liquid film of waste water on the surface media. Various mathematical models have been developed to describe trickling filter performance as a function of organic loading, hydraulic loading, depth, and recirculation. A general review of film flow models with emphasis on liquid-phase concepts which can be used to examine trickling filter performance is presented. Liquid phase film flow models based primarily on mass balances within the reactor include the general heterogeneous model, the reaction control model, the pseudo-homogeneous model, and models for hydraulic loading response and recirculation effects. Models based on the bacterial film and biological activity are also described. (Schulz-FIRL)
W78-03586

PERFORMANCE PREDICTIONS FOR THE REMOVAL OF AQUEOUS FREE CHLORINE BY PACKED BEDS OF GRANULAR ACTIVATED CARBON,
Georgia Inst. of Tech., Atlanta.
M. T. Suidan, V. L. Snoeyink, and R. A. Schmitz.
AIChE Symposium Series, Vol 73, No 166, p 18-24, 1977. 5 fig, 9 ref.

Descriptors: *Mathematical models, *Chlorination, *Activated carbon, *Adsorption, *Model studies, Hydrogen ion concentration, Flow rates, Chemical oxygen demand, Particle size, Porous media, Effluents, Waste water treatment, Water treatment.

The chlorine residual in treated water and waste water may have deleterious effects such a toxicity to species in receiving waters; taste or odor in drinking water; and adverse effects on ion exchange resins and industrial processes. Various studies have been conducted on methods of dechlorination. A mathematical model for free chlorine reacting with activated carbon in a packed bed was used in studies to show the effect of pH, particle size, temperature, influent concentration, and flow rate and contact time on the breakthrough curve and on the buildup of surface oxides of carbon within the bed. The effect of pH on the breakthrough curve was examined at pH values of 4.0, 7.6, and 10.0. The reaction of chlorine with the carbon was slowest at pH 10. With influent concentrations of 1,5, 20 and 100 mg/liter, the higher concentrations resulted in more rapid breakthrough of chlorine and more rapid poisoning of the carbon. Chlorine removal increased with a decrease in carbon particle size. Removal was greater at lower flow rates and at longer contact times. The reaction between chlorine and the carbon bed was slowed down appreciably with decreasing temperatures. (Schulz-FIRL)
W78-03587

CONSIDERATION OF SUSPENDED SOLIDS TRANSPORT IN ACTIVATED SLUDGE SYSTEM SYNTHESIS: I. SIMULTANEOUS USE OF CLARIFICATION AND SLUDGE THICKENING MODELS,
Kansas State Univ., Manhattan.
L. E. Erickson, J. C. Heydweiller, and L. T. Fan.
AIChE Symposium Series, Vol 73, No 167, p 105-111, 1977. 3 fig, 3 tab, 16 ref.

Descriptors: *Mathematical models, *Clarification, *Design criteria, *Suspended solids, *Microorganisms, Equations, Sludge treatment, Aeration, Model studies, Waste water treatment.

The design of an activated sludge system consisting of a completely mixed aeration vessel and a secondary clarifier was considered with respect to minimizing the total volume of the system. Since the optimization of designs for waste treatment systems is dependent on accurate descriptions of the various processes, mathematical models to describe clarification and thickening in secondary clarifiers have received considerable attention. A clarifier model which considers overflow and underflow (clarification and thickening) is presented. Equations for the flow balance around the secondary clarifier, the organism balance, and the organism concentration in the overflow stream are presented. Equations for the bulk, settling, and total downward flux of organisms in the system. The optimization of a system design is described with respect to the balance equations, the organism concentration in the underflow, inlet conditions, the desired effluent quality, and the clarifier depth. The effects of operating conditions such as loading, recycle flow rate, and sludge wasting rate on actual clarifier performance are discussed. (Schulz-FIRL)
W78-03588

ESTABLISHING THE BASIS FOR A WASTEWATER TREATMENT PLANT DESIGN,
Texas Univ. at Austin. Dept. of Civil Engineering.
E. F. Gloyna.
Boletin de la Academia de Ciencias Fisicas, Mathematicas y Naturales, Caracas, Vol 37, No 111, p 31-46, First Trimester, 1977. 10 fig, 3 tab, 10 ref.

Descriptors: *Design criteria, *Model studies, *Aerobic treatment, *Anaerobic digestion, *Oxidation lagoons, Nitrification, Oxidation, Organic wastes, Waste water treatment, Sewage treatment, Algae, Anaerobic conditions, Nutrient removal.

An analysis of the microbial processes in waste stabilization is presented as part of a discussion on the basic design concepts of aerobic, anaerobic, and facultative biological waste water treatment systems. Kinetic equations are presented for the net rate of growth of microorganisms and substrate utilization in biological treatment systems. Process efficiency is related to the specific removal of some soluble substrate or the combined removal of BOD in all forms. Aerated lagoons with biomass recycling and the continuous activated sludge process without biomass recycling comprise the major types of aerobic systems. Equations for materials balance, oxygen requirements, and sludge production in aerobic treatment systems are presented. Anaerobic degradation involves hydrolysis and subsequent fermentation of organic wastes with the conversion of volatile acids into methane and carbon dioxide by anaerobic system are discussed with respect to temperature, pH, oxidation-reduction potential, volatile acids concentration, and alkalinity. Facultative waste stabilization ponds rely on the oxidation of carbonaceous organics by aerobic and facultative bacteria, nitrification, reduction of carbonaceous organics by anaerobic bacreria, and oxygenation of surface liquids by algae. Guidelines are presented for pond depth, surface area, and temperature. (Schulz-FIRL)
W78-03589

USE OF ACTIVATED FLUID COKE TO REMOVE ORGANIC CONTAMINANTS FROM WASTE WATERS,
Exxon Research and Engineering Co., Linden, NJ. (Assignee).
S. E. Jaros, and W. J. Metrailer.
U.S. Patent No. 4,036,750, 14 p, 2 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1270, July 19, 1977.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Water pollution treatment, Industrial wastes, Adsorption, Particle size, Particle shape, Activated fluid coke.

Organic material is removed from waste water by contacting the waste water under adsorption conditions with activated fluid coke. The activated fluid coke may be prepared by contacting fluid coke with a gaseous mixture containing steam at temperatures of at least about 1500 degrees F. For a period of time sufficient to convert at least 35 weight % of the fluid coke to gaseous products. The activated fluid coke so formed has a total surface area of at least 400 square meters per gram. The large pore volume and large total surface area, along with the particle size, particle size distribution, particle shape, particle density and attrition resistance of the activated fluid coke, result in the activated fluid coke exhibiting excellent properties as an adsorbent, particularly for removing organic materials from waste water streams. (Sinha - OEIS)
W78-03591

METHOD OF TREATING WATER CONTAINING CHROMATE,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
N. Orita, K. Yabe, and A. Kawanami.
U.S. Patent No. 4,036,751, 14 p, 15 fig, 1 tab, 13 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1270, July 19, 1977.

Descriptors: *Patents, *Water treatment, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water purification, Ion exchange, Chromium, Resins, Separation techniques, Regeneration, Back wash.

The principal object of the invention is to enhance the chromate ion removal efficiency in treating water containing chromate, and minimize the leakage of hexavalent chromium into the treated water. In addition the ion-exchange resins are regenerated with a small amount of regenerant. The method consists in bringing the water to be treated into contact with ion-exchange resins. The water is first passed through a bed of weakly acidic cation exchange resin in H-form, then passing it through a bed of weakly basic anion exchange resin in salt form to remove the chromate from the water. An alkali metal hydroxide solution is introduced into the weakly basic anion exchange resin bed in the reverse direction relative to the direction of passing of the water to elute chromate. An acid solution is then introduced to convert the weakly basic anion exchange resin into salt form. (Sinha - OEIS)
W78-03592

DEWATERING CLAY SLURRIES,
American Cyanamid Co., Stamford, CT. (Assignee).
M. S. Lassiter, Sr.
U.S. Patent No. 4,036,752, 5 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1271, July 19, 1977.

Descriptors: *Patents, *Dewatering, *Waste water treatment, *Compaction, Consolidation, Landfills, Soil density, Ore processing industry.

Solids suspended in water such as slimes, tailings, wastes, pulps and the like are compacted to a useful state by spraying a sand slurry over the surface of the suspension in such a manner as to give high solids density. The process of removing water from waste products of ore processing operations comprises depositing slurried slimes of about 3 to 5% solids into a mined out area until the area is full, removing water from the settled slimes until about one foot of water remains upon the slurried slimes, floating sprinkler heads on the water and spraying sand slurry over the surface of the waste product with a spray nozzle unit comprised of a nozzle mounted in a pipe tee for dispersing the sand slurry upward. (Sinha - OEIS)
W78-03593

PYROLYSIS PROCESS FOR TREATING SEWAGE SLUDGE CONTAINING CHROMIUM,
NGK Insulators, Ltd., Nagoya (Japan). (Assignee).
T. Majima, and K. Hara.
U.S. Patent No. 4,036,753, 4 p, 1 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 960, No 3, p 1271, July 19, 1977.

Descriptors: *Patents, *Sewage treatment, *Sludge treatment, *Chromium, Incineration, Water pollution sources, Soil contamination, Sewage sludge, Waste treatment.

When the sewage sludge contains chromium, trivalent chromium in the sludge is oxidized into harmful water soluble hexavalent chromium in the course of incinerating, so that if such an incinerated ash is discharged from reclamation, the harmful hexavalent chromium in the incinerated ash is released into underground water, rivers and the like by rain water, which constitutes a risk of environmental pollution. The main object of the invention is to improve a pyrolysis process for treating sewage sludge containing chromium and to prevent pollution. The pyrolysis process for treating sewge sludge containing chromium comprises burning combustible gas produced by thermal decomposition of the sewage sludge in a pyrolysis furnace by supplying oxygen of less than the theoretical amount necessary for burning the sewage sludge, and keeping the partial pressure of oxygen in the furnace substantially at zero. (Sinha - OEIS)
W78-03594

BIOLOGICAL DENITRIFICATION OF WATER,
D. R. Anderson.
U.S. Patent No. 4,039,438, 5 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 253, August 1977.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Water pollution treatment, Agricultural runoff, Sewage effluents, *Denitrification, *Nitrates, Anaerobic bacteria, Cellulose, Pulp wastes, Biological treatment, Waste paper.

A process for biological denitrification of nitrate containing waters, particularly agricultural drain waters, sewage effluents and ground waters is disclosed. The invention comprises the biological denitrification of waters containing from 10 to about 250 parts per million of nitrogen as nitrate and an insufficient quantity or organic material to support the necessary anaerobic bacterial action for effecting reduction of any substantial quantities of the nitrate content. The water is contacted with a solid substrate usually a cellulosic material comprised chiefly of paper, or paper pulp, in the presence of an anaerobic bacterial culture with sufficient time and favorable growth conditions to permit the anaerobic bacteria to undergo an active growth phase and effect reduction of the nitrate content of the water. This process can thereby solve two ecological problems; it can provide a disposal for waste paper such as newsprint and also effects the reduction of nitrate in waste waters sufficiently to permit reuse and/or return of the water to the surrounding watershed. (Sinha-OEIS)
W78-03604

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, DC. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W78-03606

CONDENSATE PURIFICATION PROCESS,
Crane Co., New York. (Assignee).
S. Tahara, T. Murata, S. Shimaya, and G. J. Crits.
U.S. Patent No. 4,039,443, 6 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 255, August 2, 1977.

Descriptors: *Patents, *Waste treatment, *Water purification, Industrial water, Water quality control, *Ion exchange, Resins, Cation exchange, Anion exchange, Resin regeneration, Condensate water.

A method of purifying condensate water, specifically a method of using hydrazine in the regeneration of ion exchange resins, after the ion exchange treatment of condensate water, uses a mixed bed of ion exchange resins. The invention is especially suitable for application to steam turbine power systems including large scale electric power generation systems. In regenerating the charged resin after passing condensate water through the mixed bed of ion exchange resins, the mixed bed is separated into a layer of anion exchange resin and a layer of cation exchange resin. After the anion exchange resin layer is regenerated with caustic soda, it is treated with an aqueous solution of hydrazone. The aqueous solution of hydrazone, after the treatment, is purified by passing the liquid through a bed of hydrazine type cation exchange resin. The purified aqueous solution of hydrazone is reused in the treatment of the anion exchange resin layer. (Sinha-OEIS)
W78-03608

WELSH WATER RE-ORGANIZATION.
For primary bibliographic entry see Field 5G.
W78-03623

EPA ENLISTS ARMY TO MANAGE SEWAGE PLANT CONSTRUCTION.
For primary bibliographic entry see Field 5G.
W78-03625

HISTORIC TURNING POINTS IN MUNICIPAL WATER SUPPLY AND WASTEWATER DISPOSAL, 1850-1932,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History, Technology, and Urban Affairs.
J. A. Tarr, and F. C. McMichael.
Civil Engineering-ASCE, Vol. 47, No. 10, p 82-86, October, 1977.

Descriptors: *History, *Cesspools, *Sewerage, *Sewage treatment, *Waste water treatment, Water treatment, Water pollution control, Public health, Municipal wastes, Combined sewers, Sewers, Storm water, Waste water disposal.

During much of the 19th century government involvement in waste water management was minimal, and the cesspool-privy system was the only means for collection and treatment of human wastes. Urban population growth and the development of new urban water supply systems from 1850 to 1890 overloaded existing waste treatment systems. Piped water supply systems and the resulting increase in the per capita water consumption also placed great demands on the cesspool-privy system. Water-carriage removal and sewerage systems were adopted to alleviate overflowing of cesspools and privies. From 1880 to 1890 the virtues of separate vs. combined sewer systems were debated. An extensive report by Rudolf Herirg, an American sanitary engineer, on the status of sewer systems in Europe was published. During the period 1900-1932, stream pollution by sewage and resulting higher typhoid fever rates in downstream communities led to more attention to water pollution control and water treatment. Sand filters and trickling filters were first evaluated for water and waste water treatment during the early part of the 20th century. (Schulz-FIRL)
W78-03629

INEQUITIES FOR SMALL FOOD PROCESSING PLANTS RESULTING FROM LIQUID WASTE TREATMENT REGULATIONS,
Teepak, Inc., Danville, IL.
For primary bibliographic entry see Field 5G.
W78-03648

WATER MONITOR SYSTEM: PHASE I TEST REPORT,
National Aeronautics and Space Administration, Houston, TX. Lyndon E. Johnson Space Center.
For primary bibliographic entry see Field 5A.
W78-03663

THE RELATIONSHIP BETWEEN THE BORON CONCENTRATION OF EAST LANSING MUNICIPAL WASTEWATER AND RETENTION TIME THROUGH THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT UNDER CONTINUOUS FLOW CONDITIONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5A.
W78-03680

POSSIBILITIES FOR TREATING WASTEWATERS GENERATED IN ELECTROPLATING SHOPS TO AVOID SPECIAL WASTES--METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL. PART III (MOEGLICHKEITEN ZUR BEHANDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN--METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE. TEIL III),
R. Kammel, and H. W. Lieber.
Galvanotechnik, Vol. 68, No. 5, p 413-418, 1977. 16 fig.

Descriptors: *Recycling, *Ion exchange, *Cadmium, *Metals, *Chromium, *Separation techniques, Neutralization, Chelation, Industrial wastes, Heavy metals, *Waste water treatment.

Ion-exchange resins offer the possibility of recovering the heavy metals from industrial effluents. The chelating resins are suitable for the selective removal of certain metals. One example of ion-exchange technology is the recovery of cadmium. Cadmium is first recovered to a large extent electrolytically from cadmium-containing waste water, and the balance is removed with a weakly acidic cation-exchange resin from a solution whose pH had been adjusted to 5.4. Afterwards, the effluent can be neutralized without fear of producing cadmium-containing sludge. Chromi acid can be recovered from waste water which is first passed through a strongly acidic cation-exchange resin and then through a weakly basic anion-exchange resin. The resin is then renewed with a 5% sodium hydroxide solution yielding about 80 g/liter sodium dichromate, which can then be recycled. Gold is present in gold-plating wastes as the dicyanoaurate comples, which can be removed from its solutions with a strongly basic anion-exchange resin. Ion-exchange resins can be used to remove other ions such as silver, nickel, and copper from dilute solutions, and the continued improvement of ion-exchange resin selectivity offers much promise. (Schwartz-FIRL)
W78-03689

OXIDATION PROCESSES IN ACTIVATED SLUDGE AT HIGH DISSOLVED OXYGEN CONTRACTIONS,
K. L. Wyatt, P. Brown, and F. A. Shabi.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 3, p 340-354, 1977. 4 fig, 4 tab, 18 ref, append.

Descriptors: *Activated sludge, *Operation and maintenance, *Oxygenation, *Pilot plants, *Nitrification, *Dissolved oxygen, Treatment facilities, Municipal wastes, Oxidation, Industrial wastes, Sludge treatment, Analytical techniques, Sewage treatment, *Waste water treatment.

Pilot plant studies at the Davyhulme sewage treatment plant in England were used to examine the mechanisms of oxidation in the activated sludge process at high dissolved oxygen concentrations (up to 15 mg/liter). The objective of the study, conducted by the North West Water Authority, was to evaluate the oxygen-activated sludge system for nitrification, process variants, and performance. Operational and design data for the pilot facilities are discussed, including: pilot-plant equipment and operation procedures; staged ozygenation system; completely-mixed activated sludge system; final settling tanks and return activated sludge systems; surplus sludge disposal; oxygen/air comparative tests; and monitoring equipment and testing procedures. Studies with municipal and combined municipal/industrial wastes indicated that the performance of the completely mixed reactor with gas stripping pretreatment at uniform mixed liquor DO concentrations of 10 mg/liter was comparable to the liquid staged reactor. Nitrification was achieved with the use of the oxygenation system with best results occurring when sodium hydroxide was used to maintain the pH/alkalinity within a 7.3-8.0 range. Better overall performance in the treatment of combined wastes was observed during use of the reactor at DO concentrations of 10 mg/liter than with conventional air concentrations of 1-2 mg/liter. Surplus sludge production was reduced by as much as 40% by the high dissolved oxygen concentrations in the reactor. (Schulz-FIRL)
W78-03690

5E. Ultimate Disposal Of Wastes

RECOVERY AND REUSE OF USEFUL MATERIALS FROM POLLUTANTS OF DYESTUFF INDUSTRY,
Arlabs Ltd, Bhatghar (India).
For primary bibliographic entry see Field 5D.
W78-03204

RECOVERY AND REUSE OF MATERIALS FROM DYESTUFF INDUSTRY,
V. J. T. Inst., Bombay (India). Dept. of Public Health Engineering.
For primary bibliographic entry see Field 5D.
W78-03205

ECONOMICS OF WASTE DISPOSAL--A CONTRACTOR'S VIEW,
E. P. Austin.
International Dyer and Textile Printer, Vol. 158, No. 5, p 240-242, September, 1977.

Descriptors: *Textiles, *Water pollution sources, *Dyes, *Economics, Waste disposal, *Costs, Effluents, Water pollution, Industrial wastes, Waste water treatment, Waste water disposal.

British water authorities will allow liquid effluent to be discharged from textile plants after specified standards have been met. Physical, chemical, and biological methods are available to treat effluents. To correctly design an effluent treatment plant, information is required on the number of effluent sources, whether storm and/or surface water enters the effluent, the volume of effluent, the length of time during which effluents are discharged, and the frequency and volume of strong effluent dumped into the drains. Some knowledge of anticipated process changes or expansion, effluent composition, applicable effluent standards, where the treated effluent will be discharged, and the treatability of the effluent is also required. Disposal costs for industrial waste water depend on volume and pollutant load. A brief case history and treatment process outline for effluents from textile dyeing and finishing are given. Rotary screens, aeration tank, lime slurry mixing tank, settling tank, thickening tank, and rotary vacuum filters comprise the major types of equipment used in waste water treatment for the textile dyeing and finishing operation. A formula for calculating industrial waste treatment charges is presented. (Snyder-FIRL)
W78-03210

EARTHWORMS TO AID SLUDGE DISPOSAL.
Chemical Engineering, Vol 84, No 26, p 82, December, 1977.

Descriptors: *Biological treatment, *Treatment facilities, *Annelids, *Sludge, *Sludge disposal, United States, Soil Amendments, Fertilizers, Solid wastes, Organic matter, Pilot plants, Waste water treatment.

A facility will be built by Solid Waste Resources, Ltd. of Eugene, Oregon, for the production of a soil-enriching mix from solid wastes with the aid of earthworms. Red wiggler worms will be used because they rapidly consume large quantities of organic matter and convert it into manure containing balanced quantities of nitrogen, phosphates and potash, with soluble concentrations of copper, iron, zinc, and trace minerals. The earthworms digest a batch of sludge in about 32 days. About 350 tons of worm castings are produced per 1,000 lb of sludge. In a 300-sq ft facility used for pilot plant testing, the daily sludge-consumption rate averaged 0.76 lb set solids per sq ft of worm area. Eleven waste-disposal plants using earthworms are in operation in Japan under the auspices of Aoka Sangyo Company in Okayama. (Snyder-FIRL)
W78-03221

DEVELOPMENT OF A SOIL-WASTE INTERACTION MATRIX FOR ASSESSING LAND DISPOSAL OF INDUSTRIAL WASTES,
Chemical Engineering Research Consultants Ltd., Toronto (Ontario).
C. R. Phillips, J. S. Nathwani, and H. Mooij.
Water Research, Vol 11, No 10, p 859-868, 1977. 3 fig, 4 tab, 4 ref.

Descriptors: *Analytical techniques, *Soil contamination effects, *Sludge disposal, Soil amendments, *Hydrology, Soil investigations, Soil properties, On-site data collections, Industrial wastes, Toxicity, Groundwater, Water pollution control, Waste water disposal.

Assessing the environmental impact of disposal of industrial wastes on land is described by an interaction matrix. A procedure is developed for ranking liquid industrial wastes and possible disposal sites. Parameters used to describe wastes include effects (toxicity, groundwater pollution, and disease transmission potential), fate (chemical and biological persistence, and sorption), behavioral properties (viscosity, solubility, acidity/basicity), and waste application rate. Soils are characterized according to permeability and sorption. The distance to the point of application and the thickness of the porous layer are input as location parameters. Hydrologic parameters include the water table gradient and the infiltration rate. A matrix which combines waste point scores (rows) with soil-site point scores (columns) is used to quantify the interactions and relate them to acceptability levels. This matrix is intended to be used by regulatory agencies in determining suitability of sites for industrial waste disposal. (Snyder-FIRL)
W78-03222

LEATHER TANNING AND FINISHING WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
For primary bibliographic entry see Field 5D.
W78-03225

PHYSICAL FACTORS AFFECTING DREDGED MATERIAL ISLANDS IN A SHALLOW WATER ENVIRONMENT,
Texas A and M Univ., College Station. Dept. of Geology.
J. E. Stinson II, and C. C. Mathewson.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 1-17, December 1976. 9 fig, 8 ref.

Descriptors: *Dredging, *Texas, *Lagoons, *Spoil banks, Disposal, Erosion, Sediment transport, Geomorphology, Coasts, On-site investigations, Meteorology, Bays, Winds, *Padre Island(Tex), *Murdock basin(Tex).

Regional geologic processes should be considered when choosing locations for dredged material disposal sites. Topography, bathymetry, geomorphology, meteorology, and water circulation must be examined for a full understanding of the active processes and their effects. Winds and waves are the physical factors considered to be most dominant. Winds control sand transport across Padre Island and water levels and circulation in Laguna Madre and define the direction of current and sediment movement. Erosion and shoaling of dredged material by waves in the lagoon parallel the geomorphic trends of the area. When using open water disposal methods while dredging channels, the dredged material should be placed on the downdrift side of the channel to avoid the return of sediment to the channel. (See also W77-09325) (Humphreys-ISWS)
W78-03227

A NEW CONCEPT FOR DREDGED MATERIAL DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
M. R. Palermo, and R. L. Montgomery.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 18-53, December 1976. 15 fig, 2 tab, 7 ref.

Descriptors: *Dredging, *Waste disposal, *Research and development, Spoils bank, Disposal, Sites, Landfills, Land use, Ultimate disposal, Land development, Legal aspects, Management, Treatment, Reusable disposal facilities.

Acquisition of suitable land for confined disposal of dredged material has become increasingly difficult due to rising cost and public objection to land use for this purpose. This problem could be minimized if the useful life of disposal areas could be extended, allowing reuse over longer periods. The concept of disposal site reuse involves the reduction in volume and/or actual removal of dredged material from the disposal area for use elsewhere, thereby allowing additional placement of dredged material at the site. Multiple advantages can be realized through site reuse: (1) a permanent reusable site would be provided for maintenance dredging at a centralized location; (2) operation of reusable sites would be environmentally compatible because facilities could be properly planned and engineered, greater control is possible, and site operation is better supervised; (3) valuable resources could be reclaimed from the dredging operation and donated or sold for productive use; and (4) expense and public objection to new disposal areas would be greatly reduced due to reduction in excessive land-use requirements. Research completed to date has identified methods of separating, drying, and rehandling dredged material, legal and policy constraints regarding marketing and disposition of the material, and potential use of dredged material for landfill and construction purposes. (See also W77-09325) (Humphreys-ISWS)
W78-03228

HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE DREDGE DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, GA.
G. F. Oertel.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 194-219, December 1976. 10 fig, 2 tab, 2 ref.

Descriptors: *Atlantic Ocean, *Dredging, *Disposal, *Georgia, *Spoil banks, On-site investigations, Beds, Sands, Shape, Coasts, Currents(Water), Tidal waters, Surveys, Sediment distribution, Sediments, Spatial distribution, Bottom sediments, Deposition(Sediments), Topography, Sand waves, Movement, Tidal effects, *Savannah(Ga).

In 1973, 1.15 million cu m of dredged material were deposited 13.0 to 16.0 km seaward of the Savannah River entrance. The disposal produced a 0.75 m average increase in bottom elevation in a predetermined area. In the southeastern portion of the disposal area the dredged material formed a mound composed of 30% coarse sand which extended 6 m above the bottom to a depth of minus 9 m (MLW). The coarse sand accumulated in the area directly below the disposal path of the hopper dredge. Fine-grained dredged material was dispersed by coastal and tidal currents away from the disposal path of the dredge. The percentage of fine and very fine sand increased to over 90% in the deeper water around the mound. More bioturbation (biologic mixing of sediment) was apparent in the fine-grained than in the coarse-grained material. The stability of the sediment in the disposal area was closely related to water depth and physical energy. Near-bottom currents were generally too weak (less than 12 cm/s) to rework dredged material once it was deposited. The upper portions of the mound were most susceptible to change because of their proximity to wave surge and stronger currents (up to 30 cm/s). During a northeast storm season in 1973 (September through November) the mound became asymmetrical and migrated approximately 0.54 kilometers in a southerly direction. (See also W78-09325) (Humphreys-ISWS)
W78-03233

AQUATIC DISPOSAL OF DREDGED MATERIAL: RELEASE OF CONTAMINANTS DURING AND AFTER DISPOSAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-03234

SELECTIVE ANALYTICAL PARTITIONING OF SEDIMENTS TO EVALUATE POTENTIAL MOBILITY OF CHEMICAL CONSTITUENTS DURING DREDGING AND DISPOSAL OPERATIONS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-03259

EVALUATION OF SAFETY FACTORS WITH RESPECT TO OCEAN DISPOSAL OF WASTE MATERIALS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-03269

A SUMMARY OF THE TEST PROCEDURES AND OPERATIONAL DETAILS OF A DELAWARE RIVER AND AN OCEAN DUMPING POLLUTION MONITORING EXPERIMENT CONDUCTED AUGUST 28, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-03280

MARKING THE SEA SURFACE WITH ARTIFICIAL SEA SLICKS AND FLUORESCENT DYES TO AID SEARCH AND RESCUE OR OCEAN DUMPING SURVEILLANCE OPERATIONS,
Naval Research Lab, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03282

ULTIMATE DISPOSAL OF OIL AND HAZARDOUS MATERIALS,
Coast Guard Office of Research and Development, Groton, CT.
J. F. Leary.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 137, Price codes: A04 in paper copy, A01 in microfiche. Report No. CG-D-36-76, October 1975. 70 p, 3 fig, 3 tab, 5 append.

Descriptors: *Oil pollution, *Waste disposal, *Water pollution control, Water quality control, Storage requirements, Hazardous substances.

The state of the art methods to store and dispose recovered oily water and other hazardous materials which are discharged and enter United States inland and coastal waters is outlined. The kinds of materials likely to be recovered and techniques/systems for their storage and ultimate disposal are identified. Particular emphasis is placed on the need to establish the most cost effective and environmentally suitable ultimate disposal system for use by the U.S. Coast Guard. (Sinha-OEIS)
W78-03283

ENZYMATIC TREATMENT OF PRIMARY MUNICIPAL SLUDGE WITH TRICHODERMA VIRIDE CELLULASE,
State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
G. V. Cinq-Mars, and J. Howell.
Biotechnology and Bioengineering, Vol 19, No 3, p 377-385, March, 1977. 3 fig, 9 ref, 3 tab.

Descriptors: *Municipal wastes, *Sludge treatment, *Hydrolysis, *Cellulose, *Enzymes, Wastes, Waste treatment, Solid wastes, Water pollution sources, Sludge, Filtration, Fungi, Trichoderma viride, Cellulase, Cellobiose, Ultrafiltration, Filter paper.

Enzymatic hydrolysis of the cellulose in sterilized primary municipal sludge (raw sludge heated at 120C for 30 min, 100 ppm merthiolate added, and homogenized in a Waring blender for 2 min) by Trichoderma viride cellulase in a batch-batch membrane reactor achieved 75% conversion of cellulose to cellobiose in 24 hr. The gel-like characteristic of primary municipal sludge was changed to that of a slurry of fine particles in less than 2 hr, eliminating clogging of the reactor's membrane during ultrafiltration of the sludge. Trichoderma viride cellulase with a filter paper activity (FPA) of 2 was obtained on a growth medium of raw municipal sludge (compared to a FPA of over 4 which is attained on a defined medium of similar strength). (Swichtenberg-IPC)
W78-03292

SLUDGE INCINERATION IN A PAPER MILL USING NATURAL GAS AS SUPPORTING FUEL (SCHLAMMVERBRENNUNG MIT ERDGAS ALS STUTZFEUER IN EINER PAPIERFABRIK),
Technisch Werke der Stadt Stuttgart A.G. (West Germany).
G. Strotbek, and H. Weissbach.
Gas- und Wasserfach, Gas/Erdgas, Vol. 118, No. 3, p 109-112, 1977. 2 fig, 2 tab.

Descriptors: *Sludge treatment, *Incineration, *Pulp wastes, *Natural gas, *Fuels, Wastes, Waste treatment, Water pollution sources, Foreign countries, Europe, Sludge, Water pollution control, Sludge disposal, Pulp and paper industry.

A new way of handling the sludge stemming from primary and secondary effluent treatment at a German paper mill had to be developed after suitable dumping sites had been filled. In the new system centrifugally thickened sludge (70-75% water, about 50% of the dry substance is organic material) is fed by a bucket conveyor to a multitier oven, which is divided into three zones: a sludge-drying zone (tiers 1-6), and combustion zone (tiers 7-8), and a cooling zone (tiers 9-10). For better control of the process, the sludge is burned at a level of dewatering below that at which combustion would be self-sustaining. Hot gases from a natural gas-fired burner pass in counter-current fashion through the multitier oven to equalize the heat balance. (Speckhard-IPC)
W78-03297

REAGENTLESS PROCESS FOR DEWATERING ACTIVATED SLUDGE (BEZREAGENTNYI PROTSESS OBEZVOZHIVANIYA AKTIVNOGO ILA),
Kotlasskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
G. M. Zaleshina, A. T. Oleinik, and N. F. Dybtsyna.
Tsellyuloza, Bumaga, Karton Referativnaya Informatsiya, No. 11, p 5-6, April, 1977.

Descriptors: *Activated sludge, *Sludge treatment, *Dewatering, *Electric currents, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Bacteria, Sludge, Solid wastes.

The introduction of an electric current into a sludge suspension contributes to the dewatering process. Passing the current through the sludge suspension does not, however, cause the destruction of bacteria which comprise the biocoenosis of the activated sludge, thus permitting repeated use for biological purification. Water/sludge separation should be improved, and the amount of sludge carried away in the purified effluent should be reduced as a result of the electric current treatment. The oxygen-regeneration potential for the electrochemical effluent treatment system is reduced by the short-term application of an electric discharge. (Sykes-IPC)
W78-03319

FINAL REVISION OF REGULATIONS AND CRITERIA FOR OCEAN DUMPING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03369

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON NITROGEN TRANSPORMATIONS IN SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
R. H. Miller, S. S. Brar, and T. J. Logan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 661, Price codes: A04 in paper copy, A01 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report No. 495X, (1977). 59 p, 21 fig, 15 tab, 25 ref, 2 append. OWRT B-059-OHIO(1).

Descriptors: *Nitrification, *Denitrification, *Waste water disposal, Soil microbiology, Water pollution, Sewage effluents, Ohio, Penn State Univ Wastewater Management Study, *Nitrogen mineralization, Available soil carbon, Plant residue.

Nitrogen transformations on soils of the Pennsylvania State University Wastewater Management Study were investigated for Reed Canarygrass, Old Field, Hardwood Forest and Gameland sites. Nitrogen mineralization rates, plotted as N mineralized versus t1/2 for the 26 week mineralization period were linear for 0-7.5 cm soil depths for all sites, but only for eight weeks at the 7.5-15 cm depth, reflecting the depletion of mineralizable N compounds at lower depths. N mineralization was higher for wastewater treated sites on Hublersberg soil and represented 3.0-3.5% of the soil N; rates were 5-9 times greater on the coarse-textured Morrison soil, indicating a greater danger of NO3 leaching with wastewater treatment of this type of soil. Nitrification was rapid on all treated soils, absent on Old Field and Gameland control sites and slow on Hardwood Forest sites due to low soil pH. Denitrifying activity was low on all sites even in surface layers; glucose-amended soils, however, gave rapid denitrification, indicating a lack of available carbon. This was supported by measurements of soluble and mineralizable carbon in soil. Plant residues taken from the site supplied available carbon for denitrification for 2-4 weeks only.
W78-03424

SIXTH SEMIANNUAL INTERAGENCY BRIEFING FEBRUARY 1976, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5G.
W78-03477

LANDSCAPE CONCEPT DEVELOPMENT FOR CONFINED DREDGED MATERIAL SITES,
Mann (Roy) Associates, Inc., Cambridge, MA.
R. Mann, W. A. Niering, R. Sabbatini, and P. Wells.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-a026 684, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Contract Report D-75-5, December 1975. 168 p, 3 fig, 10 tab, 71 ref. WES DACW39-74-C-0104.

Descriptors: *Dredging, *Spoil banks, *Landscaping, Waste disposal, Landfills, Dikes, Earthworks, Soils, Vegetation, Shrubs, Trees, Windbreaks, Terracing, Planning, Land use, *Dredged material disposal, Disposal operations, Confined land disposal.

Confined dredged material disposal (CDMD) facilities have long been recognized as environmentally problematic for a number of physical, chemical, biological, and aesthetic reasons. The specific problem area of the aesthetic development of CDMD facilities is one that has received insufficient attention to date. The purpose of this study was to provide guidance for landscape development of CDMD sites. The approach of this study was: (1) to examine the principles and practices of CDMD operations and the associated constraints and potentials to landscape development, through a review of the literature, and to extend knowledge through field reconnaissance and data gathering in selected Corps Districts and from other sources of scientific and technical information; (2) to document landscape techinques directly applicable to the development of CDMD facilities, including those techniques abstracted from research of analogous facilities; and (3) to synthesize the information derived from the first two steps into appropriate landscape development guidance that can serve as an aid in the planning and design of CDMD sites. Landscape development, if considered in the earliest project stages, can aid CDMD planners and engineers in achieving effective resolution of aesthetic problems and site reuse questions while accomplishing dredged mateial disposal objectives in full. (Sims-ISWS)
W78-03478

LABORATORY STUDY OF AERATION AS A FEASIBLE TECHNIQUE FOR DEWATERING FINE-GRAINED DREDGED MATERIAL.
Environmental Engineering Consultants, Inc., Stillwater, OK.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 673, Price codes: A04 in paper copy, A01 in microfiche. Contract Report D-76-10, December 1976. 71 p, 14 fig, 8 tab, 12 ref, 1 append. DACW39-75-C-0123.

Descriptors: *Aeration, *Dewatering, *Dredging, Slurries, Silts, Laboratory tests, Air, Moisture content, Drying, Sludge disposal, Depth, Statistical methods, Feasibility studies, Water quality, Organic wastes, Biochemical oxygen demand, Chemical oxygen demand, Costs, Slurry columns, Fine-grained material, Airflow, Diffused aerators, Empirical equation.

The purpose of this study was to examine analytically and experimentally the potential feasibility for employment of aeration as a means of hastening the drying of fine-grained dredged material. Laboratory experiments were conducted on two materials in which 3- and 6-ft cylindrical columns of slurry were aerated at various airflow rates employing various initial moisture contents from 200 to slightly over 300%. It was shown that bubbling of diffused air into the slurry increased the rate of the moisture loss. Statistical analyses of the data led to an empirical formula for predicting mositure content from initial moisture content, depth, and unit airflow rate for the 2 materials. The equation provided reasonable predictions for results obtained in another laboratory-scale slurry pit. Costs for using diffused air to enhance drying under field conditions will be rather high but may be warrented depending on the cost of purchasing and developing new sites. It was concluded that the process showed sufficient potential ro recommend that field demonstration and design criteria studies be undertaken. (Visocky-ISWS)
W78-03480

NUMERICAL MODEL RESULTS OF DREDGED MATERIAL DISPOSAL AT TEN PROPOSED OCEAN DISPOSAL SITES IN THE HAWAIIAN ISLANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-03483

EQUILIBRIUM OPERATION OF SUBSURFACE ABSORPTION SYSTEMS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
F. W. Kropf, R. Laak, and A. K. Healey.
Journal Water Pollution Control Federation, Vol. 49, No. 9, p 2007-2016, September, 1977. 6 fig, 3 tab, 27 ref.

Descriptors: *Soil physical properties, *Permeability, *Infiltration rates, *Return flow, *Slime, Tertiary treatment, Waste water disposal, Soil amendments, Soil treatment, Soil microorganisms, Soil disposal fields, Soil water movement.

Land application of waste water as a means of tertiary treatment and disposal may be hindered by reductions in waste water absorption by soils due to clogging of the soil interstices and the production of a biological mat. The objectives of this study were to examine the infiltration rate through the clogging mat and to develop design and operational criteria for subsurface absorption systems which could operate a equilibrium on a long-term basis. Experimental aspects of the laboratory-scale studies are discussed, including: test samples, selection of soils, preparation and packing of soil columns, flooding schedules, improved (tall) soil columns, sidewall infiltration, and operation of the model. The studies evaluated continuous vs. intermittent flooding, characteristics and breakthrough of the slime layer, changes in hydraulic gradient, the influence of soil characteristics, sidewall vs. bottom infiltration, extended continuous inundation, and long-term acceptance rate. Results indicated that continuous inundation did not produce a higher infiltration rate than intermittent dosing and that infiltration rate was related to the hydraulic gradient. Studies also indicated that infiltration surfaces were not permanently clogged. Reductions in infiltration by the presence of a slime layer were independent of the soil porosity. Infiltration rates of 10-20 mm/day (0.2-0.5 gpd/sq ft) are predicted for all wetted surfaces. (Schulz-FIRL)
W78-03507

SEWAGE SLUDGE AND HOW TO SELL IT,
I. M. Knapp.
The American City and County, Vol 92, No 10, p 63-65, October, 1977. 1 fig, 1 tab.

Descriptors: *Drying, *Fertilizers, *Dewatering, *Sludge disposal, *Nutrients, Soil amendments, Sewage sludge, Sludge treatment, Costs, Economics, Municipal wastes, Waste water treatment.

An $800,500 sludge processing plant capable of producing a dry pelletized soil conditioner from municipal sludge is being used by the city of Largo in Pinellas County, Florida. The sludge/treatment disposal system was designed as part of a 3.0-mgd expansion project for the existing sewage treatment plant. Experiences in the marketing and promotion of Largo's dried pelletized sludge, sold as 'LarGrow', are described. Initial production costs were $140/ton while the expected revenues from the sale of the soil conditioner were $80-

100/ton. The addition of a sludge prethickener/conditioner process is expected to reduce the operating costs to the $50-80/ton range. An additional advantage presented by the disposal system is that the sale of 'LarGrow' to residents of the surrounding area eliminates transportation and application costs for the treatment plant. After thickening in three in-ground conical tanks, the wet sludge cake is combined with previously dried sludge to reduce the moisture content. A drum dryer is used to remove the remaining moisture. Some of the dried sludge is retained for mixing with incoming thickened sludge, and the remainder is conveyed to a dry product storage bin. The uniformly-sized pelletized product is packed in self-sealing, three-ply, poly-lined bags. (Schulz-FIRL)
W78-03511

CO-DISPOSAL OF SEWAGE SLUDGE AND SOLID WASTES--IT WORKS,
Environmental Protection Agency, Washington, DC. Resource Recovery Div.
D. B. Sussman.
The American City and County, Vol 92, No 10, p 55-58, October, 1977. 1 fig.

Descriptors: *Incineration, *Sludge treatment, *Sludge disposal, *Solid wastes, *Organic matter, Waste disposal, Energy, Fuels, Heat treatment, Municipal wastes, Waste water disposal, Waste water treatment.

Since municipal sludge has a heat value of 10,000 BTU per lb of dry solids and is autogenous at a moisture:solids ratio of 70:30, co-disposal of solid waste and municipal sludge is suggested so that the energy produced by the combustion of solid waste can be used to dewater sludge to its autogenous point. Basic approaches to co-disposal include the use of sludge incinerators with the organic portion of solid wastes as a fuel to dry, burn, and reduce the volume of sludge; and the use of a solid waste incinerator, solid waste-fired steam generator, or waterwall combustion unit to burn dewatered sludge. The use of a fluidized bed furnace for co-disposal in an EPA-supported demonstration at Franklin, Ohio, is described. The facility at Franklin was also designed to recover a low grade paper fiber, ferrous and nonferrous metals, and glass from the solid waste stream and to use fuel derived from the non-recoverable organic portions of the waste to operate the sludge incinerator. Th modification of an existing multiple hearth sludge incinerator to accept refuse-derived fuel and operate in either an incineration or pyrolysis mode at a facility in Concord, California, is described. Experiences with the use of a solid waste incinerator as a sludge volume reduction unit are described for Ansonia, Connecticut; Norwalk, Connecticut; Holyoke, Massachusetts; and other municipalities. The direct use of heat from burning solid waste to dewater and burn sludge was demonstrated in Glen Cove, New York. (Schulz-FIRL)
W78-03512

CENTRIFUGAL DEWATERING OF MUNICIPAL AND INDUSTRIAL SLUDGE,
Washington State Univ., Pullman.
T. Asano, T. Suzuki, and N. Hayakawa.
Water and Sewage Works, Vol 124, No 9, p 130-135, September, 1977. 9 fig, 3 tab.

Descriptors: *Dewatering, *Sludge treatment, *Polymers, *Centrifugation, *Separation techniques, Coagulation, Filtration, Suspended solids, Sludge disposal, Municipal wastes, Industrial wastes, Equipment, Waste water treatment.

Sludge dewaterability was investigated with a horizontal continuous cylindrical-conical centrifuge which was manufactured by Nishihara Environmental Sanitation Research Corporation Limited in Tokyo, Japan. The Model SD-700P centrifuge includes a sludge feed pump, chemical feed pump, chemical mixing tank, flow meters, atmospheric moisture control unit, effluent inspection window, and an operation control panel. Results of the use of the centrifuge with various types of municipal, industrial, and water treatment sludges are presented. Flonac, a cationic organic polymer, was evaluated with regard to improving suspended solids recovery. With digested mixed, primary and activated sludges, solids recovery was 48-80% without polymer addition and over 99% with the addition of Flonac. Suspended solid capture for raw primary sludge was 73-96% without Flonac and over 98% with polymer addition. Polymer addition to mixed raw primary and activated sludges increased solids recovery from 61% to approximately 98%. Suspended solids capture with activated sludge was 40-97% without polymer addition and more than 98% recovery with the polymer. Suspended solids capture with aerobic digested sludge was increased from 55% to 98% with the addition of a polymer. A nonionic organic polymer (Aquafloc 30) and an anionic polymer (Aquafloc 305) significantly improved the dewaterability of water filtration plant sludge. Process and operational variables which may affect sludge dewaterability, such as sludge feed rate, sludge feed concentration, solids recovery, and automatic operation, are discussed. (Schulz-FIRL)
W78-03515

AWARD WINNING PLANT UTILIZES SPRAY IRRIGATION,
Dufresne-Henry Engineering Corp., North Springfield, VT.
J. M. McCarthy.
Public Works, Vol 108, No 11, p 60-61, November, 1977.

Descriptors: *Spray irrigation, *Return flow, *Treatment facilities, *Sewage, Pipes, Irrigation practices, Waste water disposal, Municipal wastes, Waste water treatment, Effluents.

The Dufresne-Henry Engineering Corporation has designed a $2,050,000 waste water treatment and disposal facility for the town of Dover, a small ski resort in Vermont. A $1.3-million tributary system with 9.5 miles of sewers and two lift stations was installed for the spray irrigation/land treatment system. Comminutors and dual oxidation canals followed by clarification and effluent chlorination are used to treat the waste water prior to disposal. A liquid-solids gravity separator with polymer thickening is used to dewater the sludge prior to disposal as fertilizer or at a landfill. Design for the facility required accommodation for large variations in flow on a seasonal basis, as well as on a weekend-weekday basis due to the ski area patronage. Two 18.2-million-gal earthen ponds were constructed to equalize variations in plant volumetric loading and to hold effluent during periods when spray irrigation is not allowed because of saturated ground conditions. Spray irrigation over a 55-acre field is accomplished by a distribution system which consists of 4 miles of 2, 3, and 4 inch galvanized steel piping supported by 1500 wooden posts. Irrigation during the winter is accomplished by fixed spray heads spaced at 25-ft intervals, while irrigation during the summer is accomplished by rotary spray heads at 50-ft intervals. An effluent application rate of 0.25 inch/hr is controlled by the pressure and flow rate of the effluent from the spray heads. (Schulz-FIRL)
W78-03519

ENERGY GUZZLING SEWAGE PLANT WILL FUEL ITSELF.
For primary bibliographic entry see Field 5D.
W78-03522

SLUDGE COMPOSTING PROJECTS IN U.S. CITIES,
Agricultural Research Service, Beltsville, MD. Biological Waster Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
E. Epstein.
Compost Science, Vol 18, No 5, p 5-7, September/October, 1977.

Descriptors: *Sludge treatment, *Sludge digestion, *Treatment facilities, *Sewage treatment, *Fertilizers, Sludge disposal, Recycling, Sewage treatment, Waste water treatment.

Recent legislative action, increased public awareness of waste recycling, improved technology, and increased costs of sludge disposal by incineration have led to increased interest in sewage sludge composting in the United States. Current sludge composting methods used in the United States include the windrow system and the Beltsville Aerated Pile Method. In the Beltsville process a mixture of sewage sludge and bulking material such as wood chips is composted in a stationary pile for 21 days while air is drawn through the pile. Design details of a Beltsville composting system used at the Beltsville Agricultural Research Center in Maryland are presented. An extended modification of the aerated pile was developed to reduce the compost area, the amount of blanket material required, and the woodchip requirement for the pile base. Additional studies are being conducted to examine the effects of pile height on composting processes, the feasibility of indoor composting, and possible uses for compost. Among cities in the United States which are now using or have used some type of composting for treatment of sludge are Durham, North Carolina; Bangor, Maine; Camden, New Jersey; Merrimac, New Hampshire; and Chicago, Illinois. Full-scale facilities for composting of 120 tons of wet sludge per day are currently under construction in Windsor, Ontario, Canada. (Schulz-FIRL)
W78-03525

SLUDGE DISPOSAL TO LAND 'GOOD FARMING PRACTICE'.
Surveyor, Vol 150, No 4447, p 22, September, 1977. 1 tab.

Descriptors: *Fertilizers, *Sludge disposal, *Heavy metals, *Nutrient removal, *Waste water disposal, Food chain, Waste water treatment.

Details of a report by the British National Water Council's working party on the disposal of sewage sludge to land are presented. The report concluded that, in general, land application of sewage sludge for agricultural purposes was advantageous because of the large quantities of nutrients, particularly nitrogen and phosphorus, present in municipal sludge. Tentative guidelines on application rates to produce maximum agricultural benefits and minimum deleterious effects are presented. Accumulation of heavy metals in plants as a result of sewage sludge application is discussed. Provisional limits for Zn, Cu, Ni, Cr, Cd, Pb, Hg, Md, B, As, and Se in sludge and possible sources are listed in tabular form. The effects of sludge properties on its adaptability to land application are discussed. Further areas of research recommended by the working party include a literature survey, data collections on the quantity and quality of sludges slated for land disposal, studies on the nutrient value and heavy metal concentrations of sludge, analytical techniques for rapid determinations of metals in sludges, and a cost-benefit analysis of land application. (Schulz-FIRL)
W78-03527

SANITATION FOR THE DEVELOPING NATIONS.
For primary bibliographic entry see Field 5D.
W78-03530

GREYWATER FOR THE GREENHOUSE,
Clivus Multrum Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W78-03534

WASTEWATER RENOVATION AND SLUDGE UTILIZATION ON LAND INCLUDING QUESTIONS OF OWNERSHIP,
Environmental Protection Agency, Chicago, IL. Office of Research and Development.
J. M. Walker.
Compost Science, Vol 18, No 5, p 8-15, September/October, 1977. 3 fig, 6 tab, 16 ref.

Descriptors: *Return flow, *Waste water disposal, *Sludge disposal, *Soil amendments, *Fertilizers, Sludge treatment, Operation and maintenance, Treatment facilities, Legal aspects, Municipal wastes.

Land application of municipal waste water as a means of treatment and disposal has been cited as a cost-effective, environmentally sound alternative to the construction of new or improved waste water treatment facilities. Various aspects of land renovation of waste water and application of sludge are discussed, and the feasibilities of public vs. private ownership are examined. Sludge and waste water characteristics are discussed with respect to land requirements. Advantages and disadvantages of public vs. private ownership of land and operation are presented. The Muskegon County, Michigan, waste water treatment system is presented as an example of a publicly owned and operated treatment system which uses land application for the treatment of waste water. The Cooperative Sewage Utilization Association for the treatment and land application of municipal waste water from the city of Braunschweig, Germany, is described as a joint public-private interest. The Fulton County, Illinois, public operation for the treatment of liquid sludges from the Metropolitan Sanitary District of Chicago is described. The public-private land application of sludge in West Hertfordshire, England, is discussed. Research on land application and uses of sludge and waste water are described. (Schulz-FIRL)
W78-03535

ACTIVATED SLUDGE TREATMENT, GENERATION, AND DISPOSAL,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5D.
W78-03538

A LOOK AT NEWER METHODS FOR DEWATERING SEWAGE SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH.
R. V. Villiers, and J. B. Farrell.
Civil Engineering-ASCE, Vol 47, No 12, p 66-71, December, 1977. 9 fig, 4 tab, 11 ref.

Descriptors: *Dewatering, *Filtration, *Separation techniques, *Filters, *Ultimate disposal, *Incineration, Equipment, Sludge treatment, Sludge disposal, Waste water treatment.

Although incineration has been widely used as a sludge disposal technique, high fuel costs have begun to render the process uneconomical unless the sludge can be first dewatered to a solids concentration of greater than 30%. This value is critical, since the sludge will burn autogenously above a solids concentration of 30%. Although vacuum filtration and centrifugation can dewater sludge to about 20% solids, the amount of auxiliary fuel required for incineration is still considerable. The Klein belt filter press was developed in Europe in the early 1960's and first introduced into the United States in 1971. Pilot studies at the Allegheny County waste water treatment plant in Pittsburgh, Pennsylvania, have indicated that the belt filter press is capable of producing a sludge cake of 30% solids or greater, 5-12% higher than expected with a vacuum filter. Other filter presses which have achieved solids concentrations as high as 44% include a twin roller press, a high-solids filter, screw presses, and diaphragm filter presses. Design data and operating experiences are presented for various commercially available filter presses. (Schulz-FIRL)
W78-03550

COMPLETE SERVICE FOR SLURRY RECYCLING.
Water and Waste Treatment, Vol 20, No 8, p 44, August, 1977.

Descriptors: *Fertilizers, *Sludge disposal, *Sludge treatment, *Nutrient removal, *Equipment, Sewage disposal, Storage tanks, Pumping, Municipal wastes, Waste water treatment.

Molex Limited produces a complete system for land disposal of digested sludge as a fertilizer and soil conditioner. Used in England, the method has provided a viable method of sludge disposal which also returns essential nutrients to the land. Much of the sludge transportation is accomplished by Molex road tankers with capacities ranging 1,500-4,600 gallons. A Molex HD 130/100 screw pump is used to convey the load to a 4,600 GRP Molex transfer vessel. For distribution over farm land, the sludge is pumped to agricultural slurry tankers of the 900-gal fiberglass or 1,200-gal single axle type. The tankers are equipped with flotation tires to minimize soil compaction and maximize the travel range of the road tanker. The screw pump has an output of 22,000 gph at 130 psi and 300 ft head and can be used during foul weather to pump the slurry into irrigation lines with multiple spreaders. The HD 130/100 can also be used as a diesel-driven mobile irrigation unit. (Schulz-FIRL)
W78-03553

SUBMARINE PIPELINE FOR RIVER WEAR.
Water and Waste Treatment, Vol 20, No 8, p 42, August, 1977.

Descriptors: *Outfall sewers, *Waste water disposal, *Sewage treatment, *Pipelines, Conveyance structures, Sewers, Treatment facilities, Waste water treatment.

The Northumbrian Water Authority in England has contracted the Engineering Division of John Laing Construction to install a sewage pipeline on the sea floor at Sunderland, Tyne and Wear. The project was initiated in an effort to improve the water quality of the River Wear. It includes an evaluation of the sewage outfall area about one mile south of Hudson Dock and fabrication and installation of 300 m of 1.4 m-diam piping at a total cost of 552,000 lbs. The pipe will be fabricated and joined in lengths of up to 120 m at Hudson Dock. The concrete-coated pipe will be transported to the sea on a steel slide and towed to the outfall site by tug. A pontoon-mounted crane equipped with a mechanical excavating grab will be used to excavate and backfill the pipe trench. The pipeline will be connected to an existing outfall pipe at one end and fitted with a concrete-coated diffuser at the other. Before disposal through the new pipeline, sewage will be screened at the Hudson waste water treatment plant. (Schulz-FIRL)
W78-03554

SEA OUTFALL FOR DORSET.
Water and Waste Treatment, Vol 20, No 8, p 38, 42, August, 1977.

Descriptors: *Outfall sewers, *Waste water disposal, *Sewage treatment, *Pipelines, *Conveyance structures, Sewage bacteria, Sewers, Treatment facilities, Waste water treatment.

Plans for a drainage system and sea outfall have been recently adopted by the Wessex Water Authority in England as a solution to problems associated with seven existing outfalls in the Weymouth and Portland areas. Extensive investigations prior to the development of a final design will evaluate environmental conditions before and after the construction of the proposed outfall. Studies will be conducted to select the most appropriate location and design. The length of the outfall has been tentatively set at 1,200 m. The fate and distribution of sewage bacteria from the outfall site will be assessed. Pretreatment requirements will also be evaluated. The discharge of ground and screened domestic effluents via an outfall was chosen over the more costly option of construction of inland waste water treatment facilities. Concern has been voiced over possible damage to Chesil Beach by the 140-ft deep outfall tunnel. The total cost for sewers, pumping stations, headworks, and the sea outfall is projected at 8,800,000 pounds. (Schulz-FIRL)
W78-03557

QUANTITATIVE MAPPING OF SUSPENDED SOLIDS IN WASTEWATER SLUDGE PLUMES IN THE NEW YORK BIGHT APEX,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-03564

POLYCYCLIC AROMATIC HYDROCARBONS IN AGRICULTURAL SOIL (POLYZYKLISCHE, AROMATISCHE KOHLENWASSERSTOFFE IN LANDWIRTSCHAFTLICH GENUTZTEN BODEN),
Mainz Univ. (West Germany). Hygiene Inst.
For primary bibliographic entry see Field 5B.
W78-03566

DETERMINATION OF HEAVY METALS IN SEWAGE-BASED FERTILIZER USING SHORT-LIVED ISOTOPES,
Surrey Univ., London (England). Dept. of Physics.
For primary bibliographic entry see Field 5A.
W78-03571

WASTEWATER EFFLUENT DISCHARGE TO COOLING LAKES,
Texas Univ. at Austin. Dept. of Civil Engineering.
R. D. Taylor, J. E. Dailey,, and A. Rohlich.
Journal of the Environmental Engineering Division-ASCE, Vol 103, No EE5, p 907-918, October, 1977. 7 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Waste water disposal, *Cooling water, *Municipal wastes, *Industrial water, *Water reuse, Multi-purpose projects, Effluents, Aquatic life, Water quality control, Eutrophication, Pilot plants, Waste water treatment, Environmental effects.

The large quantity of fresh water required for cooling lakes which are used to dispose of waste water from power plants, and the increasingly stringent regulations on discharge of municipal waste waters, have created interest in the use of treated municipal waste waters as makeup water in cooling lakes. Although waste water has been used in cooling towers, up to this point it has not been discharged directly to cooling lakes in the United States. Results of a field study at Lake Braunig, a man-made cooling lake near San Antonio, Texas, are presented. Much of the lake's makeup water is drawn from the San Antonio River which in itself contains a large portion of secondary effluent. The water quality and trophic state were monitored in Lake Braunig over a 12-month period. The program indicated that the lake was highly eutrophic, although still useful for recreational and power plant purposes. The dominant algal species within the ecosystem is suggested as the most important factor in the usefulness of a lake as a cooling water source. Problems associated with the full-scale discharge of waste water to cooling lakes include: carbonate scaling and dezincification of condensers, boiler water treatment, water quality limitation on recreational uses, and the quality of cool-

ing lake effluent released to receiving waters. (Schulz-FIRL)
W78-03575

HEAVY METALS TRANSPORT MODEL IN A SLUDGE-TREATED SOIL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5B.
W78-03590

WASTEWATER TREATMENT THROUGH SOIL -- WITH SPECIAL REFERENCE TO SEPTIC TANK EFFLUENT TREATMENT,
ADI Ltd., Fredericton (New Brunswick).
T. Viraraghavan.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 3, p 95-102, June, 1977. 5 fig, 3 tab, 44 ref.

Descriptors: *Septic tanks, *Soil disposal fields, *Waste assimilative capacity, *Soil water movement, Groundwater, Path of pollutants, Soil contamination, Application methods, Waste water disposal, Municipal wastes.

Various hydrologic aspects which may influence waste water disposal with septic tank-soil absorption systems are discussed, including infiltration, percolation, evapotranspiration, and runoff. Major factors which control infiltration include soil porosity, moisture content, surface soil compaction, and the presence and type of vegetation. Studies on the effects of long-term, continuous water application on infiltration rates are described. Factors affecting percolation rates are discussed for saturated and unsaturated flow conditions. Modifications for septic tank effluent application to the Darcy equation are discussed for saturated and unsaturated percolation. Physical, chemical, and biological actions which help to remove pollutants from water as it travels through soil are described. Studies on filtration, the major physical mechanism by which waste water is purified in the soil, are described. Adsorption and ion exchange are discussed as chemical mechanisms. The role that soil bacteria play in waste water treatment is discussed. Typical characteristics of septic tank effluent are presented. Studies on the transport of sewage bacteria and viruses through soil systems are described. The fate and effects of specific chemical contaminants in septic tank effluents, including nitrogen, phosphates, surfactants, chloride, BOD, COD, and TOC, are discussed. (Schulz-FIRL)
W78-03620

MARINE POLLUTION: A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
For primary bibliographic entry see Field 5G.
W78-03628

HISTORIC TURNING POINTS IN MUNICIPAL WATER SUPPLY AND WASTEWATER DISPOSAL, 1850-1932,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History, Technology, and Urban Affairs.
For primary bibliographic entry see Field 5D.
W78-03629

MANAGEMENT MODEL FOR WASTEWATER DISPOSAL ON LAND,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
A. Koenig, and D. P. Loucks.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 321-330, 1976. 14 ref.

Descriptors: *Waste water disposal, *Surface irrigation, *Land reclamation, *Mathematical models, Drainage systems, Design criteria, Nitrogen, Water balance, Effluents, Estimating, Biochemical oxygen demand, Planning, Constraints, Equations, Systems analysis, Management, Soil water balance, Soil nitrogen balance, Maximization, Drainage capacity, Land application.

Presented is a method for examining the use of land for wastewater disposal. A simple nonlinear model is proposed which can assist in evaluating land disposal schemes for pretreated municipal wastewater effluent under different climatic conditions. For a given drainage capacity of the soil, an irrigation schedule is derived based on climatological data, and the minimum area for land application is found that will meet certain nitrogen concentration limitations in the drainage water. Results are obtained by first determining the soil-water balance and finally maximizing the nitrogen concentration in the irrigation wastewater which can be applied to the land. The independence of the soil-water balance subsystem is a convenient means for testing the soil assimilative capacity for a wide variety of hydrologic and climatological conditions. A numerical example is used to demonstrate application of the model. It is concluded that if the concentration of nitrogen in the drainage effluent is a limiting constraint, then the best policy in designing a land disposal scheme is to provide good drainage for a maximum throughput of wastewater effluent. (Bell-Cornell)
W78-03636

THE RELATIONSHIP BETWEEN THE BORON CONCENTRATION OF EAST LANSING MUNICIPAL WASTEWATER AND RETENTION TIME THROUGH THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT UNDER CONTINUOUS FLOW CONDITIONS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5A.
W78-03680

DISPOSAL OF COAL PREPARATION WASTES: ENVIRONMENTAL CONSIDERATIONS,
Los Alamos Scientific Lab., NM.
E. M. Wewerka, J. M. Williams, and N. E. Vanderborgh.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-UR-762198, Price codes: A01 in microfiche. Report No. LA-UR-76-2198, 1976. 7 p, 17 ref. 761016--2.

Descriptors: *Environmental effects, *Coal mine wastes, Waste dumps, *Waste disposal, Drainage effects, Public health, Hazards, Air pollution, Water pollution sources, Trace elements, Waste storage, *Hazard assessment, Waste management, Coal preparation.

Over 3 billion tons of coal preparation wastes have accumulated in the U.S., and the current annual rate of waste production of 100 million tons is expected to double within a decade. The total number of active and abandoned coal waste dumps is estimated at between 3,000 and 5,000, and about one half of these pose some type of health, environmental, or safety problem. Structural weaknesses in coal refuse banks have led to tragic landslides; coal refuse dumps are one source of highly mineralized and acidic drainage which affects more than 10,000 miles of U.S. streams and waterways; and the 300 or so burning waste banks are considered a major source of air pollution. There is also growing concern about possible environmental effects from trace elements in he coal waste materials. Prevention and control measures suggested include dump foundation design, waste segregation by physical characteristics, proper grading and compaction of wastes with provision for adequate drainage, restriction of air and water influx through wastes, water treatment, and cooling or sealing of fire areas. Although corrective measures are available for some forms of coal refuse contamination, difficulties in preventing and controlling contamination are predicted to increase concurrently with national usage of cleaned coals. (Wares-IPA)
W78-03686

POSSIBILITIES FOR TREATING WASTEWATERS GENERATED IN ELECTROPLATING SHOPS TO AVOID SPECIAL WASTES--METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL. PART III (MOEGLICHKEITEN ZUR BEHANDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN--METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE. TEIL III),
For primary bibliographic entry see Field 5D.
W78-03689

5F. Water Treatment and Quality Alteration

PRECIPITATION PRODUCTS IN THE FE(II) AND TRISODIUM-PHOSPHATE SYSTEM AT PH 2.5-13.0, (IN GERMAN),
Goettingen Univ. (West Germany). Abt. Oekochemie.
R. Kickuth, and K. Tubail.
Geoderma 16(5), p 433-442, 1976.

Descriptors: *Iron, *Chemical precipitation, *Phosphates, Pollutant identification, Analytical techniques, Hydrogen ion concentration, *Trisodium phosphate, Water analysis, Water purification, Water treatment, Potable water.

The precipitation of Fe(II)-phosphates and -hydroxides by interactions of Fe(II)-sulfate and Na3PO4 in aqueous solutions of pH 2-13 at room temperature was investigated. The results of potentiometric titration were similar to those reported in literature. No stoichiometric compound was found among the precipitation products in the whole pH-range, e.g., FeHPO4, Fe3(PO4)2 and Fe(OH)2. All precipitation products contain PO4 - groups and OH-groups in various proportions depending on the pH during their formation. FeHPO4 may be regarded as a hypothetical initial compound, when precipitation begins at about pH 2 and Fe(OH)2 as the end-product at very high pH-values, respectively. Fe3 (PO4)2 does not occur except in the form of parially hydrolyzed species in a neutral milieu. All these compounds form a continuous system of non-stoichiometric phosphates and hydroxydes, respectively. The situation is even more complicated with Na present in solutions, and this is not due to surface adsorption. The composition of the precipitates plotted against the pH-values do not show some peculiarities, which clarly divide the field of precipitation into 2 regions: that of non-stoichiometric phosphates and that of non-stoichiometric hydroxides. The transition point is defined as a pH-value at which PO4 and OH-groups in the precipitates are interchangeable most easily. This occurs at a pH of 8.8. The composition of this transition product may be written as FeOH(P^4)o,33. --Copyright 1978, Biological Abstracts, Inc.
W78-03454

WATER PURIFICATION SYSTEM UTILIZING ULTRAVIOLET RADIATION,
H. M. Ross.
U.S. Patent No. 4,017,734, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 957, No 2, p 808, April 12, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Ultraviolet radiation, Flow control, Light.

A water purification system utilizes an ultraviolet generator encased in a quartz cylinder to irradiate water flowing through a passageway defined by the surface of the quartz cylinder and an outer casing. An ultraviolet sensor and control circuit shuts off the water when the ultraviolet radiation level drops below a predetermined level. A flow-sensing switch controls an ultraviolet dimming circuit which reduces the generator output when water is not flowing. Water flow is controlled by reduced annular spaces at the inlet and outlet of the passageway and the quartz cylinder and the ultraviolet sensor are kept free of sedimentation by wiper blades. (Sinha-OEIS)
W78-03598

APPARATUS FOR THE ELECTROLYSIS OF WATER WHICH OPERATES UNDER PRESSURE,
Societe de Recherches Techniques et Industrielles, (France). (Assignee).
L. Mas.
U.S. Patent No. 4,039,421, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 248, August 2, 1977.

Descriptors: *Patents, *Water treatment, *Electrolysis, Separation techniques, Oxygen, Hydrogen, Electrochemistry, Equipment.

An apparatus for the electrolysis of water which operates under pressure and can be started up without injecting nitrogen is described. A set of valves arranged in the electrolyte circulation circuit upstream and downstream of the stack of electrolytic cells isolates the stack from the remainder of the apparatus when the apparatus has finished operations, with the result that a specific pressure is maintained within the cells until the apparatus is next started up. (Sinha-OEIS)
W78-03602

ION-EXCHANGE PROCESS FOR DESALTING WATER AND SUBSEQUENT REGENERATION OF THE ION EXCHANGERS,
CKD DUKLA, Prague (Czechoslovakia). (Assignee).
For primary bibliographic entry see Field 3A.
W78-03607

WATER PURIFICATION DEVICE,
Lever Bros. Co., New York. (Assignee).
B. H. Bory, and A. B. Kessler.
U.S. Patent No. 4,039,444, 11 p, 6 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 255, August 2, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Organoleptic properties, Domestic water, Equipment.

A device for the purification of water and methods for its use are disclosed. The device comprises a closed container substantially porous to water, a purification agent and an ingredient dispersed in the purification agent for the purpose of inhibiting fine particles of the agent from escaping the container when the device is immersed in water. The inhibitory ingredients include certain modified starches, wood flour and aluminium soap. The device is especially useful in removing incipient impurities from drinking water than can elude customary water treatment and render drinking water organoleptically unsatisfactory. (Sinha-OEIS)
W78-03609

INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Centre for Community Water Supply, The Hague (Netherlands).
For primary bibliographic entry see Field 5C.
W78-03627

5G. Water Quality Control

BACTERIAL CONTROL OF AQUATIC ALGAL POPULATIONS,
Medical Coll. of Ohio at Toledo.
J. C. Burnham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 569, Price codes: A06 in paper copy, A01 in microfiche. Ohio State University, Columbus, Water Resources Center, Completion Report No. 548, July 1977. 117 p, 12 fig, 5 tab, 39 ref, 7 append. OWRT B-051-OHIO(1).

Descriptors: *Algal control, Aquatic algae, *Cyanophyta, Electron microscopy, Oxygen requirement, Photosynthetic oxygen, *Toxins, Water quality control, *Bdellovibrio bacteriovorus, Cell lysis, *Photorespiration, Phormidium luridum, Synechococcus.

The effect is described of a toxic substance secreted by Bdellovibrio bacteriovorus ATCC15143 on two species of blue-green algae, Phormidium luridum var. olivacea and Synechococcus sp. This algal inhibitor, which had a molecular weight of less than 10,000 and was partially sensitive to protease activity, was examined for its potential as a naturally-produced algal control agent. The need for a moderate concentration of environmental protein for production of the toxin was demonstrated along with the requirement of alkaline conditions (pH 9.0 optimum) for antialgal activity. One of the primary findings was the unique photorespiratory process that is triggered by exposure of the blue-green algae to the toxin. This photorespiration was a totally light dependent process as dark respiration remained normal and occurred prior to the lysis of the algal cells. When the effects of the bdellovibrio produced inhibitor were compared with the action of a variety of known chemical redox inhibitors, the greatest similarity was to a mixture of amphotericin B and polymyxin B. Transmission electron microscopy indicated a distinct pathological breakdown of the algal cells that was dependent on the blue-green algal species being exposed to the toxin. A host independent mutant of B. bacteriovorus 15143 was isolated which produced a similar algal toxin. Finally, over 100 bacterial isolates from local water resources were evaluated for comparative blue-green algal lytic activity.
W78-03201

TEXTILE INDUSTRY EFFLUENTS--INSTRUCTIONS FOR PRACTICAL USE (TEXTIL-ABWASSER--WEGLEITUNG FUER DIE PRAXIS).
BWL-Gruppe der schweizerischen Textilindustrie; Basel, Switzerland, 1977. 10 p, 1 tab, 8 ref.

Descriptors: *Textiles, *Dyes, *Industrial wastes, *Effluents, *Filtration, Neutralization, Water pollution control, Toxicity, Waste water treatment, *Switzerland.

The legal guidelines and requirements in Switzerland for the handling of textile plant waste water are presented. The guidelines suggest that the industry make use of degradable and non-toxic products whenever and wherever possible, and that they require the treatment of the effluent before discharge from the plant. The treatment would include filtration to remove fibers and solids; adjustment of pH; equalization of the wastes over the entire week rather than allowing fluctuations of discharged quantities; and, if possible, the construction of company treatment plants. Toxic or dangerous substances should be stored in tanks rather than included in the effluent. (Schwartz-FIRL)
W78-03206

ACID MINE DRAINAGE TREATS SEWAGE DUMPED IN STREAMS.
Coal Age, Vol. 82, No. 11, p 23, November, 1977.

Descriptors: *Acidic water, *Mine wastes, *Sewers, *Environmental effects, *Floods, Disinfection, Acid mine water, Waste water treatment.

Sewage lines and treatment plants were heavily damaged during the Johnstown flood in Pennsylvania, and millions of gallons of raw sewage flowed daily into the Conemaugh River. The heavily acid-laden receiving streams in the area proved valuable in the partial disinfection of the untreated sewage, which otherwise could have presented a serious health hazard to downriver communities, including Pittsburgh. Problems of the nearby Windber sewer authority were caused by the loss of about 4.5 miles on interceptor. Since some areas along the sewer routes were washed down to bare rock during the flood, aerial pipelines are being considered as replacements. Officials have stated that since the sewage receives primary treatment through the acidic nature of the Conemaugh and Kiskiminetas Rivers and is further diluted by the Allegheny River, its effect on water quality in the Pittsburgh area is minimal. (Schulz-FIRL)
W78-03212

AUTOMATIC WATER-TREATMENT PLANT.
For primary bibliographic entry see Field 5D.
W78-03213

PRE-INSULATED PIPING SYSTEM USED FOR WATER AND TAILINGS AT CANADA'S FIRST ARCTIC MINE.
For primary bibliographic entry see Field 8G.
W78-03214

INDUSTRIAL EFFLUENT CONTROL AND CHARGES,
M. C. Dart.
Journal of the Institute of Water Pollution Control, Vol. 76, p 192-199, 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Industrial wastes, *Legislation, *Taxes, *Costs, *Sewerage, Flow measurement, Biochemical oxygen demand, Chemical oxygen demand, Sewers, Waste water treatment.

Various topics related to a series of guidelines recommended for controlling and charging for industrial effluents in England are discussed. Major objectives of the document are summarized and measures which the industrial discharger should take to comply with the objectives are discussed. Various aspects of the assessment of waste water treatment costs to industrial dischargers are discussed, including flow measurement as a basis for treatment charges, and the advantages and disadvantages of the use of COD instead of BOD as a means of determining industrial waste strength. A formula for calculating the total charge per cubic meter of industrial effluent with respect to conveyance charge, primary treatment costs, COD, suspended solids, and sludge treatment and disposal costs is presented. The use of a minimum charge to cover administrative costs for small or weak discharges is discussed. Analytical techniques and sampling schemes used in the assessment of industrial effluents are discussed. (Schulz-FIRL)
W78-03217

WATER REUSE IN THE SOUTHWEST,
New Mexico State Univ., University Park.
H. G. Folster, and W. Barkley.
AIChE Symposium Series, Vol. 73, No. 166, p 283-292, 1977. 20 fig, 5 tab, 26 ref.

Descriptors: *Water reuse, *Water resources development, *Return flow, *Southwest US, Agriculture, Water rights, Water requirements,

Tertiary treatment, Industrial water, Treatment facilities, Water utilization, Economics, Industrial wastes, Waste water treatment.

The reuse of municipal waste water to supplement limited water resources is described for the semi-arid southwesten portion of the United States which encompasses West Texas, New Mexico, and Arizona. Strict water rights and surface water allocations have limited water resources available to new users. Agricultural and industrial uses of water in the Southwest are described. Although water resources are limited, and the majority of municipal and industrial reusers of waste water in the United States are located in the southwestern portion of the country, water conservation is not practices to a great extent in the Southwest. Waste water reuse practices are described for each of the states in the region. Municipal waste water from Amarillo, Texas, is being used by the Southwestern Public Service Company for its steam-powered electrical generating plants and by Texaco for cooling and boiler water make-up. The El Paso Products Company in Odessa, Texas, uses 5.5 mgd of treated municipal effluent in its chemical manufacturing operations. Cosden Oil and Chemical Company of Big Springs, Texas, reuses municipal effluent in low-pressure boiler feed make-up water. Treated municipal waste water is being reused in New Mexico for mineral processing, cooling water, irrigation, and operations at the Los Alamos Scientific Laboratory. (Schulz-FIRL)
W78-03219

GRANULAR MEDIA FILTRATION SAVES TREATMENT COSTS; HELPS MEET EPA STANDARDS,
For primary bibliographic entry see Field 5D.
W78-03224

DREDGING OPERATIONS IN THE GALVESTON DISTRICT,
Army Engineer District, Galveston, TX.
D. S. McCoy.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 54-81, December 1976. 15 fig, 4 tab.

Descriptors: *Dredging, *Texas, *Navigable waters, *Operation and maintenance, Navigation, Channels, Costs, Transportation, Inland waterways, Annual costs, Maintenance costs, Unit costs, *Galveston(Tex), Waterborne commerce.

Discussed were dredging operations as related to the principal Federal channels constructed along the Texas Coast, commerce, dredging costs, and implications that environmental regulations and archeological problems are having on dredging. The Galveston District is responsible for the Federal navigation system in Texas, which totals approximately 1,000 miles of dredged shallow-draft and deep-draft channels ranging in depths from 6 to 45 feet. These navigation channels serve a wide variety of users ranging from recreational to sports and commercial fishermen, and industry. The major waterway users in Texas are the petroleum and petroleum-refining industries, which account for approximately 60% of all waterborne commerce in Texas. These industries pay over $700 million in wages and ship goods valued at over $9 billion each year. In July 1975, the Corps of Engineers new Federal Dredging Regulation was published in the Federal Register. The intent of these regulations was to insure compliance with requirements of the National Environmental Policy Act of 1969 (NEPA) on all Federal projects. The new regulation significantly increases the time, cost, and the administrative work required to obtain the necessary coordination and concurrence of each disposal plan. The impact of implementing dredging regulations, complying with NEPA and adjusting to concerned environmental groups, have caused revisions of disposal procedures which have resulted in maintenance dredging costs. Reported costs jumped 37% between Fiscal Year 1974 and Fiscal Year 1975, with escalation to 86% between Fiscal Year 1975 and Fiscal Year 1976. (See also W77-09325) (Humphreys-ISWS)
W78-03229

DREDGE MATERIAL CONTAINMENT IN NYLON BAGS IN THE CONSTRUCTION OF MINI-PROJECTS FOR BEACH STABILIZATION,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
J. L. Machemehl.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 82-122, December 1976. 78 fig, 3 tab, 7 ref.

Descriptors: *Beach erosion, *Shore protection, *North Carolina, *On-site investigations, Beaches, Erosion control, Shape, Profiles, Barrier islands, Coasts, Data collections, On-site data collections, Projects, Groins(Structures), Hydraulic structures, Littoral drift, Inlets(Waterways), Materials, *Holden Beach(NC), Nylon bags.

Erosion in the vicinity of Lockwoods Folly Inlet, North Carolina, has been serious. Between 1943 and 1972 a high rate of shoreline erosion existed along the easternmost 6,000 ft (1829 m) of Holden Beach. Erosion occurred at an inordinate and rather steady rate of 14.7 ft/yr. Valuable ocean-front lots were lost, beach cottages were damaged, and sections of North Carolina Highway 132 were destroyed as a result of the erosion. The beach is approximately 44,000 ft long and has an average width of 1600 ft. An experimental sand-filled nylon bag groin field was planned, designed, and constructed to provide positive erosion control. A low impermeable structure with two nylon bags in the base and one nylon bag interlocking on the top was designed to stabilize the beach. The pilot groin was designed to follow the natural slop of the beach from Elev. + 5.0 ft (2.0 ft above high tide) to Elev. -3.0 ft (1.0 ft below low tide). This design allowed sand to pass over the top of the structure at high tide thus preventing excessive scour on the downdrift side. The groins were beneficial in stabilizing dredged material. Nylon bags can be used to construct inexpensive groins to stabilize a beach strand. With an economic life of two years, the bags compare favorably with other types of construction material. (See also W77-09325) (Humphreys-ISWS)
W78-03230

THE NATIONAL DREDGING STUDY,
Office of the Chief of Engineers (Army), Washington, DC.
W. R. Murden.
In: Proceedings of the Eighth Dredging Seminar; Held November 8, 1975, Houston, Texas. Sea Grant Report No. CDS-195, TAMU-SG-77-102, Texas A and M University, College Station, p 127-178, December 1976. 22 fig.

Descriptors: *Dredging, *Programs, *Forecasting, *Data collections, Surveys, Planning, Federal government, Industries, Local governments, Equipment, Navigation, Project purposes, Operation and maintenance, Annual costs, Costs.

Results from the National Dredging Study of dredging requirements were summarized and included: (1) A detailed review and analysis of the Federal dredging program during 1964-1973; including the utilization of Corps equipment and industry equipment and the division of the annual workload between industry and the Corps. (2) A detailed forecast of the national dredging requirements, both the Corps dredging program and private work, for 1974-1983; considering the impact of changed requirements, the methods and equipment that might be used, and the various alternatives of sub-dividing the dredging workload of the Corps. (3) A detailed review and analysis of the Corps bidding and estimating procedures, and an analysis of the effect of the Corps policies and procedures on the dredging operations. (See also W77-09325) (Humphreys-ISWS)
W78-03231

MODELING OF OIL EVAPORATION IN AQUEOUS ENVIRONMENT,
Technische Univ., Brunswick (West Germany). Leichtweiss Inst. for Water Research.
For primary bibliographic entry see Field 2D.
W78-03244

SELECTED ASPECTS OF THE CONTROL OF TOXIC SUBSTANCES (A COMPILATION OF SPEECHES), BY THE MEMBERS OF THE STAFF OF THE OFFICE OF TOXIC SUBSTANCES.
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 417, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA 560/4-76-002, May 1976. 147 p, 1 fig, 8 tab, 62 ref.

Descriptors: *Toxicity, *Water pollution, *Water pollution control, *Risks, Air pollution, Pesticides, Chemicals, Chlorination, Cost-benefit analysis, Microenvironment, Wastes, Chemical analysis, *Toxic Substances Control Act, *Hazard assessment, Flame retardants, Carcinogens, Mutagens.

A collection of speeches presented primarily during 1975 and 1976 by members of the staff of the Office of Toxic Substances, U.S. Environmental Protection Agency, exemplifies the evolution of interests, policies, and programs of the office. Subject areas include pesticides, flame retardant chemicals, water chlorination, mutagenic assay, chemical use in printing operations, monitoring activities, microcosm methodology, cost/benefit considerations, chemical use in well drilling operations, risk analysis for chemical carcinogens, chemical use in rubber processing operations, trace contaminants, toxic chemicals registries, and regulation and control of toxic substances. Particular attention was given to aspects of water pollution by toxic substances via industrial routes, e.g., polychlorinated biphenyls. The need to establish standards for toxic substances and contaminants was reiterated in speeches describing provisions of the pending Toxic Substance Control Act. Various indicators and tests of chemical toxicity were also reported, such as carcinogenecity and mutagenicity. (Wares-IPA)
W78-03263

SURVEY OF EQUIPMENT AND TECHNIQUES TO IDENTIFY AND QUANTIFY DISCHARGED HAZARDOUS CHEMICALS,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5A.
W78-03266

PRE-SCREENING FOR ENVIRONMENTAL HAZARDS--A SYSTEM FOR SELECTING AND PRIORITIZING CHEMICALS.
Little (Arthur D.), Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 093, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-560/1-77-002, ADL 78486, Phase I Report, April 1977. 126 p, 13 fig, 15 tab, 10 ref, 4 append. 2 LA 328, 68-01-3208.

Descriptors: Pollutants, *Environmental effects, *Hazards, *Statistical methods, *Model studies, Chemicals, Priorities, Estimating, Forecasting, *Screening, *Hazard assessment.

Results of a study to develop a conceptual scheme for ranking chemicals emitted into the environment in order of their hazard potential are reported, with major focus on preliminary screening of chemicals prior to full commercial production and secondary focus on evaluating potential hazard of chemicals already in production. A number of alternatives for ranking chemicals were explored. The method recommended consists of selecting chemicals for further attention by comparing the concentration of each chemical that may be expected in the environment to the concentration levels of that chemical which are of concern. The proposed method for estimating the eventual environment level is based on a multicompartment model of the environment. In order to provide estimates with moderate effort, the model is substantially simplified, ensuring that the model does not underestimate eventual levels and that overestimation is kept within reasonable bounds. The proposed method for estimating levels of concern was selected on the basis of simplicity and accuracy, and a test using available information on tolerable air concentrations indicates that the estimated levels would be adequate for preliminary screening. The method also provieds the capability of ranking selected chemicals into more refined priorities by estimating the time horizon during which regulatory action would prevent significant deleterious effects. Since additioal research is required before the conceptual ranking scheme can be implemented, the development of improved methods of predicting levels of concern from available information on chemical composition is being investigated. The performance of the system with a number of test chemicals also needs investigation to validate its accuracy and efficiency. The four appendices contain descriptions of the distribution of a pollutant in the environment, chemical classes with potential for causing biological damage, estimation of diffusivities, and sample compound data. (Wares-IPA)
W78-03267

NONPOINT SOURCE CONTROL GUIDANCE CONSTRUCTION ACTIVITIES,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
R. E. Thronson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 775, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-700/01 Final Report, December 1976. 122 p, 27 fig, 8 tab, 123 ref, 1 append.

Descriptors: *Water pollution control, *Water pollution sources, *Construction, Water pollution effects, Erosion, Sediments, Oil, Biology, Pesticides, Metals, Soil contamination, Land development, Transportation, Communication, *Management practices.

A control guidance document is one of a series designed to provide State and areawide agencies, Federal agencies, and others concerned with information assistance in carrying out water quality planning and implementation activities with regard to nonpoint source pollution in construction activities. Information is given on identification and assessment of existing construction nonpoint source problems, analysis and procedures needed for selection of controls, descriptions of individuals and systems representing prime management practices with a method for determining their effectiveness, and several methods for predicting potential pollution problems for future construction activities. Existing data indicate that construction activities, when soils and foundation materials are disturbed and left exposed to erosion by rain, wind, and runoff water, are responsible for causing environmental damages especially to waterways, lakes, and impoundments. The best management practice for construction pollutant control is to eliminate potential pollutants at the site area, emphasizing prevention rather than treatment. Pollutants of concern include excessive sediment, chemical petroleum products, biological materials, pesticides, metals, soil additives, and miscellaneous wastes. The appendix is a summarized guidance statement on best management practices for identifying and preventing water pollution for construction nonpoint sources such as land development, transportation and communication networks, water resource facilities, and building and faciltiy construction. (Wares-IPA)
W78-03268

GEOGRAPHIC AREAS OF PARTICULAR CONCERN.
Delaware Coastal Zone Management Program, Dover.
For primary bibliographic entry see Field 2L.
W78-03273

GELATION OF OIL SLICKS BY AMINE CARBAMATES AS AN ADJUNCT TO U.S. NAVY OIL SPILL RECOVERY OPERATIONS,
Lowell Univ., MA. Dept. of Chemistry.
W. W. Bannister.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 702, Price codes: A05 in paper copy, A01 in microfiche. Final Report of Office of Naval Research for the Period 15 October 1975 - 14 November 1976, January 1977. 77 p, 20 fig. ONR-N00014-76-C-0340.

Descriptors: *Oil spills, *Water pollution control, *Pollution abatement, *Toxicity, Water quality control, Skimming, Oil pollution, *Aliphatic amines, *Amine carbamates, Carbamate salts, Recovery operations, Oil slick removal, Gelation.

Solutions of Amine D (dehydroabietylamine: 70%) in ethyl and benzyl alcohol, when sprayed on oil slicks to a concentration of about 10% and then treated with C02 to form the carbamate, provides excellent gelation of the oil. Lab tests were performed on gel strengths, effects of film thickness, temperature, and salinity for various fuels. A field test indicated that this system is very advantageous in recovery of oil slicks, in terms of ease of pick-up; immobilization of the oil; keeping the gelled oil from drifting back over cleared areas; and greater viability of the gelled slick. The toxicity of the Amine D is of a very low order, comparable to that of the oil slick itself; for water depths of over two feet, the toxicity is negligible. There is a significant (ca. 50%) reduction in evaporation rate of gelled, compared with ungelled hydrocarbons. This factor would be important in terms of reduced vapor hazards and perhaps fire hazards. Ultraviolet fluorescers as additives to the gelling agent or to the oil slick itself were studied and found to have promise in terms of providing increased visibiltiy for night time operations. (Sinha-OEIS)
W78-03276

SPORT FISHING IN WESTERN DELAWARE BAY: ASSESSMENT OF CRITICAL AREAS (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W78-03277

A PRELIMINARY TEST OF A GOVERNMENT-OWNED LOCAL AREA OIL ON WATER SURVEILLANCE SYSTEM,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5A.
W78-03281

MARKING THE SEA SURFACE WITH ARTIFICIAL SEA SLICKS AND FLUORESCENT DYES TO AID SEARCH AND RESCUE OR OCEAN DUMPING SURVEILLANCE OPERATIONS,
Naval Research Lab, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03282

ULTIMATE DISPOSAL OF OIL AND HAZARDOUS MATERIALS,
Coast Guard Office of Research and Development, Groton, CT.
For primary bibliographic entry see Field 5E.
W78-03283

UNIQUE ECOLOGICAL FEATURES OF THE LOUISIANA COAST.
Burk and Associates, Inc., New Orleans, LA.
For primary bibliographic entry see Field 6G.
W78-03284

THE PHYSICAL OCEANOGRAPHY AND WATER QUALITY OF NEW YORK HARBOR AND WESTERN LONG ISLAND SOUND,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W78-03286

EXPERIMENTAL BOILER PROMOTES DEVELOPMENT OF FUEL-SAVING WATER TREATMENT PROGRAMS.
Canadian Pulp and Paper Industry, Vol 30, No 7, p 71, May 5, 1977. 1 fig.

Descriptors: *Boiler feed water, *Water treatment, *Chemicals, Industrial water, Scaling, Boilers, Laboratory tests, Water quality control, Equipment.

An experimental boiler developed by Mogul Corp. (Chagrin Falls, Ohio) is used to study deposit adhesion as afected by different chemicals used in the treatment of feed water. The boiler serves as a final evaluation tool for the testing of promising chemical treatment formulations, such as scale inhibitors, prior to the field trial stage and the introduction of new products in the market place. (Swichtenberg-IPC)
W78-03294

SPECIFIC ENERGY CONSUMPTION FOR ENVIRONMENTAL PROTECTION IN THE (SWEDISH) PULP AND PAPER INDUSTRY: QUESTIONNAIRE RESULT (SPECIFIK ENERGIFORBRUKNING FOR MILJOVARD INOM MASSA-OCHPAPPERSINDUSTRIN: RESULTAT AV EN ENKAT),
IVL-Konsult A. B., Stockholm (Sweden).
L. Sodersten, and L. Widell.
Svensk Papperstidning, Vol. 80, No. 12, p 361-362, September 10, 1977. 2 tab. English summary.

Descriptors: *Energy, *Pulp and paper industry, *Water pollution control, *Air pollution, Environment, Protection, Wastes, Industrial wastes, Waste water treatment, Foreign countries, Europe, Steam, Electric power, Activated sludge, Ecology, Biological treatment, Effluents, Sludge treatment, Pumping, Pumps, Water pollution treatment, Water pollution sources, *Sweden, Sulfite mills, Kraft mills, Paper mills, Black liquors, Condensates, White liquor(Kraft process), Fans.

This survey of 5 kraft, 5 sulfite, and 2 paper mills (conducted in the fall of 1976 by the Swedish Forest Industries Water and Air Pollution Research Foundation) led to the following indicative results: Sulfite mills consumed ca. 1500 MJ/ton(90) of steam merely to evaporate the excess water needed for better washing. In kraft mills, this effort at improved washing and black liquor collection consumed ca. 1000 MJ/ton(90) plus 500 MJ/ton(90) for condensate treatment.

Electrical energy (mainly for driving pulps and fans) amounted to 10-30 kw-hr/ton(90). Flue gas treatment requirements varied with the process used: In kraft mills 6-10 kw-hr/ton was consumed mainly for electrostatic dust precipitation; in sulfite mills, the scrubber system consumed the major amount (20-40 kw-hr/ton) of electric energy. External treatments (fiber sedimentation basins and activated sludge process) consumed ca. 5-10 kw-hr/ton(90). Thus, total electric energy demands for environmental protection came to ca. 30 kw-hr for kraft and 60 kw-hr for sulfite mills per ton of pulp. Paper mills required only electric power (no steam) for ecology treatments, viz., ca. 25 kw-hr/ton(90), of which ca. 10 kw-hr went for biological effluent treatment, 8 kw-hr for sludge treatment, and the rest (7 kw-hr) for pumping the white liquor. (Brown-IPC)
W78-03315

ENVIRONMENTAL PROTECTION ENERGY USE IN THE (U.S.) PULP AND PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. O. Blosser.
Tappi, Vol. 60, No. 8, p 83-84, August, 1977. 4 tab.

Descriptors: *Water pollution control, *Air pollution, *Pulp and paper industry, *Energy, Electric power, Steam, Fuels, Burning, Sludge, Sulfite liquors, Oxidation, Evaporation, United States, Black liquors.

A NCASI environmental protection study examined the users of electrical energy for water and air quality protection, and the uses of supplemental energy (viz., steam or fuel) for burning sludge and sulfite liquors, black liquor oxidation, and dilute spent liquor evaporation. Energy needed for environmental protection in the U.S. pulp and paper industry in 1975 was 41.2 billion Btu/day. (Swichtenberg-IPC)
W78-03318

THE COMING WATER FAMINE,
House, Washington, DC.
For primary bibliographic entry see Field 3B.
W78-03324

POLLUTION AND INDUSTRIAL WASTE.
Practicing Law Institute, New York, 1970. 514 p, 1 tab. Edited by B. Handschau, J. McCord, and H. W. Enberg, II.

Descriptors: *Industrial wastes, *Water quality, *Pollution abatement, *Air pollution, *Solid wastes, Ohio, Pennsylvania, New York, Administration, Administrative agencies, Clean Air Act, Water pollution, Economics, Effluents, Federal government, Interstate commissions, Legislation, Permits, Governmental interrelations, Waste disposal, Water pollution control, Water quality standards, Water quality control, Financing, Federal Water Pollution Control Act.

The pollution of the environment by industrial wastes was the subject of a program in New York during February of 1970. This work is a transcript of that program with some expansion and revision by contributors. The problem is examined from legal, administrative, economic and political perspectives. The first chapter delves deeply into the problem of water quality management. Water quality standards are discussed along with administrative tools for implementation and enforcement. Two chapters are devoted to solid waste disposal and air pollution control. One section covers the financing of pollution abatement in Ohio with emphasis on municipal bonds. Tort liability and administrative controls, with emphasis upon problems of litigation, are discussed in another section. The final chapters consider federal involvement in pollution control from the point of view of the executive and legislative branches. Appendices include the text of the Water Quality Improvement Act of 1969 and several articles on air and industrial pollution. (Quarles-Florida)
W78-03325

DEATH OF THE SWEET WATERS,
D. E. Carr.
W.W. Norton and Company, Inc., New York, 1977. 257 p.

Descriptors: *Water management(Applied), *Water pollution, *Desalinization, *Potable water, Water law, Weather, Sewage, Sea water, Precipitation(Atmospheric), Powerplants, Potomac River, Oil industry, Pulp and paper industry, Mississippi River, Hudson River, Groundwater, Great Lakes, Geological surveys, Flood control, Droughts, Detergents, Cloud seeding, Thermal pollution, Irrigation.

The world is rapidly approaching a water crisis of mammoth proportions. Causes of the shortage of clean water are examined with heavy emphasis is placed on the problems of the United States. The author discusses various aspects of the problem including detergent pollution, industrial wastes, sewage, drought, floods, saline water intrusion, and silting. The control of water is viewed from an historical perspective. One chapter is devoted solely to the study of the physical properties of water. Another summarizes legal issues in the area of water rights. The problem of man's lack of knowledge about the effects of many water pollutants is discussed. Among the solutions that the author suggests are desalination and weather modification. He concludes that the major problem in the water field is pollution since there is a shortage of clean water. Although federal programs are needed to accomplish anything of lasting importance, the author criticizes scattered federal research grants distributed under the Water Resources Research Act. He urges the use of a close-knit, highly professional group for research. The work includes an extensive sixteen page bibliography. (Quarles-Florida)
W78-03326

THE INDUSTRY/EPA CONFRONTATION (LIVING TODAY WITH THE WPCA AMENDMENTS OF 1972),
Centec Consultants, Inc., Reston, VA.
P. S. Minor.
McGraw-Hill Book Company, New York, 1976. 343 p, 4 tab.

Descriptors: *Water quality control, *Water pollution control, *Water pollution treatment, *Federal Water Pollution Control Act, *Industrial wastes, Pollutants, Water pollution, Water quality, Water treatment, Water pollution sources, Governments, Legislation, Water resources, Water resources development, Legal aspects, Administration, Water policy, Toxins, Wastes, Industrial water.

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) authorized by the Environmental Protection Agency (EPA) to specify levels for national guidelines in pollution control and to require stringent policies of control to meet water quality requirements. The author feels that the EPA has abused its power in seeking enforcement of poorly planned and unrealistic control policies that could waste national resources and impose unncessary expense on industry. The presentation is designed to assist the manager in an industrial water pollution control setting to comply with the FWPCA in a cost-practical way. Discussion of the law focuses on control of industrial point sources. Materials include the FWPCA provisions and discussion and background of past conflicts between the EPA and industry on technical, economic and legal issues. Other topics include obtaining permits, improvements in technology, and factors influencing the future government controls on industry. Appendices offer information on: (1) national litigation; (2) implementation of guidelines in other areas of the FWPCA such as toxic materials, inspection and monitoring and municipal treatment plants; (3) the National Commission on water quality; and (4) an EPA organizational chart. (Mulligan-Florida)
W78-03327

ECONOMIC ANALYSIS OF INDUSTRIAL INCENTIVES FOR POLLUTION CONTROL: IMPLICATIONS FOR WATER QUALITY.
ABT Associates, Inc., Cambridge, MA.
Prepared for Federal Water Pollution Control Administration, Washington, D.C., December, 1967. 119 p, 2 tab.

Descriptors: *Industries, *Pollution abatement, *Industrial wastes, *Water pollution control, River basin commissions, Regional development, Research and development, Effluents, Waste treatment, Wastes, Benefits, Water resources development, Sanitary engineering, Sewage treatment, Domestic wastes, Streams, Federal government, River basin development, Technology, Hydrology, Water quality, Water pollution, Economics, Economic impact.

In an effort to hasten the abatement of water pollution, the federal government set standards that industry must meet in the handling of industrial wastes. In order to encourage industry to comply more swiftly with the standards, the government has used various incentive programs. This report explores and ultimately rejects these general incentives as being unlikely to affect the amount of pollution control investment undertaken. The writers suggest that such incentives will raise the cost of society by promoting inefficiency. The report sets forth, as a major solution, regional or river basin water quality authorities. These would assume much of the responsibility for waste treatment and water quality. By changing the focus of the nation's pollution control efforts, abatement for water pollution may be achieved in an efficient and equitable manner. Industrial leaders will be inclined to cooperate because of the cost savings to them as a result of the relief of the burden of building and operating pollution control facilities. The report includes a list of specific recommendations concerning fiscal incentives, river basin authorities, current problems, hardship cases, and scarce inputs to pollution control. (Quarles-Florida)
W78-03328

WATER QUALITY MANAGEMENT PLANNING: THE FATE OF 208,
Cook Coll., New Brunswick, NJ. Environmental Law.
W. Goldfarb.
Toledo Law Review, Vol. 8, No. 1, p. 105-34, Fall 1976.

Descriptors: *Land use, *Federal Water Pollution Control Act, *Water quality control, *Water management(Applied), Water law, Legal aspects, Alternate planning, Comprehensive planning, Planning, Water policy, Water resources, Water conservation, Water pollution sources, Water pollution, Aquatic environment, Environmental control, Wastes, Water quality, Law enforcement, Penalties(Legal).

The water quality management planning mechanism of the Federal Water Pollution Control Act (FWPCA) may be ineffective as a vehicle for reconciling land use and management with water quality considerations. This defect is ascribed to the inadequate enforcement devices attendant to FWPCA. Section 208 of FWPCA purports to require each state to develop areawide plans for managing all wastes generated in the area. FWPCA does not, however, contain provisions which would compel the development of these plans; the only sanctions contained in section 208 apply exclusively after the plans have been ap-

proved by the Regional Administrator of the Environmental Protection Agency. Although the FWPCA has been judicially interpreted as requiring 208 plans, the courts have not imposed any sanctions for failure to produce a plan. Several enforcement alternatives including witholding of pollution control funds, and writs of mandamus are discussed and rejected as inadequate or counterproductive. The author concludes that the very unenforceability of water quality management planning will result in the passage of stronger state and federal land use laws. (Brightman-Florida)
W78-03330

EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES.
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 300, Price codes: A07 in paper copy, A01 in microfiche. August, 1974, 124 p.

Descriptors: *Regulation, *Effluents, *Water pollution abatement, *Industrial wastes, Administrative agencies, Federal government, Grains(Crops), Water pollution sources, Canneries, Sugar crops, Textiles, Cements, Chemical industry, Plastics, Detergents, Fertilizers, Wood wastes, Oil industry, Metals, Electric power industry, Asbestos, Rubber, Feed lots, Pulp and paper industry.

The Environmental Protection Agency has compiled a set of tables of effluent limitations for industrial wastes classified by industries and time units. Interim guidelines to be achieved by July 1977 and final guidelines to be achieved by July 1983 are included. The effluent reduction to be achieved by new sources is also listed in the tables. The industries covered are dairy products processing; grain mills; canned and preserved fruits and vegetables processing; canned and preserved seafood processing; textiles; sugar processing; cement manufacturing; feedlots; electroplating; organic chemicals; inorganic chemicals; plastics and synthetics; soap and detergents; fertilizer manufacturing; petroleum refining; iron and steel manufacturing; non-ferrous metals; phosphate manufacturing; steam electric power generating equipment; ferroalloy manufacturing, leather tanning and finishing; glass manufacturing; asbestos manufacturing; rubber processing; timber products; pulp, paper and paperboard; builders paper and board; and meat products. (Moorehouse-Florida)
W78-03331

EFFECTIVE NATIONAL REGULATION OF POINT SOURCES UNDER THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: THE DOUBLE BURDEN OF LEGISLATIVE DRAFTMANSHIP AND JUDICIAL REVIEW,
J. Jackson.
Georgia Law Review, Vol 10, No 4, p 983-1024, Summer 1976.

Descriptors: *Federal jurisdiction, *Water pollution control, *Legislation, *Regulation, *Legal review, State jurisdiction, Legal aspects, Water quality control, Effluents, Discharge(Water), Penalties(Legal), Sewage effluents, Economic feasibility, Technology, Water law, Administrative agencies, Federal Water Pollution Control Act, Judicial decisions, Administrative decisions, Law enforcement.

Because of poor draftsmanship, conflicting judicial decisions have hampered administration of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Although the FWPCA urged federal and state cooperation in discharge regulation, it was unclear which level of government had final responsibility. Frequently the Environmental Protection Agency (EPA) has had to assume control when states concerned about attracting industrial development were lax in enforcing effluent limitations of point sources. As a result the EPA regulations were often directed at a single polluter and much litigation arose. Under both the FWPCA and the Aministrative Proceddures Act, the Federal district court had jurisdiction to review EPA guidelines. Section 509 of the FWPCA granted jurisdiction to the Circuit Courts of Appeals to review EPA effluent limitations. Needless litigation to determine whether EPA regulations were guidelines or effluent limitations threatened the administration of the FWPCA. The author urges the courts to ignore the superficial issue of jurisdiction and to determine state responsibility for enforcing the FWPCA. (Cocheu-Florida)
W78-03333

LIABILITY, COMPENSATION AND PREVENTION OF OIL SPILLS: A NORTH AMERICAN PERSPECTIVE,
Lewis and Clark Co., Portland, OR. Northwestern School of Law.
J. L. Pedrick.
Earth Law Journal, Vol 1, No 4, p 301-22, November 1975.

Descriptors: *Compensation, *Insurance, *Oil spills, *Oil pollution, Protection, Law of the Sea, Regulation, Legislation, International law, Oil industry, Oil, Florida, Water pollution, Water law, Legal aspects, Coast Guard regulations, International waters, Water pollution sources, Disasters, Water quality control, Coasts.

International conventions and United States statutes provide limits to liability for oil spills which are too low to cover the clean-up costs of spills from today's oil supertankers. The 1971 International Maritime Consultative Organization Compensation Convention sets a fairly adequate $30 million limit but too narrowly restricts the situations which are covered. Increasing liability limits to adequate levels covering a broad range of situations may increase insurance premiums to a prohibitive levels. Supplemental insurance subsidized by interested countries or chartering oil companies may help finance the increase in cost of insurance. Coastal states in the United States may now pass laws similar to Florida's 1970 Oil Spill Prevention and Pollution Control Act because the Supreme Court has held that states may be indemnified by potential pollutors. Improved tanker construction and port traffic control are also necessary to prevent oil pollution but international acts in these areas have received little support. Absent this support, unilateral actions like the Coast Guard Regulations for tank vessels in domestic trade may set precedent for industrialized nations interested in protecting at least their own coasts. An extensive list of references is found in the footnotes. (Hammersley-Florida)
W78-03335

THE UNITED NATIONS ENVIRONMENT PROGRAM: THE MEDITERRANEAN CONFERENCES,
For primary bibliographic entry see Field 6E.
W78-03336

ENVIRONMENTAL REGULATION OF OFFSHORE EXPLORATION, PRODUCTION, AND DEVELOPMENT,
Atlantic Richfield Company, Anchorage, AK.
C. D. Cowles, IV.
In: Environmental Regulation of Offshore Exploration, Production, and Development: Proceedings of the 27th Annual Institute on Oil and Gas Law and Taxation, February 18-20, 1976, Dallas, Texas, Mathew Bender, New York, 1976, p. 53-96.

Descriptors: *Oil industry, *Exploration, *Offshore platforms, *Regulation, *Permits, Drilling, Legislation, Effluents, Oil pollution, Economic impact, Federal jurisdiction, Administrative agencies, Leases, State jurisdiction, Federal Water Pollution Control Act, Geologic investigations, Oceans, Oil fields, Legal aspects, Environmental control.

Since statutory and regulatory time periods for various reports and permits from government agencies can delay the development of offshore oil fields, the oil industry must be prepared early in its planning stages to encounter a myriad of administrative procedures. Under the Outer Continental Shelf Lands Act, the oil industry must obtain permits to begin geological and geophysical exploration. Then compliance with provisions regulating pollution and waste disposal is required. If offshore leases have been issued, exploratory drilling permits must be obtained for various types of drilling procedures. Pollutant discharge at this stage is regulated by the Federal Water Pollution Control Act Amendments of 1972. Dischargers must obtain a permit under the National Pollutant Discharge Elimination System. A separate ocean dumping permit is required to discharge drilling mud and cement. The Environmental Protection Agency must then approve a spill prevention control and countermeasures plan. Often onshore development near new drilling cites requires compliance with federal and state coastal zone management acts. Finally an environmental impact statement under the National Environmental Policy Act may have to be issued if any significant federal action is involved in offshore development. (Cocheu-Florida)
W78-03337

ENVIRONMENTAL PROBLEMS ONSHORE,
Shell Oil Co., Houston, TX. Corporate Law Dept.
J. A. Evans.
In: Environmental Problems Onshore: Proceedings of the 27th Annual Institute on Oil and Gas Law and Taxation, February 18-20, 1976, Dallas, Texas, Matthew Bender, New York, 1976, p. 29-51.

Descriptors: *Oil industry, *Legislation, *Regulation, *Federal jurisdiction, *Water pollution control, Administrative agencies, Political constraints, Clean Air Act, Potable water, State jurisdiction, Permits, State governments, Federal Water Pollution Control Act, Navigable waters, Industrial wastes, Economic impact, Federal government, Effluents, Aquifers, Legal aspects.

Recent environmental laws have produced significant problems for the oil and gas industry. To comply with the National Environmental Policy Act, industry had to await environmental impact statements from federal agencies. Administrative delay held up progress on the Alaska pipeline for three years and slowed coal and other energy resource development. Stringent air quality standards and regulations promulgated under the Clean Air Act hindered industrial growth and development. Language ambiguities in the effluent limitations and guidelines of the Federal Water Pollution Control Act (FWPCA) have caused extensive litigation by industries unable to determine how to comply. The FWPCA also established the National Pollutant Discharge Elimination System which requires a permit be obtained for discharge of pollutants. The Safe Drinking Water Act authorized regulation of underground injection of brine for oil and gas production. In addition, state laws and regulations often hamper industrial operations. Because complex technical engineering decisions must be made to promulgate regulations and evaluate compliance with these regulations and the laws, the author proposes a special environmental court. Decisions of present courts, equipped to rule on technical matters, often have costly ramifications for industry. (Cocheu-Florida)
W78-03338

ALASKA PIPELINE--FINANCIAL RESPONSIBILITY FOR OIL SPILLS.
Federal Maritime Commission, Washington, DC.
Federal Register, Vol 42, No 115, p 50584-97, June 15, 1977.

Descriptors: *Oil spills, *Alaska, *Penalties(Legal), Ships, *Law enforcement, Insurance, Pipelines, Administration, Regulation, Water, Water pollution, Administrative decisions, Oil pollution, Water pollution control, Water law, Legal aspects, Water policy, Legislation, Transportation, Damages, Water pollution sources.

The federal Maritime Commission has proposed regulations to enable vessel operators to comply with subsection (c) of section 204 of the Trans-Alaska Pipeline Authorization Act. The Act makes the owners and operators of vessels which load certain oil at the terminal facilities of the trans-Alaska pipeline jointly, severally, and strictly liable for damages resulting from the discharge of oil from such vessels. In addition, the Act requires that financial responsibility in the amount of $14 million be demonstrated before any oil is loaded. The proposed regulations would allow certificates of financial responsibility to be issued to vessel owners demonstrating their financial responsibility. Besides the issuance of certificates, the proposed regulations discuss procedure for demonstrating financial responsibility fees for issuance of the certificates, and enforcement of the rules by the U.S. Coast Guard. Also included are samples of the forms to be used to establish the shipowner's financial responsbility. (Stadler-Florida)
W78-03340

OIL POLLUTION LIABILITY LEGISLATION TRANSMITTED TO THE CONGRESS,
G. Ford.
Department of State Bulletin, Vol 73, p 262-63, August 18, 1975.

Descriptors: *Legislation, *Oil pollution, *Oil spills, *Compensation, Protection, Coasts, Environmental effects, Water pollution, Oil industry, International waters, Water pollution sources, Transportation, Boats, International law, Treaties, Damages, Environment, Federal jurisdiction, State jurisdiction, Navigable waters.

In his message to Congress regarding his proposed Comprehensive Oil Pollution Liability and Compensation Act of 1975, President Ford outlined the deficiencies in the present manner of dealing with oil spills, the main features of the bill that would mitigate those problems, and the bill's importance to the international effort to protect the marine environment. Available data showed that one third of all oil spills were uncompensated because their sources were unidentifiable; furthermore, inconsistent Federal and state laws hampered the compensation process. This legislation would (1) establish strict liability for all oil pollution damages from identifiable sources; (2) provide relief for oil-related environmental damages; (3) establish a uniform system for settling claims; and (4) provide for compensation for spills from unidentifiable sources. The bill would be funded by placing a small fee on oil transported or stored on or near navigable waters. In addition, the bill would implement two international conventions which provide remedies for oil pollution damage from ships at sea. These remedies apply to ships not otherwise subject to American laws and courts which discharge oil that reaches this country's shores. (Jones-Florida)
W78-03343

PETROLEUM REFINING POINT SOURCE CATEGORY PRETREATMENT STANDARDS FOR EXISTING SOURCES EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 42, No. 56, p 15684-90, March 23, 1977.

Descriptors: *Federal Water Pollution Control Act, *Oil industry, *Regulation, *Effluents, Discharge(Water), Pretreatment(Water), Environment, Storm runoff, Biological treatment, Pollutants, Chromium, Phenols, Sulfides, Wastewater(Pollution), Water pollution treatment, Water pollution sources, Water pollution, Streams, Oil, Municipal water, Pollutant identification, Oil pollution, Oil wastes, Ammonia.

The Environmental Protection Agency has established interim final pretreatment standards for existing sources in the petroleum refining point source category. Two sets of pretreatment standards were established: (1) prohibited discharge standards; and (2) categorical pretreatment standards. The first set was designed to protect municipal treatment works by prohibiting the discharge of pollutants that would hinder the operation of publicly owned treatment works such as those which would cause a fire or explosion hazard or would cause corrosive structural damage. The second set contained numerical limitations on pollutants from existing sources in the petroleum refining point source category which would damage publicly owned treatment works. The regulations promulgated establish the maximum concentrations of ammonia, oil, and grease allowed to be discharged by petroleum refineries to publicly owned treatment works. Prior to the establishment of these regulations, many groups and agencies were allowed to participate in their development. The Environmental Protection Agency also conducted a study on the economic and inflationary impact of the new regulations and found it to be reasonable. (Quarles-Florida)
W78-03346

TEXTILE INDUSTRY POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 42, No. 102, p 26979-84, May 26, 1977.

Descriptors: *Industrial wastes, *Textiles, *Federal Water Pollution Control Act, *Sewage treatment, *Pre-treatment(Water), Discharge(Water), Hazards, Waste water disposal, Water pollution sources, Biological treatment, Coagulation, Waste water treatment, Pollutants, Water quality control, Industrial water, Standards, Treatment facilities, Disposal, Effluents, Sewage, Sewage effluent.

Final pretreatment standards are herein established governing existing sources in the wool scouring, wool finishing, dry processing, woven fabric finishing, knit fabric finishing, carpet mills, and stock and yarn dyeing and finishing subcategories of the textile mills point source category. Those pollutants which create a fire or explosion hazard, cause corrosive damage, obstruct sewer flow, or upset treatment efficiency are prohibited in an effort to protect publicly owned treatment plants. The economic and inflationary impact of these regulations is predicted to be minimal, and no price increases are expected as a result of these regulations. An appendix to the regulations summarizes the basis of these final pretreatment standards, and discusses various technical alternatives for compliance with the regulations. A study was made of energy requirements and nonwater quality environmental impacts of various pretreatment technologies. Comments on the regulations made by private individual and industries are included. (Brightman-Florida)
W78-03347

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION, ALASKA PIPELINE.
Federal Maritime Commission, Washington, DC.
Federal Register, Vol. 42, No. 146, p. 38798-811, July 29, 1977.

Descriptors: *Pipeline, *Oil spills, *Regulations, *Transportation, *Ships, Alaska, Administrative agencies, Coast Guard regulations, Federal government, Gasoline, Insurance, Oil, Oil fields, Oil industry, Oil pollution, Piping systems(Mechanical), Water law, Water pollution, Law enforcement.

The Federal Maritime Commission has issued regulations implementing subsection (c) of section 204 of the Trans-Alaska Pipeline Authorization Act. That subsection makes the owners and operators of vessels carrying oil which has been transported through the trans-Alaska pipeline, jointly, severally, and strictly liable for damages resulting from the discharge of oil from such vessels. The subsection further requires proof of financial responsibility for $14 million before such oil may be loaded aboard a vessel. The applicant may establish its financial responsibility by filing an insurance form, a surety bond form, or by maintaining in the United States working capital and net worth of $19 million or more, depending upon the number of vessels. The regulations will be enforced by the Coast Guard. A vessel engaged in a prohibited activity may be denied entry into any port of the United States, and may be detained at any port. The regulations also set standards for certificates; procedures for application and issuance; and the grounds for denial and revocation. (Jordan-Florida)
W78-03351

WATER RESOURCE POLICY STUDY.
Water Resources Council, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-03352

JUDICIAL MAELSTROM IN FEDERAL WATERS: A COMPOSITE INTERPRETATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
R. H. Jensen.
Fordham Law Review, Vol 45, No 3, p 625-50, December, 1976.

Descriptors: *Effluents, *Legislation, *Federal Water Pollution Control Act, *Judicial decisions, Legal review, Wastes, Water pollution, Legal aspects, Federal government, Administrative agencies, Permits, Regulation, Water Quality Act, Water pollution sources, Discharge(Water), Industrial wastes, Waste water(Pollution), Administrative decisions.

Framers of the Federal Water Pollution Control Act Amendments of 1972 strove to eliminate interpretive problems by clearly manifesting the intent of Congress upon the face of the Act. A survey of recent circuit court opinions, however, highlights rampant judicial confusion in interpreting the Act. One major problem concerns Environmental Protection Agency (EPA) authority to issue effluent limitations as regulations. Another issue is whether circuit courts have jurisdiction to review existing source regulations. The Eighth Circuit held that Section 301 of the Act does not grant the EPA the requiite regulatory authority; six months later, both the Third and Seventh Circuits found that Section 301 did authorize the EPA to issue effluent limitations as regulations. Later still, the Fourth and Tenth Circuits agreed with the Third and Seventh Circuits, but they did so via a different statutory track. Finally, the Second and District of Columbia Circuits support the majority position but use yeat another mode of analysis. Despite the great wealth of legal reasoning on this issue, each opinion contains pitfalls and consequently each remains unconvincing. It will be up to the Supreme Court to remedy the divergent views. (Moorhouse-Florida)
W78-03356

ONSHORE IMPACT OF OFFSHORE DRILLING: THE POLICE POWER ALTERNATIVE,
G. L. Barr.
Southwestern University Law Review, Vol. 8, No. 4, p. 967-91, 1976.

Descriptors: *Regulation, *Offshore platforms, *Zoning, *Environmental effects, *Land use, Coasts, Continental shelf, Land development, Oil industry, Drilling, Local governments, Legal aspects, Public rights, Exploitation, Water law, Oil, Oil pollution, Oil wastes, Water pollution sources, Legislation, State governments, Governmental interrelations.

The United States is currently engaged in a program to relieve domestic dependence on foreigh energy supplies through expanded development of mineral resources on the outer Continental Shelf (OCS). Although the OCS is a potential goldmine of energy resources, indiscriminate exploitation will lead to severely adverse environmental consequences. Numerous methods exist for controlling the onshore impacts of OCS operations such as coastal commissions and the environmental impact statement process. Another alternative is the use of the police power by local officials. This power enables the state to make all laws necessary to advance the health, safety, morals or general welfare of the people which do not violate the Constitution. Zoning is the foremost example of police power and is a major weapon in offsetting the effects of offshore development through conservation, aesthetics and protection from natural hazards. Municipal ordinances may also be used to offset adverse environmental consequencws if the end sought to be obtained by the ordinance is proper and the method utilized reasonable. A final avenue open to the local community is the utilization of the public nuisance doctrine to enjoin both harmful and aesthetic nuisances. (Moorhouse-Florida)
W78-03358

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, (Washington, DC.).
For primary bibliographic entry see Field 6E.
W78-03359

PRETREATMENT STANDARDS FOR EXISTING SOURCES AND NEW SOURCES OF POLLUTION (PROPOSED REGULATIONS FOR 21 INDUSTRIES).
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 42, No 22, p 6476-6501, February 2, 1977.

Descriptors: *Water quality standards, *Water pollution control, *Pretreatment(Water), *Industrial wastes, *Treatment facilities, Water treatment, Water pollution, Water pollution sources, Water quality control, Standards, Legal aspects, Industrial production, Industrial plants, Industrial water, Waste water treatment, Waste dilution, Waste treatment, Management, Local governments, Municipal water, Municipal wastes.

The Environmental Protection Agency has proposed rules for the establishment of pretreatment standards for existing sources and new sources of pollution involving 21 industries. The rules generally (1) provide for the prohibition of the release of pollutants which interfere with the operation of any publicly-owned treatment works; (2) require the establishment of pretreatment standards; (3) prohibit dilution to meet the standards; and (4) allow for the request of an industrial variance from the standards through a specified application procedure where the applicant must demonstrate a fundamental difference in the factors considered in establishing the standards and the applicant's effluent discharge. A variance may be granted where the established standards are thus shown to be inappropriate. In addition, the rule provide for the adoption of local rules substantially equivalent to the above, by municipalities operating their own treatment works. Provisions for special variances by local municipal plant dischargers of specific pollutants are specified. The procedure to be followed in making such applications is set forth as well. The proposed rules require the public disclosure of any information submitted or required under any of the above procedures. (Yawn-Florida)
W78-03361

THE TOWN DILEMMA (P.C.B.'S IN BLOOMINGTON, INDIANA),
D. Jordan.
Environment, Vol 19, No 2, p 6-15, March, 1977. 2 fig.

Descriptors: *Polychlorinated biphenyls, *Industrial wastes, *Indiana, *Chemical wastes, *Waste disposal, Effluents, Industrial plants, Industrial production, Water pollution, Water pollution sources, Aroclors, Sewage, Sewage sludge, Waste treatment, Solid wastes, Pesticides, Sludge, Water quality, Sewage effluents, Environmental effects, Toxins, Soil contamination effects, Water pollution effects, Industrial water.

The Westinghouse plant in Bloomington, Indiana has apparently produced economic and health problems by its use of polychlorinated biphenyls (PCB's). PCB's are to be banned entirely by 1979 under the federal Toxic Substances Control Act because of their adverse effects on human and environmental health. The Westinghouse system permits PCB's to escape in air discharges, in stormwater runoffs from outdoor plant areas, and in discharges to the city sewer system. Bloomington's interest in retaining the jobs and economic support provided by Westinghouse prevents unified opposition. Elections of last November seemed to produce public support for the Westinghouse position. Litigation continues between the company and the State of Indiana but public interest has declined and hearings were transferred to Indianapolis where testimony has been heard since November 1976. Westinghouse has attempted to join Bloomington as co-defendent in the class action suit brought by city residents. The company argued that the city's sewage effluent carried PCB's to drinking water supplies and the city's sludge brought PCB's to agricultural lands. (Mulligan-Florida)
W78-03362

STATE BOARD ADOPTS COMPREHENSIVE ACTION PLAN (WASTEWATER RECLAMATION),
D. Smith.
Western Water, p 4-6, January/February 1977.

Descriptors: *Reclaimed water, *Water reuse, *California, *Waste water treatment, Treatment facilities, Water pollution treatment, Water pollution, Water management(Applied), Water policy, Water resources, Water purification, Water quality control, Water resources development, Impaired water use, Reclamation, Water supply, Alternative water use, Water rights, Water utilization.

In January, 1977, the California State Water Resource Control Board adopted a policy encouraging wastewater reclamation and reuse of treated water. To implement that policy they will utilize the state and federal Clean Water Grant Program for funding, thus providing up to 87 1/2 percent of the cost of building treatment facilities. In addition, the Board will encourage use of reclaimed water as part of its ongoing water rights administration program. However, domestic use is not anticipated for reclaimed water. Projects that do not impair current water uses may be funded if they also: (1) make beneficial use of wastewater otherwise discharged into brackish receiving water; (2) supplement freshwater uses with reclaimed water; or (3) preserve, restore, or enhance instream beneficial uses such as fish and wildlife. Legislation may be sought to authorize Board review of water supply contracts to ensure full consideration of reclamation alternatives. The policy statement of the Board recommends further research and demonstration projects. The Association of California Water Agencies expressed support for the reclamation concept, but urged modification in areas of water rights and cost distribution. (Mulligan-Florida)
W78-03363

STATE UNDERGROUND INJECTION CONTROL PROGRAMS.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 41, No 170, p 36730-45, August 31, 1976.

Descriptors: *Water quality control, *Underground waste disposal, *Public health, *Injection wells, Waste disposal wells, Water wells, Waste storage, Rechare wells, Water quality, Potable water, Subsurface drainage, Drainage wells, Administrative agencies, Water permits, Injection, Underground structures, Regulation.

Pursuant to the Public Health Service Act, as amended by the Safe Drinking Water Act, the Environmental Protection Agency (EPA) has proposed regulations governing state underground injection control programs. The regulations establish minimum requirements for state programs to protect existing and potential underground sources of drinking water from harm from underground injection of fluids. Existing state programs are strengthened and broadened by the proposals. Three categories are created to enable regulation of diverse underground injection practices. Three categories are created to enable regulation of diverse underground injection practices. The first group includes waste disposal wells, wells used to inject materials into underground strata for storage, recharge wells, barrier wells, subsidence control wells and mining wells. The second category covers underground injection wells as they relate to oil and gas production. The third group includes drainage wells. Minimum state permit requirements applicable to wells within each of the above listed groups are set forth in detail. Requirements and procedures for the federal approval of state underground injection control programs are also specified. These regulations are based upon review by the EPA of existing state programs and on technical and policy input from diverse sources. (Josepher-Florida)
W78-03364

WATER PROGRAMS: SECONDARY TREATMENT INFORMATION (PROPOSED RULES).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 172, p 37, 222-23, September 2, 1976.

Descriptors: *Oxidation lagoons, *Waste water treatment, *Ponds, *Sewage treatment, *Sewage lagoons, Suspended solids, Federal Water Pollution Control Act, Lagoons, Regulations, Bacteria, Water quality control, Water treatment, Wastewater(Pollution), Wastes, Algae, Algal control, Sewage treatment, Settling, Basins, Ponding, Administrative agencies.

The Environmental Protection Agency (EPA) has proposed an amendment to the Secondary Treatment Information regulation promulgated pursuant to the Federal Water Pollution Control Act Amendments. The amendment provides for an upward adjustment of the suspended solids limitations in ponds which are used for secondary treatment and have a maximum capacity of one million gallons per day. This special consideration recognizes that ponds without supplemental solids

removal processes may not be capable of achieving the suspended solids requirements of the existing regulation. The EPA counsels against large scale replacement of ponds with mechanical plants because of the widespread use of ponds in small communities and because of the many benefits derived from the use of wastewater treatment ponds. Some of these benefits are: low costs of construction and operation; ease of operation; low energy requirements; and, the ability of many ponds to achieve low fecal coliform bacteria concentrations without separate disinfection processes or the use of chemical disinfectants. Variances are proposed with respect to suspended solids requirements in National Pollutant Discharge Elimination System permits for publicly-owned treatment works. (Josepher-Florida)
W78-03365

BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS AND PH (SECONDARY TREATMENT INFORMATION).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 41, No. 144, p 30786-88, July 26, 1976.

Descriptors: *Sewage treatment, *Coliforms, *Disinfection, *Federal Water Pollution Control Act, *Water quality standards, Biochemical oxygen demand, Chlorination, Treatment, Treatment facilities, Effluents, Bacteria, Water quality control, Water treatment, Water purification, Suspended solids, Chlorine, Acidity, Acid-base equilibrium, Regulation, Administrative agencies.

The Environmental Protection Agency (EPA) has amended its Secondary Treatment Information regulation, promulgated pursuant to sections 301 and 304 of the Federal Water Pollution Control Act Amendments of 1972, by deleting the fecal coliform bacteria limitations. In lieu of the deleted limitations, the EPA will henceforth rely on state water quality standards for establishment of minimum disinfection requirements for publicly owned treatment works (POTW's). Disinfection requirements will remain as conditions of permits issued under the National Pollutant Discharge Elimination System (NPDES). The EPA recognizes that continuous disinfection of all municipal wastewater discharges is not necessary to protect public health from disease. Potential effects resulting from the use of chlorine for wastewater disinfection are discussed. The value of the use of coliform bacteria and chlorine residual as microbiological indicators of wastewater contaminants is also discussed. The specification of a minimum chlorine residual as an indicator of adequate disinfection is rejected due to its process related approach and its preclusion of other disinfection processes. No changes in the amendment for pH limitation have been made. Minimum levels of effluent quality attainable by secondary treatment are described in terms of biochemical oxygen demand, suspended solids, and pH. (Josepher-Florida)
W78-03366

THE DEVELOPMENT OF THE CALIFORNIA AND FEDERAL WATER POLLUTION CONTROL PROGRAMS,
S. Cleong.
University of California, Davis, Law Review, Vol. 5, p 234-71, 1972.

Descriptors: *Coordination, *Grants, *Water quality control, *California, *Governmental interrelations, Financial feasibility, Water rights, Federal jurisdiction, Legal aspects, Regulation, State jurisdiction, Reservation doctrine, Water pollution, State governments, Financing, Costs, Capital, Participating funds, Water quality standards, Federal Water Pollution Control Act, Legislation, Standards.

The problem of federal-state interaction is prevalent in all major areas of pollution control. An analysis of the situation for controlling water pollution is relevant to other areas of pollution control as well. In the area of water pollution, Congress has held fast to the philosophy that primary responsibility for control rests with the states. However, it continues to exert influence by conditioning grants on certain prerequisites and threatening to have the Environmental Protection Agency do for the states what the states fail to do themselves. The establishment of federal water quality standards has also been successful. In California, the effect of the federal program upon California's water quality control legislation has been minimal. The area where federal activity has been most influential is the much needed federal grant program where California clearly depends on federal money. The interplay between the states and the federal government should vary according to the actual needs of the specific area of concern. Over-adherence to state responsibility can be just as damaging as an over-zealous assumption of power by Congress. (Rieck-Florida)
W78-03367

BALANCING OF INTEREST AND INTERNATIONAL LIABILITY FOR THE POLLUTION OF INTERNATIONAL WATERCOURSES: CUSTOMARY PRINCIPLES OF LAW REVISITED,
Yale Univ., New Haven, CT. Yale Law School.
G. Handl.
The Canadian Yearbook of International Law, Vol 1975, p 156-94, 1975.

Descriptors: *Water quality control, *International law, *Water pollution control, *International waters, Legal aspects, Environmental effects, Environment, Penalties(Legal), Law of the Sea, Jurisdiction, Legal review, Regulation, Water pollution, United Nations, Treaties, Law enforcement, Reasonable use.

By specifying fundamental competences and liabilities, customary international legal principles concerning transnational pollution provide the legal framework for general analysis of international environmental disputes. On the basis of case law, state practice and examined literature, it may be inferred that as a fundamental principle, state responsibility for the pollution of an international watercourse is not grounded in one uniform theoretical concept. Rather, liability for extraterritorial environmental effects is the result of a convergence of several elements. One of the primary elements is extraterritorial damage, i.e. environmental damage in the narrow sense or damage in or to the territory of another state. Another basic factor hinges on attribution of the activity causing damage to the state. Principle 21 of the Stockholm Declaration emphasizes the fact of control over the activity as an element invoking liability. Other lesser elements also considered are: (1) breach of a specific international legal obligation; (2) the specific nature of the conduct causing the pollution being a source of special danger as defined by treaty; and (3) 'unreasonable use' of the waters. In sum, a finding of state responsibility under customary international law depends on a balancing of interests, taking into account various factors pertinent to the situation under consideration. (Rieck-Florida)
W78-03368

FINAL REVISION OF REGULATIONS AND CRITERIA FOR OCEAN DUMPING.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 42, No. 7, p 2462-90, January 11, 1977, 29 p.

Descriptors: *Oceans, *Permits, *Disposal, *Waste disposal, Water quality control, Water policy, Regulations, Legal aspects, Legislation, Water pollution, Water quality standards, Water law, Toxicity, Water pollution effects, Bioassay, Hazards, Water pollution sources, Sites, Law enforcement, Dredging, Ecosystem, Environmental effects, Solid wastes.

The Environmental Protection Agency has adopted regulations affecting procedures for reviewing applications for ocean dumping and the substantive criteria for evaluating those applications. The regulations specify in detail the considerations involved in determining whether to issue a permit. They also create more comprehensive guidelines regarding the disposal of dredged material. Eight major substantive changes were made by the new regulations. Among these changes are new levels which estimate concentrates of waste which are not acutely toxic or harmful; a permit system forcing dumpers to find satisfactory alternatives as soon as possible; and environmental criteria consistent with criteria established under other laws concerning discharges into inland waters. The procedures established in reviewing applications for ocean dumping permits allow time for responsible participation in the review process while, at the same time, expediting that process. Another major change deals with the definition of 'trace contaminants'. The criteria for defining 'trace contaminants' is based on impacts on the ecosystem, measured by bioassays. (Rieck-Florida)
W78-03369

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR NEW SOURCE NPDES PERMITS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-03370

EXISTING REMEDIES FOR WATER POLLUTION,
Florida Univ., Gainesville. School of Law.
B. S. Russell.
Available from Eastern Water Center, University of Florida, Gainesville, Florida 32611, for $1.75. Spring 1970. 31 p.

Descriptors: *Water pollution control, *Florida, *Pollution abatement, *Penalties(Legal), *Remedies, Regulation, Governments, Common law, Negligence, Law enforcement, Legislation, Water quality standards, Water rights, Trespass, Rivers and Harbors Act, Federal Water Pollution Control Act, Legal aspects, Compensation, Navigable waters, Reasonable use, Water pollution, Damages.

Pollution control is best handled by the governmental agencies created for that purpose. Because of the inadequacies in common law, there have been many developments in federal, state and local legislation to control and protect water quality. These developments have, in turn, had an impact upon traditional private remedies for water pollution. Federal control over pollution is accomplished by the Federal Water Pollution Control Act. This act limits private remedies because compliance with the standards of the Act is a defense to pollution allegations. In Florida enforcement of clean waters is shared by the State Board of Health and the Florida Department of Air and Water Pollution Control. The Florida statutes under which the agencies operate attempt to protect private actions, as well as allowing for state actions. The principal theories of action used by individuals are nuisance, trespass, negligence, strict liability and inverse condemnation. The claims are subjected to a balancing of conveniences test in which the court will attempt to measure benefits and costs to each. The defenses raised are the statute of limitations, prescription, laches and agreement. (Maass-Florida)
W78-03372

SALT WATER INTRUSION IN FLORIDA (LEGAL APPROACHES TO PREVENTION AND CONTROL),
Florida Univ., Gainesville. School of Law.
J. G. Helwig.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611, for $2.45. Spring 1969, 38 p.

Descriptors: *Saline water intrusion, *Hydrologic aspects, *Florida, *Well regulations, Aquifer systems, Aquifers, Coasts, Groundwater, Permeability, Saline water barriers, Tidal streams, Wells, Freshwater, Water pollution, Mixing, Encroachment, Well permits, Drilling, Saline water-fresh water interfaces, Legislation, Canals, Artesian wells.

Sea water, which is heavier than fresh water because of dissolved salts, moves into fresh water supplies in coastal areas if the fresh water level becomes too low. Invading salt water may extend upstream where tidal waters have access to the stream and the stream flow is not great enough to sweep the salt water out. If the fresh water aquifer is open to the sea, lowering the freshwater level permits direct inflow of salt water. Also, residual salt water trapped beneath impervious rock layers may contaminate higher fresh water aquifers when improper well drilling techniques or equipment allow vertical mixing of the aqiufers. Salt water intrusion in Florida results from increased water use, excessive drainage, lack of protection against tidal waters in canals, improper drilling techniques, and waste. Corrective legal measures include artesian well capping statutes to prevent waste, implementation of salt water barrier lines in tidal channels, and licensing and regulation of well drilling. Florida has either enforcement or statutory problems in each of these areas. (Malloy-Florida)
W78-03373

PORTER COUNTY CHAPTER OF IZAAK WALTON LEAGUE OF AMERICA, INCORPORATED V. TRAIN (PROCEDURAL RULES FOR INTERVENORS IN ENVIRONMENTAL PROTECTION AGENCY ADMINISTRATIVE HEARINGS).
For primary bibliographic entry see Field 6E.
W78-03377

SAVE THE BAY, INCORPORATED V. MISSISSIPPI AIR AND WATER POLLUTION CONTROL COMMISSION (HEARING REQUIREMENTS FOR DISCHARGE PERMITS UNDER NPDES).
For primary bibliographic entry see Field 6E.
W78-03378

APPALACHIAN POWER COMPANY V. TRAIN (REVIEW OF EPA REGULATIONS GOVERNING DISCHARGE OF HEAT).
For primary bibliographic entry see Field 6E.
W78-03380

DUPONT DE NEMOURS COMPANY V. TRAIN (EFFLUENT LIMITATIONS BASED UPON INDUSTRY-WIDE REGULATIONS PERMISSIBLE UNDER SECTION 301).
For primary bibliographic entry see Field 6E.
W78-03381

NO OIL, INCORPORATED V. OCCIDENTAL PETROLEUM CORPORATION (EXEMPTIONS FROM PERMIT REQUIREMENTS UNDER THE CALIFORNIA COASTAL ZONE CONSERVATION ACT).
For primary bibliographic entry see Field 6E.
W78-03385

PLEASANT VIEW UTILITY DISTRICT V. VRADENBURG (RECOVERY FOR TAKING OF FLOWAGE EASEMENT BARRED BY STATUTE OF LIMITATIONS).
For primary bibliographic entry see Field 6E.
W78-03389

FLORIDA SAFE DRINKING WATER ACT (PROPOSED LEGISLATION).
For primary bibliographic entry see Field 6E.
W78-03390

CARMEL VALLEY VIEW, LIMITED V. BOARD OF SUPERVISORS, IN AND FOR COUNTY OF MONTEREY (DENIAL OF USE OF SEPTIC TANKS IN PROPOSED SUBDIVISION).
For primary bibliographic entry see Field 6E.
W78-03393

CITY OF BOULDER V. BOULDER AND LEFT HAND DITCH COMPANY (RIGHTS OF JUNIOR APPROPRIATORS TO RETURN FLOW).
For primary bibliographic entry see Field 6E.
W78-03398

STATE EX REL. BROWN V. BROOKSIDE RECLAMATION, INCORPORATED (EXHAUSTION OF ADMINISTRATIVE REMEDIES REQUIRED BEFORE INSTITUTION OF NUISANCE ACTION).
For primary bibliographic entry see Field 6E.
W78-03399

ARKANSAS RIVER BASIN COMPACT, KANSAS-OKLAHOMA.
For primary bibliographic entry see Field 6E.
W78-03408

BIG BLUE RIVER COMPACT, KANSAS-NEBRASKA.
For primary bibliographic entry see Field 6E.
W78-03409

WATER QUALITY ACT.
For primary bibliographic entry see Field 6E.
W78-03412

HOOKER CHEMICALS AND PLASTICS CORPORATION V. TRAIN (REVIEW OF ENVIRONMENTAL PROTECTION AGENCY'S NEW SOURCE REGULATIONS FOR PHOSPHATE MANUFACTURING INDUSTRY).
For primary bibliographic entry see Field 6E.
W78-03413

HOOKER CHEMICALS AND PLASTICS CORPORATION V. TRAIN (FEDERAL COURT REVIEW OF ENVIRONMENTAL PROTECTION AGENCY GUIDELINES).
For primary bibliographic entry see Field 6E.
W78-03414

AMERICAN IRON AND STEEL INSTITUTE V ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION FOR JUDICIAL REVIEW OF ENVIRONMENTAL PROTECTION AGENCY REGULATIONS).
For primary bibliographic entry see Field 6E.
W78-03416

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT (VOLUME I-TEXT).
Forest Service (USDA), Washington, DC.
For primary bibliographic entry see Field 5B.
W78-03417

MATHEMATICAL METHODS FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. Nakamura, and E. D. Brill, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 660, Price codes: A09 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 130, November 1977. 168 p, 23 tab, 30 fig, 7 ref, 2 append. OWRT A-082-ILL(2).

Descriptors: Optimization, *Regional planning, *Sewage treatment, Pollution, *Alternative planning, *Input-output analysis, Regional analysis, Mathematical studies, *Waste water treatment, Water pollution control, Branch and bound tree(Matrix).

A mathematical method is presented that deals with regionalization of wastewater systems, a complex public sector planning problem. The method focuses on generating alternative physical plans efficiently and systematically so that planning issues other than economic efficiency may be meaningfully integrated into the process of comparing alternative plans. Such a method, although simple in concept, can aid analysts in developing insights. Two types of alternative plans can be generated by the method, single-time period plans and simplified multiperiod plans. In generating alternatives plans, the method takes advantage of the structure of a branch-and-bound algorithm. A branch-and-bound tree may be transformed into a matrix called the imputed value incidence matrix which displays the incidence relationship between each of the alternative plans and the state of variables (regional facilities) associated with it. Once the matrix is constructed the imputed value of a given variable or a given set of variables can be obtained from the matrix. An application of the method to a realistic example problem is presented and the interpretation of imputed values is discussed.
W78-03420

MIXED INTEGER PROGRAMMING MODELS FOR WATER RESOURCES MANAGEMENT,
Utah Water Research Lab., Logan.
B. Finney, W. J. Grenney, A. B. Bishop, and T. C. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 699, Price codes: A13 in paper copy, A01 in microfiche. Utah Water Research Laboratory Publication PRWG198-1, December 1977. 287 p, 33 tab, 12 fig, 42 ref, 7 append. OWRT B-145-UTAH(1), 14-34-0001-7132.

Descriptors: *Programming, Model studies, *Optimization, River basin development, *Planning, Water resources, Water supply, Water quality, *Regional analysis, *Simulation analysis, Path of pollutants, Waste water treatment, *Jordan River(Utah).

A regional water quality control model is developed by linking a steady-state water quality simulation model with an optimization model. The water quality simulation model can be applied to complex river systems with both point and nonpoint loads using multiple interdependent pollution parameters described by either linear or nonlinear equations. Twelve water quality parameters can be modeled simultaneously: four nonconservative constituents (or conservative constituents if the decay rate is set equal to zero); coliform bacteria (MPN); phosphorus; biochemical oxygen demand (BOD); ammonia (NH3); nitrate (NO3); dissolved oxygen (DO); temperature (C); and algae. The water quality model is used to generate constraint equations for the optimization model. The optimization model is formulated as an integer programming problem in which the integer decision variables are wastewater treatment levels or dif-

fuse source management practices to be determined for each load. The model considers the addition or upgrading of wastewater treatment with structural and nonstructural schemes for both point and diffuse pollution sources. A least cost solution is found subject to water quality standards at surveillance points. Additional constraints can include uniform and zoned uniform treatment. Low flow augmentation and bypass piping can be considered with slight water quality simulation model modification. A simulation model-optimization model iteration procedure is used to find an optimum solution.
W78-03421

PROCEEDINGS, RESEARCH PLANNING CONFERENCE ON THE AQUATIC PLANT CONTROL PROGRAM, 22-24 OCTOBER 1975, CHARLESTON, S.C.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 072, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper No. A-76-2, (Final Report), December 1976. 129 p, 3 append.

Descriptors: *Herbicides, *Aquatic weed control, *Biocontrol, *Chemcontrol, *Pesticide residues, *Aquatic Plant Control Program, U.S. Army Corps of Engineers, Water hyacinth, Alligatorweed, Insects, Pathogenic fungi, Bacteria, Water pollution control, Eutrophication, Water pollution treatment, Model studies, Eichhornia crassipes, Hydrilla verticillata, Alternanthera philoxeroides, Eurasion water milfoil, Myriophyllum spicatum, White amur, Ctenopharyngodon idella.

The Research Planning Conference on the Aquatic Plant Control Program of the U.S. Army Corps of Engineers was held October 22-24, 1975 in Charleston, South Carolina. The conference was arranged by the Construction-Operations Division, Directorate of Civil Works, of the Office of the Chief of Engineers to review current operations activities and current research projects of the Aquatic Plant Control Program. Three general types of research are described: (1) effects and fate of herbicides in the aquatic environment, including 2,4-D in slow-moving water, and controlled-release herbicides (2) biological control agents, including insects, white amur, pathogenic fungi, and pathogenic bacteria; and (3) use of integrated control methods, such as combinations of pathogens and insects tested at Lake Concordia, Louisiana. An overview of the research program discusses other research efforts not reported in these proceedings--rapid survey techniques, a mathematical model for selection of appropriate control techniques for a given problem, and mechanical control--as well as efforts to redirect the control program to be more operationally oriented. Several papers also deal with state certification programs for applicators of aquatic herbicides (Georgia, Florida, Texas, Oklahoma, and Arkansas), and surveys are given of aquatic weed problems in Puerto Rico, Oklahoma, Mexico, and Texas. (See W78-03430 thru W78-03443) (Lynch-Wisconsin)
W78-03429

HISTORY OF THE AQUATIC PLANT CONTROL PROGRAM,
Office of the Chief of Engineers (Army), Washington, D. C. Construction Operations Div.
E. O. Gangstad.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p C3-C9, December 1976. 1 tab.

Descriptors: *History, *Aquatic weed control, *U.S. Army Corps of Engineers, *Aquatic Plant Control Program, Biocontrol, Chemcontrol, Herbicides, Alligatorweed, Pesticide residues, Environmental effects, Insects.

Ten years of activity of the Research Advisory Committee of the Expanded Project for Aquatic Plant Control are reviewed. The Federal Rivers and Harbors Act of 1965 authorized the aquatic plant control program under the jurisdiction of the U.S. Army Corps of Engineers. The first meeting of the committee was held in Galveston, Texas in October 1966. In 1965 there were five research programs underway: (1) U.S. Department of Agriculture (Crops and Entomology), on herbicides and insect control; (2) U.S. Fish and Wildlife Service, on the effects of herbicides on fish and benthic organisms; (3) Federal Water Control Administration, on pesticide residue toxicity; (4) Auburn University, on the environmental effects of herbicide treatment; and (5) University of Southwestern Louisiana, on the effects of synergistic agents on herbicide cntrol. Research on aquatic plant control since 1966 has included: (1) a carbon dioxide laser (1968) for control of aquatic plants; field model test results did not justify field application; (2) controlled-release herbicides (1968) (no successful field application as yet); (3) use of herbivorous fish (1969), including development of monosex white amur; a large-scale test program is being planned for Lake Conway, Florida; (4) residues of 2,4-D, endothall, and diquat in fish and shellfish (1970); and (5) control of alligatorweed (1971). The Aquatic Plant Control Program is a cooperative program involving 12 states, with costs shared at 70% federal and 30% state. (See also W78-03429), (Lynch-Wisconsin)
W78-03430

RECENT SOUTH AMERICAN FIELD STUDIES OF PROSPECTIVE BIOCONTROL AGENTS OF WEEDS,
Agricultural Research Service, Stoneville, MS. Southern Weed Science Lab.
G. B. Vogt, and H. A. Cordo.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 36-55, December 1976. 1 tab, 29 ref.

Descriptors: *South America, *Biocontrol, *Insects, *Aquatic weed control, Weed control, Agriculture, Ecology, Niches, Water hyacinth, Gulf Coastal Plain, Southeast U.S., Regions, Brazil, Argentina, Paraguay, Uruguay, Host specificity, Alligatorweed, Water milfoil, Myriophyllum, Egeria, Alternanthera, Eichhornia.

Potential use of South American insects as weed biocontrol agents in southern U.S. states was studied in terms of biogeography, ecology, and host plant specificity in Brazil, Argentina, Paraguay, and Uruguay. Priority was given to three aquatic (Myriophyllum, Egeria, and Alternanthera) and three row crop weeds (Sida, Anoda, and Amaranthus). Attention was also given to Eichhornia, Pontederia, and Pistia. Possible control agents for each plant are discussed in detail, followed by an analysis of biogeographical and ecological considerations. For Myriophyllum brasiliense control, it appears that lysathia flavipes is nearly an ecological homolog of the North American L. ludoviciana, and Hyperodes marginicollis is an ecological analog of Perenthis vestitus. No insects were found affecting Egeria densa of E. naias. Regarding alligatorweed, Disonya argentinensis is clearly an ecological nonhomolog or nonanalog, and is a more specialized and possibly more effective agent that the North American D. xanthomelas and D. collata; more testing for host specificity is needed, however. Enemies of row crop weeds appear to be ecological homologs of species already found in the southern U.S. (mostly south of Vicksburg, Mississippi). Of the remaining insects, some are clearly ecological nonanalogs. (See also W78-03429) (Lynch-Wisconsin)
W78-03431

AQUATIC WEED PROBLEMS IN MEXICO AND TEXAS AND SOME OF THE MEASURES FOR THEIR CONTROL,
Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program.
L. V. Guerra.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 56-63, December 1976. 3 fig, 2 tab.

Descriptors: *Mexico, *Texas, *Aquatic weed control, *Water hyacinth, Biocontrol, Mechanical control, Chemcontrol, Herbicides, Eutrophication, Hydrilla, Water lettuce, Salvinia, White amur, Manatees, Elodea.

The aquatic nuisance weeds water hyacinth, water lettuce, and Salvinia have been problems in central and southern Mexico since 1890, and Hydrilla is currently present in the water-supply lake of the city of Monterey. Submerged problem weeds are Chara, Najas sp., and Myriophyllum sp. Manual and mechanical measures have not been adequate for suppression of water for irrigation is too valuable; harvesters have created algal blooms, while chemicals are expensive and application information is lacking. White amur have been successfully used for biocontrol, but manatees succumbed to disease. In Texas the major aquatic weed problem is water hyacinth, but of the nine watersheds with water hyacinth or alligatorweed problems, four are in a control phase and five are at the maintenance level. In many maintenance lakes, however, receding water levels, warm days, and moisture have produced a new hyacinth crop every 60-90 days. Access to these areas of shallow water and dense brush is virtually impossible, and a special vehicle is needed. Although the Guadalupe River has been largely cleared of hyacinths, an invasion of Elodea has occurred. Alligatorweed is being controlled in the north coastal area with flea beetles (Agasicles sp.). Research on chemical methods of hydrilla control showed Hydeout produced the greatest plant knockdown. (See also W78-03429)
W78-03432

FIELD TRIP, GOOSE CREEK RESERVOIR,
Army Engineer District, Charleston, SC.
For primary bibliographic entry see Field 4A.
W78-03433

AQUATIC PLANT PROBLEMS IN PUERTO RICO,
Army Engineer District, Jacksonville, FL. Aquatic Plant Control Section.
For primary bibliographic entry see Field 4A.
W78-03434

RECONNAISSANCE SURVEY OF AQUATIC WEED INFESTATIONS IN LAKES AND NAVIGABLE STREAMS IN OKLAHOMA,
Oral Roberts Univ., Tulsa. Dept. of Natural Science.
R. Couch.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 26-35, December 1976. 1 fig, 3 tab, 14 ref.

Descriptors: *Oklahoma, *Aquatic weed control, *Eurasian water milfoil, Lakes, Streams, 2,4-D, Chemcontrol, Mechanical control, Reservoirs, Baseline studies, Myriophyllum spicatum, Water willow, Dianthera americana.

A comprehensive survey of aquatic weed infestations in Oklahoma shows that Eurasian water milfoil (Myriophyllum spicatum) and water willow (Dianthera americana) are the most serious problems. Water star grass (Heteranthera dubia), Chara spp., and filamentous algae (Pithophora and Spirogyra) are other problem plants. M. spicatum was first officially reported in 1964, but unofficial reports go back to 1938. An estimated 8,206 acres

are currently infested by the weed, which was probably introduced via aquarium dealers. The worst infestations are in Lake Thunderbird, Fort Cobb Reservoir, Shawnee Twin Lakes, Wichita Mountains Wildlife Refuge, and Lake Humphries. Propagated by seeds or vegetative fragments, it is spaced mainly by boats, other recreational gear, or by birds. Plant fragments can survive up to 21 days of drying. The herbicide 2,4-D has been effectively used in Fort Cobb Reservoir, where evapotranspiration had become a serious problem. Moderate to dense stands of D. americana occur in 12 Oklahoma lakes and streams, mostly in the northeast; the plant grows along shores in water up to 10 ft deep. A total of 1,500 acres is infested. Limited mechanical control has been used in Spavinaw Lake. Recommendations are that a control rather than eradication program be established for water milfoil together with yearly aerial reconnaissance surveys of infested areas. (See also W78-03429) (Lynch-Wisconsin)
W78-03435

AQUATIC WEED VERSUS PLANT PATHOGEN, A STUDY OF A BIOLOGICAL CONTROL IN ACTION,
Florida Univ., Gainesville. Dept. of Plant Pathology.
K. E. Conway, T. E. Freeman, and R. Charudattan.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 85-89, December 1976. 6 fig. DACW 73-73-0049.

Descriptors: *Biocontrol, *Aquatic weed control, *Water hyacinth, *Pathogenic fungi, *Cercospora rodmanii, Fungi, Reservoirs, Lakes, Florida, Seasonal, Succession, Eichhornia crassipes, Rodman Reservoir(FL), Lake Alice(FL).

A pathogenic fungus, Cercospora rodmanii, is being tested as a biocontrol against water hyacinth in Lake Alice and Rodman Reservoir, Florida. The fungus was isolated after widespread decline of water hycinth (Eichhornia crassipes) was observed in the reservoir in 1971. Inoculations of C. rodmanii were applied to a small 1.7-ha pool of Lake Alice in September-October 1974; a 6.4-m spray arc from the bank covered 64.42 sq m. The entire pool, as well as part of Lake Alice, was infected by late November. By January browning was complete in the pool, and plants appeared to have been killed. Warm temperatures caused new growth in late January and February, but plants reached only 6 in. instead of the normal 2-3 ft; in Lake Alice plants attained the normal 3-4 ft height. By June new leaves were outgrowing the disease, despite four additional sprayings; but with cooler fall temperatures a general browning occurred by mid-September, a month ahead of the previous year. In Rodman Reservoir, where disease severity had declined since 1971, five sprays were applied from the shoreline in February-May 1975 to test plots at the reservoir's edge. By mid-April, a growth reduction was noted, in addition to complete browning of plants in the main part of the reservoir by June due to a heavy natural infection. In one of the spray areas 35-40 acres of water opened by mid-October, but a 20-acre water lettuce invasion replaced dead water hyacinth in another area. (See also W78-03429) (Lynch-Wisconsin)
W78-03436

EXTENSIVE DEGRADATION OF SILVEX BY SYNERGISTIC ACTION OF AQUATIC MICROORGANISMS,
Syracuse Univ. Research Corp., NY.
For primary bibliographic entry see Field 5B.
W78-03437

CONTROLLED RELEASE HERBICIDES - RUBBER FORMULATIONS,
Creative Biology Lab., Inc., Barberton, OH.
G. A. Janes.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 90-94, December 1976. 4 tab. DACW-73-C-0042.

Descriptors: *Aquatic weed control, *Herbicides, *Rates of applications, *Chemcontrol, *Chronicity, *Copper sulfate monohydrate, *Slow-release treatment, Copper, Ions, Toxicity, Water hyacinth, Vallisneria americana, Cabomba caroliniana, Myriophyllum spicatum, Eurasian water milfoil, Eichhornia crassipes.

Laboratory tests show that aquatic weeds can be controlled through chronic intoxication ('chronicity') with ultralow herbicide dosages administered continually from slow-release systems. In current experiments, chronicity of copper sulfate monohydrate was demonstrated in tests on Vallisneria americana, Cabomba caroliniana, Myriophyllum spicatum (Eurasian water milfoil), and Eichhornia crassipes (water hyacinth). An effective level of copper ion can be released over 5-7 months. Plants were potted in topsoil, placed in 1-gal glass aquaria containing 3 liters deionized water, and allowed th stabilize for four weeks. E-51 pellets were then added at 1, 10, 50, and 100 ppm with respective copper ion contents of 0.175, 1.75, 8.75, and 17.5 ppm. Temperature was maintained at 70-76F. Little significant difference was noted by pellet size, and chronic intoxication rate may have been exceeded. At 100 ppm for V. americana 100% mortality was achieved by the 60th day, for M. spicatum 79% mortality by the 60th day, and for C. caroliniana 100% mortality by the 35th day. At 1 ppm for V. americana and M. spicatum mortality at 10 ppm in 40 days, and at 50 ppm in 35 days. At copper ion concentrations of 0.03, 100% mortality was achieved for V. americana in 60 days and for C. caroliniana in 45 days; mortality was 80% for M. spicatum in 60 days. After 60 days mortality in controls ranged from 7-25%. (See also W78-03429) (Lynch-Wisconsin)
W78-03438

LARGE-SCALE FIELD TEST WITH THE MONOSEX WHITE AMUR IN FLORIDA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. L. Decell.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 112-126, December 1976. 13 fig, 1 tab.

Descriptors: *Biocontrol, *Aquatic weed control, *White Amur monosex fish, *Lake Conway(FL), Ecosystems, Model studies, Florida, Lakes, Baseline studies, Monitoring, Hydrilla verticillata, Ctenopharyngodon idella.

The White Amur fish, Ctenopharyngodon idella, was chosen among various aquatic weed control agents by the U.S. Army Corps of Engineers for operational-scale testing because of its great control potential as evidenced in research programs. Biological control appears to offer the best long-term permanent solution to many aquatic weed problems. The experiment will use monosex (female) white amur to control Hydrilla verticillata in the 1,820-acre Lake Conway, Florida chain of five lakes. Monosex fish minimize but do not eliminate the risk of reproduction. The project schedule is: (1) January 1976-March 1977, baseline data collection; (2) spring 1977, stocking of white amur; and (3) spring 1977-1980, continuous monitoring of data groups. Three major models are currently being developed, including a white amur stocking model, an ecosystems response model, and an operations model. All are deterministic models intended to display responses for given conditions, and are primarily based on currently available data. The fish will be obtained from 35,000 produced in a monosex spawning experiment in Stuttgart, Arkansas by the U.S. Fish and Wildlife Service. (See also W78-03429) (Lynch-Wisconsin)
W78-03439

POSSIBLE EFFECTS OF THE INTRODUCTION OF THE WHITE AMUR INTO LAKE CONWAY, FLORIDA,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W78-03440

INTEGRATED CONTROL OF WATER-HYACINTHS WITH FOUR BIOLOGICAL AGENTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
W. N. Rushing.
In: Proceedings, Research Planning Conference on the Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 106-109. 1 fig.

Descriptors: *Biocontrol, *Aquatic weed control, *Water hyacinth, *Insects, *Pathogenic fungi, Louisiana, Testing procedures, Eichhornia crassipes, Water hyacinth weevil, Neochetina eichhorniae, Arzama densa, Cercospora, Acremonium zonatum, Lake Concordia(LA).

Combinations of four biological control agents were applied to experimental plots of water hyacinth (Eichhornia crassipes) at Lake Concordia, Louisiana: (1) the water hyacinth weevil Neochetina eichhorniae, (2) moth Arzama densa, (3) fungus Cercospora, and (4) zonate leaf spot fungus Acremonium zonatum. Tests plots consisted of 64 aluminum-pipe frames 2 m by 2m by 46 cm high, supporting a perimeter of chicken wire and a flooring of nylon-mesh netting. In early spring 1975 plants were collected locally and placed in the enclosures. Plant weight and height were measured at two-week intervals. Weight was determined through lifting the enclosure with an electronic winch supported by two boats; plants were held in place by nylon net. Each agent alone was tested, plus eight treatment combinations and four controls; each treatment included four replications. Little effect of Arzama or Acremonium alone was noted in preliminary observations, but Neochetina alone resulted in total plant weight per plot of about 106 kg by the end of September 1975, compared with 140 kg in control plots. Cercospora plots registered total weight of about 127 kg. A combination of Arzama and Neochetina resulted in total plant weight of about 100 kg by September 30, compared with about 95 kg for Arzama, Neochetina, and Cercospora together, and 75 kg for all four agents in combination. (See also W78-03429) (Lynch-Wisconsin)
W78-03441

2,4-D IN SLOW-MOVING WATER,
University of Southwester Louisiana, Lafayette. Dept. of Plant Industry.
For primary bibliographic entry see Field 5B.
W78-03442

WATERHYACINTHS - A NUISANCE OR A BENEFIT,
National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
B. C. Wolverton.
In: Proceedings, Research Planning Conference on Aquatic Plant Control Program, 22-24 October 1975, Charleston, S.C., p 110-111, December 1976. 8 ref.

Descriptors: *Water hyacinths, *Biological treatment, *Water pollution treatment, *Beneficial use, Waste treatment, Sewage treatment, Benefits, Suspended solids, Pollutants, Nutrients, Sewage lagoons, Methane, Fertilizers, Feeds, Heavy metals, Eichhornia crassipes.

Water hyacinth, Eichhornia crassipes, can be used beneficially for removal of pollutants from waste water and for production of many useful raw

materials. In sewage lagoons containing warm, enriched sewage, water hyacinths grow at a phenomenal rate of 8-16 tons of biomass per acre per day and are capable of absorbing, metabolizing, and concentrating large amounts of chemical pollutants at predictable rates, rendering the plants suitable for biological heavy metal monitoring systems. In waste treatment lagoons they can reduce total suspended solids and DOD5 levels and remove nutrients and other pollutants. Animal feed and fertilizer can be produced from water hyacinths grown in domestic sewage free of toxic heavy metals, and methane gas from plants grown in any type of chemical or sewage wastewaters. Harvested plants possess valuable protein, nutrients, and other minerals. Economical transporation and utilization of the harvested material requires drying, because the plants contain about 95% water by weight. Mechanical dewatering is unsuitable as pressing results in loss of large quantities of nutrients. A newly designed solar drying system, which will begin operation in April-May 1976, will reduce moisture to an optimum 5%. Water hyacinths grown in nutrient-rich sewage contain up to 20-25% crude protein by dry weight. (See also W78-03429) (Lynch-Wisconsin)
W78-03443

EFFECT OF VEGETATION ON LANDFILL STABILIZATION,
Auburn Univ., AL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-03448

DEVELOPMENT OF SUSPENDED SOLIDS QUALITY CONTROL AND PERFORMANCE EVALUATION SAMPLES,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5A.
W78-03450

EVALUATION OF INSTRUMENT FOR THE DETERMINATION OF PHENOL IN WATER,
Central State Univ., Wilberforce, OH. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-03452

THE ENVIRONMENTAL EFFECTS OF USING COAL FOR GENERATING ELECTRICITY,
Argonne National Lab., IL.
For primary bibliographic entry see Field 6G.
W78-03455

USER HANDBOOK FOR THE ALLOCATION OF COMPLIANCE MONITORING RESOURCES,
Systems Control, Inc., Palo Alto, CA.
G. P. Grimsrud, E. J. Finnemore, W. J. Winkler, R. N. Patton, and A. I. Cohen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 692, Price codes: A15 in paper copy, A01 in microfiche. Report No. EPA-600/5-76-012, December 1976. 314 p, 31 fig, 65 tab, 32 ref. 1HC619, 68-01-2232.

Descriptors: *Waste water(Pollution), *Monitoring, *Data collections, Regulation, Water quality standards, Effluents, Statistical methods, Environment, Cost-benefit analysis, Resource allocation, *Standards compliance, Environmental planning.

A handbook designed for use by environmental planners and managers, presents the development and successful demonstration of hand and computerized procedures for the design of effluent compliance monitoring systems; a guide for determining whether effluent sources are in compliance with effluent standards was the objective. The procedures outlined incorporated Federal regulation requirements for compliance monitoring to validate self-monitoring reports and support enforcement actions, including scheduled and random quality control inspection of monitoring reports and equipment, follow-up inspections when an effluent standard violation is suspected, and ad hoc intensive surveys when there is evidence of a water quality violation. The procedure developed determines how often to monitor each source in a region to obtain maximum benefit from the compliance monitoring program, using information from past self-monitoring, ambient monitoring, and compliance monitoring reports. Resource allocation procedures and criteria are described as dependent on determination of statistical characteristics of effluent streams. The maximum marginal return method for solving the resource allocation problem is based on the concept of allocating resources where marginal return is greatest, yielding a relation between minimized cost of undetected violations and the corresponding resource cost. Thus, by setting up a priority list for monitoring tasks and removing samples from the list that have been allocated, the remaining items will be, in descending order, the ones that should be monitored with an increase in resources. General requirements for manpower, data, and computers for either hand or computer calculation are described, and procedures are demonstrated for both calculation methods. Computer program documentation is included as the Effluent Monitoring Program (EFFMON). (Wares-IPA)
W78-03458

LAKE CONSTANCE: ENDANGERMENT AND POSSIBILITIES FOR REHABILITATION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
For primary bibliographic entry see Field 5C.
W78-03464

SEEPAGE FROM OXIDATION PONDS,
Tahal Water Planning for Israel Ltd., Tel Aviv. Dept. of Sewage Reclamation.
For primary bibliographic entry see Field 5B.
W78-03472

SIXTH SEMIANNUAL INTERAGENCY BRIEFING FEBRUARY 1976, WASHINGTON, D.C.,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. C. Calhoun, Jr, R. M. Engler, M. D. Malkasian, R. M. Mecca, and H. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 187, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper D-76-19, July 1976. 136 p, 90 fig, 2 append.

Descriptors: *Dredging, *Research and development, *Projects, Disposal, Water, Monitoring, On-site investigations, Environmental effects, Sampling, Oceans, Movement, Costs, *Dredged material, *Research programs, Dredging costs, Disposal area.

Briefings given semiannually to representatives of the Corps of Engineers and other Federal agencies were edited to present the status of the Dredged Material Research Program (DMRP). Significant progress was made in all DMRP project areas as evidenced by the shift of emphasis from paper and laboratory studies to field studies. The latter were the testing grounds for many of the concepts explored and verified by laboratory results. Other field studies demonstrated the productive uses of dredged material and the feasibility of dredged material becoming a natural resource. Problems, accomplishments, and objectives within each of four projects were discussed: the Environmental Impacts and Criteria Development Project, the Habitat Development Project, the Disposal Operations Project, and the Productive Uses Project. The research covered a diversity of problems on the disposal, effects of disposal, and possible uses of dredged material. The research was conducted under contract with universities, cooperations, and Government agencies throughout the United States. In February 1976, the DMRP was 60% complete. (Roberts-ISWS)
W78-03477

LANDSCAPE CONCEPT DEVELOPMENT FOR CONFINED DREDGED MATERIAL SITES,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W78-03478

FIRST ANNUAL REPORT ENVIRONMENTAL PROTECTION AGENCY/CORPS OF ENGINEERS TECHNICAL COMMITTEE ON CRITERIA FOR DREDGED AND FILL MATERIAL,
Environmental Protection Agency, Washington, DC.
F. G. Wilkes, and R. M. Engler.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 662, Price codes: A04 in paper copy, A01 in microfiche. Report, March 1977. 53 p, 1 tab, 1 ref, 2 append.

Descriptors: *Dredging, *Environmental control, *Landfills, Water pollution control, Marine plants, Ecology, Mixing, Wetlands, Biocontrol, Research and development, Information exchange, Wastes, Marine protection.

A technical committee of scientists and engineers from research elements of the Environmental Protection Agency (EPA) and the Army Corps of Engineers Waterways Experiment Station (CE) was formed in late 1975 to act as a focal point for coordinating and disseminating agency research related to regulatory functions pursuant to Sections 404 and 103 of Public Laws 92-500 and 92-532, respectively. The committee was chaired by the EPA and CE. A major goal of the Technical Committee was the development of a comprehensive manual for technical implementation of all technical phases of Public Laws 92-500 and 92-532. Other objectives of the Technical Committee were to recommend needed research priorities in order to implement fully Sections 404 and 103, to establish joint projects and priorities, to conduct joint program reviews, to avoid duplication of effort, and to exchange and to disseminate research results. A listing of 16 research areas was presented, with each area of research assigned an overall priority; projected costs and duration of study also were presented. (Roberts-ISWS)
W78-03481

OIL SPILL RECOVERY METHOD AND APPARATUS,
R. S. Jenkins.
U.S. Patent No. 4,038,182, 7 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 960, No 4, p 1747, July 26, 1977.

Descriptors: *Patents, *Oil spills, *Oily water, *Water pollution control, *Water quality control, Separation techniques, Vortices, Flow, Equipment, Oil recovery.

A method and apparatus recovers an immiscible oily substance spread as an oily film over the surface of a body of water by forming a vortex in the water mass to attract the oily film and water. The water and oily film flow into the vortex and then flow into a quiescent zone to enable separation of the oily film and water. The separated oil is retained in a receiver and recovered as desired. (Sinha-OEIS)
W78-03600

METHOD FOR DESTRATIFYING BODIES OF WATER,
J. W. Clark.

U.S. Patent No. 4,039,439, 11 p, 14 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 254, August 2, 1977.

Descriptors: *Patents, *Water quality control, Water circulation, Mixing, *Stratification, Aeration, Water quality, Water treatment, Bubbles, *Destratification.

A method for improving the quality of large bodies of water so that the general overall quality is improved comprises placing in the lower reaches of a large body of water means for generating hydrogen and utilizing the bouyancy of the hydrogen as a vehicle to carry the hydrogen-saturated water to the surface so that the water is subjected to natural aeration and sunlight without the vehicular hydrogen leaving the surface of the body of water. The method is described in which the hydrogen is produced electrolytically in conjunction with oxygen and in which the hydrogen bubble sizes are controlled within a range of from 100 to 600 microns and secondary benefits are provided in that the oxygen generated combines with the hydrogen-saturated water in the lower reaches of the body to the water to tend to improve bacterial conditions in the lower reaches of the body of water. (Sinha-OEIS)
W78-03605

FLUID SEPARATION DEVICE FOR LOW TEMPERATURE ENVIRONMENTS,
Lockheed Aircraft Corp., Burbank, CA. (Assignee).
H. F. Miller, and M. G. Hoard.
U.S. Patent No. 4,039,454, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 961, No 1, p 258-259, August 2, 1977.

Descriptors: *Patents, *Oil pollution, *Water quality control, *Water pollution treatment, Separation techniques, Ice, Ice-water interfaces, Equipment, Low-temperature environments.

This invention is designed to enhance the operation of oil pick-up devices which are called upon to operate in freezing temperature environments in which pieces of ice as well as fluid surface areas are found to be coated with undesirable fluids such as oil. The device separates, in an ice environment, fluids having differing physical properties which combine an oleophilic pick-up device with a rotating tumbler mechanism which tends to agitate and propel oil coated pieces of ice rearward and along a perforated inclined through-put barrier where oil jarred off the ice chunks is allowed to rise through the perforations and be contained in an area where it can be accumulated and recovered by the pick-up unit. (Sinha - OEIS)
W78-03613

METHOD FOR CONDITIONING FRESH AND SEA WATERS FROM OIL,
Snam Progetti S.p.A., Milan (Italy). (Assignee).
W. Marconi, N. Oddo, and L. Degen.
U.S. Patent No. 4,042,495, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 3, p 1274, August 16, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Microorganisms, Nutrients, Biodegradation, Nitrogen, Phosphorus, Metabolism, Hydrocarbons.

Oily hydrocarbons which pollute the surface of water are removed by scattering over the polluted surface solid particles of nutrient salt containing nitrogen and phosphorus in a form that is readily assimilable by aqueous microorganisms capable of metabolizing hydrocarbons. The particles of nutrient salt are given a surface pretreatment with paraffine so that they are buoyant and only slowly soluble in water and lipophilic. (Sinha-OEIS)
W78-03617

OIL WATER SEPARATOR,
P. M. McCarthy, G. T. McTighe, and R. T. McTighe.
U.S. Patent No. 4,042,512, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 961, No 3, p 1279, August 16, 1977.

Descriptors: *Patents, *Separation techniques, *Oily water, *Oil pollution, Water pollution treatment, Water quality control, Flow separation, Runoff, Equipment.

The apparatus comprises a stationary tank having an inlet at one end directing incoming material onto a sloping corrugated baffle member over which the material flows downwardly and inwardly and from which the fluids are directed between upwardly sloping parallel corrugated plates to accelerate separation of water and oil or similar lightweight materials. The material flows toward the other end of the tank from which clarified water is permitted to escape from the lower regions and separated oil is withdrawn from the top. Baffle means are also provided in the bottom of the tank to intercept particulate matter settling to the bottom and an access opening adjacent the baffle permits periodic cleaning of such collected solids from the tank. The apparatus is used for clarifying run-off or drainage water containing oil and/or other lightweight materials. (Sinha-OEIS)
W78-03619

THE RISING COST OF MAKING DESERTS BLOOM,
Earthscan, London (England).
For primary bibliographic entry see Field 4B.
W78-03621

WELSH WATER RE-ORGANIZATION.
Water Services, Vol. 81, No. 978, p 453, August, 1977. 1 fig.

Descriptors: *Regional economics, *Networks, *Sewage treatment, *Water treatment, *Costs, Organizations, Foreign countries, Waste water treatment, *Wales.

The Welsh National Water Development Authority has reorganized its 25 single-purpose water supply, river, and sewage divisions into seven regional authorities which will cover all three purposes. Slated to go into effect on or about April 1, 1978, the new multipurpose divisions will be the Gwynedd, West Wales, Gower, Dee and Clwyd, Wye, Usk, and Taff divisions. The initial capital expenditure for the reorganization will be approximately 500,000 pounds and annual operating costs after the initial 3-yr period should be similar. Approximately 100 jobs, or 2% of the 5500 existing positions, will be gradually eliminated in the reorganization process, Services will be coordinated from a single headquarters location within each regional division. (Schulz-FIRL)
W78-03623

EPA ENLISTS ARMY TO MANAGE SEWAGE PLANT CONSTRUCTION.
Engineering News-Record, Vol. 199, No. 13, p 10, September, 1977.

Descriptors: *Construction, *Government finance, *Economics, *Contract administration, Standards, Treatment facilities, Municipal wastes, Government supports, Specifications, Waste water treatment.

The EPA has enlisted the aid of the U. S. Army Corps of Engineers in the supervision of design and construction of federally-funded municipal waste water treatment plants. The Corps will insure smooth construction for large projects, review design specifications and bid documents, identify construction problems and solutions, and cooperate with the community's private consulting engineer. The tentative agreement between the Corps of Engineers and the EPA was announced after the release of a report by the General Accounting Office that cited problems in design and construction stages in the EPA's multibillion dollar construction program. The Corps will provide 600 man-yrs at a cost of $20 million during the first year of the program, which is still subject to approval by the Office of Management and Budget. (Schulz-FIRL)
W78-03625

ORSANCO: AN INTERSTAGE AGENCY,
Ohio River Valley Sanitation Commission, Cincinnati.
R. Boes, and L. Weaver.
AIChE Symposium Series, Vol. 73, No. 167, p 262-266, 1977. 1 ref.

Descriptors: *Regional analysis, *Water pollution control, *Water quality management(Applied), Pollution abatement, Monitoring, Environmental effects, Project post-evaluation, River basins, River basin commissions, Ohio River, Waste water treatment.

ORSANCO (Ohio River Valley Water Sanitation Commission) has been administering a regional program to control water pollution in the 155,000-sq-mile Ohio River basin which includes Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia. The commission's purposes are to coordinate the acquisition of information of stream quality characteristics, to evaluate pollution abatement, and to guide additional control efforts while insuring adequate water quality within the basin for purposes. The committee also adopts and enforces effluent limitations and standards. Biological monitoring and sampling programs have been used to assess water quality and the status of municipal and industrial control facilities. The commission was also responsible for an order to expand five waste water treatment plants in the Pittsburgh and Cincinnati metropolitan areas in 1964. Along the Ohio River, treatment facilities provide service for 99% of the 3 million sewered population and 90% of the 1700 industrial dischargers. Comparisons of water quality for 1952-53 and 1963-64 indicated lower levels of mineral constituents associated with mine drainage and waste water dischargers, higher dissolved oxygen levels, lower coliform levels, and other water quality improvements as a result of the program. Future interest of the commission will be focused on the effects and bioaccumulation of pollutants by aquatic life and on other water quality management programs. (Schulz-FIRL)
W78-03626

MARINE POLLUTION: A MULTI-FACETED, MULTI-AGENCY DETECTION, RESEARCH AND ENFORCEMENT PROGRAM.
Sea Technology, Vol. 18, No. 10, p 10-17, 49-50, October, 1977.

Descriptors: *Water pollution control, *Sewage disposal, *Oil wastes, *Oceans, *Environmental effects, Research and development, Oil water, Sludge disposal, Waste water treatment.

Activities of the numerous federal and civil organizations involved in marine pollution programs, and federal measures being taken to control or eliminate pollution of the marine environment, are described. Among the agencies involved in detection, clean-up, and research of ocean pollution are the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Coast Guard. Programs being conducted by the various agencies to control ocean dumping of sewage sludge and other wastes are described. The Marine Ecosystems Analysis (MESA) project under the auspices of NOAA has investigated waste dumping and its environmental effects in the New York Bight and Puget Sound, Washington. A 7-yr study on the New York Bight was initiated to determine the

fate and effect of pollutants on the ecosystem, to quantify environmental factors involved in designing and siting offshore structures, and to provide other information on coastal processes. Various projects on oil pollution and the disposal of oily wastes are described. Studies being conducted by the U.S. Navy on treatment and disposal of sanitary sewage for ships are described. (Schulz-FIRL)
W78-03628

URBAN STORMWATER MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie.
In: Stochastic Approaches to Water Resources, Volume II. Edited and Published by Hsieh Wen Shen, Colorado State University, Fort Collins, 1976. p 19-1 to 19-48. 19 fig, 5 tab, 62 ref.

Descriptors: *Stochastic processes, Analytical techniques, *Planning, *Design, *Storm water, *Optimization, *Model studies, *Simulation analysis, Risks, Decision making, Management, Storage, Treatment, Waste water(Pollution), Synthetic hydrology, Rainfall, Urban runoff, Water pollution control, Costs, Data collections, Economic efficiency, Equations, Systems analysis, Forecasting, Screening model, Overflow minimization, Cost minimization, Chance-constrained programming, Search technique, Risk programming.

Demonstrated is how stochastic analysis techniques can be incorporated into the planning, design, and operation of urban stormwater control systems. The consideration of risk in decision making for Urban Stormwater Management (USWM) is emphasized. An overview of the problems associated with USWM is presented and alternative management strategies are discussed, with particular attention paid to storage-treatment combinations. A case study, the San Francisco Master Plan for Wastewater Management, highlights the present state of acceptance and application of stochastic analysis techniques; considered is the current WRE-HEC STORM screening model. Discussed is the use of stochastic-conceptual models for generating synthetic rainfall sequences, which serve as input to models predicting the runoff quantity and quality responses of urban catchments, which in turn can be used to synthetically generate urban runoff data. A general classification is presented of stochastic analysis approaches to incorporating risk in planning and design for USWM; some important stochastic optimization techniques are suggested. Finally, a simple numerical example using the STORM model to solve a cost minimization problem is presented. It is shown that with little additional effort, important information can be obtained from a stochastic analysis. With such information, decision makers can gain better insight into the effectiveness of a particular alternative. (See also W77-10439) (Bell-Cornell)
W78-03632

SELECTION OF MODELS FOR URBAN DRAINAGE PROBLEMS: TECHNICAL ASPECTS AND NON-TECHNICAL CONSTRAINTS,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-03633

WATER QUALITY ASPECTS OF AGRICULTURAL AND URBAN DRAINAGE,
Rice Univ., Houston, TX.
P. B. Bedient, and W. G. Characklis.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 374-393, 1976. 12 fig, 1 tab, 20 ref.

Descriptors: *Urban drainage, *Agricultural watersheds, *Water quality, Monitoring, Surface runoff, Storm water, Sediments, Nutrients, Pollutants, Hydrology, River basins, Simulation analysis, Mathematical models, Systems analysis.

Reported are recent environmental studies conducted on agricultural watersheds in Florida and urbanizing watersheds near Houston, Texas to characterize the quantity and quality of surface runoff from various land uses. Estimates of water storage and surface runoff, which were compared to measured values of streamflow at the downstream end of the river basin, were provided in the agricultural watersheds by a hydrologic simulation model. Water quality measurements of various pollutants allowed calculation loading rates using simulated runoff at corresponding points in the basin. In the Woodland Project area in Texas, characterized by a natural drainage system and extensive lake storage for storm water runoff, storm event data were analyzed for both quantity and quality. From the description of water quality relationships from agricultural and urban watersheds, interesting similarities have been discovered. First detention time plays a key role in hydrologic and nutrient cycling as it relates to storage and treatment rates for runoff on the land, in the soil, and in lakes or streams. Secondly, storage of runoff water in ponds, lakes, and marsh areas can be used for both flood control and water quality control. Finally, while a certain amount of drainage density may be necessary in both agricultural and urban watersheds, such activity can be kept to a minimum by routing runoff through available storage, or constructing on-site detention ponds. (Bell-Cornell)
W78-03638

SIMULATION OF QUALITY OF URBAN DRAINAGE EFFLUENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-03641

INEQUITIES FOR SMALL FOOD PROCESSING PLANTS RESULTING FROM LIQUID WASTE TREATMENT REGULATIONS,
Teepak, Inc., Danville, IL.
E. W. McMillan, and E. D. Brill, Jr.
Water Resources Bulletin, Vol. 12, No. 5, p 985-993, October 1976. 5 tab, 8 ref.

Descriptors: *Water quality control, *Waste treatment, *Regulation, *Cost analysis, *Liquid wastes, *Equity, Water management(Applied), Economics, *Dairy industry, Effluents, Economies of scale, Data collection, Biochemical oxygen demand, Capital costs, Estimating, Programs, Treatment costs, Sewer surcharge.

The cost of the liquid waste treatment measures required to meet federal as well as typical state and local regulations was examined for dairy processing plants of various sites. Federal effluent standards were found to produce higher estimated capital costs per unit of raw material for smaller plants, even with relaxed requirements for smaller plants. State regulations limiting the effluent BOD5 concentration were also found to result in inequitable costs for smaller processors. These inequities result from economies of scale and not from such factors as level of process technology employed or amount of waste produced per unit of raw material. In contrast, applying an example sewer surcharge formula did not produce inequities from economies of scale. (Bell-Cornell)
W78-03648

WATER-ENERGY CONFLICTS IN MONTANA'S YELLOWSTONE RIVER BASIN,
Montana State Dept. of Health and Environmental Sciences, Billings. Bureau of Water Quality.
For primary bibliographic entry see Field 6E.
W78-03649

COASTAL RECREATION RESOURCES IN AN URBANIZING ENVIRONMENT, SYMPOSIUM, HYANNIS, MASSACHUSETTS, APRIL 12-14, 1976.
For primary bibliographic entry see Field 6B.
W78-03662

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
D. J. Goldstein, and D. Yung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 568, Price codes: A21 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-065, June 1977. 467 p, 96 fig, 155 tab, 281 ref, append. EHE623, 68-03-2207.

Descriptors: *Water conservation, *Water quality control, *Water consumption, Industrial water, Water utilization, Water loss, Water requirements, Environmental effects, Coals, North Dakota, Wyoming, New Mexico, Coal mines, Water supply, Water resources, Economics, *Coal conversion processes, Processes.

The results of a study to determine water consumption and environmental impacts of coal conversion processes in Western states are presented. Brief descriptions and process water requirements are given for the Lurgi, Bigas, Carbon Dioxide Acceptor, Agglomerating Burner-gasification, Winkler, Stirred Bed, Molten Salt, Lurgi process for utility fuel gas production, Koppers-Totzek, H-Coal, and Synthoil processes, and detailed designs and analyses are given for the Hygas, Synthane, and Solvent Refined coal processes and for Lurgi combined cycle power generation. At three proposed sites (North Dakota, New Mexico, and Wyoming), complete water requirements and effluents, including all mining and related offsite uses, are given for the power, Hygas, and Solvent Refined Coal process plants. The synthane process is analyzed only at the Wyoming site. Analyses of influent and effluent water, with examples for study, are also given. For the three selected plants at the North Dakota site, source water of good quality is assumed to be cheap and available. For the New Mexico plants, source water will be available but is brackish. All the Wyoming site plants will receive sewage from a satellite town, and additional fresh water is available but is assumed to be expensive. The plants, being net consumers of water, are designed for no discharge of water. For each process at each site (10 cases) an integrated water treatment plant block flow diagram is given with approximate costs and energy requirements. The appendix contains results of analyses of wastewater samples. (Wares-IPA)
W78-03685

DISPOSAL OF COAL PREPARATION WASTES: ENVIRONMENTAL CONSIDERATIONS,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 5E.
W78-03686

ASBESTOS FIBERS IN DISCHARGES FROM SELECTED MINING AND MILLING ACTIVITIES. FINAL REPORT PART III,
McCrone (Walter C.) Associates, Inc., Chicago, IL.
For primary bibliographic entry see Field 5A.
W78-03687

A LEGAL ORDER FOR THE OCEANS, II,
For primary bibliographic entry see Field 6E.
W78-03691

HOLLINGS CALLS FOR DEPARTMENT OF ENVIRONMENT AND OCEANS,
Senate, Washington, DC.
For primary bibliographic entry see Field 6E.

W78-03692

ENVIRONMENTAL RESEARCH OUTLOOK (FY 1977 THROUGH FY 1981).
Environmental Protection Agency, Washington, DC. Office of Research and Development.
Report No. EPA-600/9-77-002, February 1977. 194 p.

Descriptors: *Research and development, *Research priorities, *Comprehensive planning, *Projects, Public health, Planning, Social aspects, Ultraviolet radiation, Economic impact, Resources, Research facilities, Research equipment, Technology, Laboratories, Multiple-purpose projects, Administrative agencies, Federal government, Pollutants, Water supply, Industries, Energy, Conservation, Toxicity.

The purpose of the annual summary of environmental research activities, priorities, and trends prepared by the Office of Research and Development (ORD) is to present a flexible research plan to support the Environmental Protection Agency's mission of protecting and enhancing the quality of the environment. The plan is supplemented by a series of more detailed reports which highlight past accomplishments and describe research focused on current environmental issues. The organizational structure of ORD is explored and compared to the program structure of the agency's activities. In addition, considerations involved in the establishment of priorities and the trends and options within the agency are discussed. Numerous tables and figures are utilized to illustrate these aspects of ORD operations. Finally, the fourteen subprograms of ORD, particularly health effects studies and energy research, are examined in detail. (Moorhouse-Florida)
W78-03695

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL SCHEDULING OF WATER SUPPLY PROJECTS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 4A.
W78-03241

MATHEMATICAL METHODS FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03420

MIXED INTEGER PROGRAMMING MODELS FOR WATER RESOURCES MANAGEMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-03421

STOCHASTIC MODELS FOR RESERVOIR DESIGN,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W78-03631

URBAN STORMWATER MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03632

MODELS FOR SCHEDULING RELEASES FROM MULTIRESERVOIR SYSTEMS: A STATE-OF-THE-ART REVIEW,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 4A.
W78-03637

6B. Evaluation Process

WATER RESOURCE PLANNING AND RURAL WATER SYSTEMS,
For primary bibliographic entry see Field 6E.
W78-03371

MATHEMATICAL METHODS FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03420

MIXED INTEGER PROGRAMMING MODELS FOR WATER RESOURCES MANAGEMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-03421

A STUDY OF FEASIBILITY OF STATE WATER USER FEES FOR FINANCING WATER DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6C.
W78-03425

DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982, (FINAL DRAFT).
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 278, Price codes: A08 in paper copy, A01 in microfiche. Submitted to Office of Science and Technology Policy, Washington, D. C., April 1977. 138 p, 2 fig, 9 tab, 53 ref, 4 append.

Descriptors: *Water resources research(US), *Research and development, *Future planning(Projected), Projections, Planning, Water policy, *Federal project policy, *Project planning, *Research projects, Expenses, Economics.

This report analyzes the effectiveness of the 10-year program of water resources research (1965-75), sets forth a perspective for the role that water resources must play in the U. S., and identifies issues in which water is a vital consideration. The Committee on Water Resources Research (COWRR) attempted to re-focus the needed program in water research for at least the next five years. An objective, defensible analysis of the criticalnational water problems is presented, which involves the delineation of water resources questions of national interest, and identifies the deficiencies in knowledge and understanding which must be eliminated. COWRR recommends that the Administration and Congress take immediate steps to restore the program by 1978 to the equivalent level of support it had in 1971 at least, and develop plans to increase the support by 1982 to the level of effort recommended by the Committee in its 1966 report. The Congress and the Administration are also urged to increase their efforts to formulate and implement a unified national program of water resources research that integrates and balances the research activities of the Federal agencies in support of clearly expressed national goals and objectives. The mission agencies are requested to maintain a balanced in-house and extramural research program that includes industry and consultants as well as the universities to ensure a continued supply of appropriately trained graduates. A thorough manpower needs study should be undertaken for the broad spectrum of the water resources field to assess the supply and demand that is likely to occur over the next decade. Federal agencies are admonished to give careful attention in design of their research progrms and budget requests to these important areas. The Interdepartmental Committee on Atmospheric Sciences should be informed of COWRR's strong support in the efforts of ICAS to consider and coordinate Federal atmospheric and climatic research programs. (OWRT)
W78-03428

DATA EVALUATIONS AND RECOMMENDATIONS FOR COMPREHENSIVE PLANNING FOR THE YAZOO RIVER BASIN, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-03473

RESERVOIR PLANNING AND OPERATION,
Harvard Univ., Cambridge, MA. Dept. of Engineering and Applied Mathematics.
For primary bibliographic entry see Field 4A.
W78-03630

OUTLET DRAINAGE - AN ASSESSMENT OF ENVIRONMENTAL EFFECTS,
Waterloo Univ. (Ontario). Dept. of Geography.
J. C. Day, R. F. Brady, and M. J. Staite.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 445-460, 1976. 1 fig, 3 tab, 28 ref.

Descriptors: *Outlets, *Drainage, Effects, *Projects, *Cost-benefit analysis, *Project planning, Assessment, *Environmental effects, Basins, Water management(Applied), Reservoirs, Agriculture, Cost analysis, Cost-benefit ratio, Economic feasibility, *Dundalk Plateau(Ontario), Land drainage, Cost distribution, Canada.

At present, most research concerning drainage impacts generally examines isolated parts of the environment. Available data are fragmentary, specialized, and elusive. During the past two years, a research group at the University of Western Ontario and the University of Waterloo studied environmental impacts of an outlet drainage project in the Dundalk Plateau, Ontario. Events which led to adoption of the drainage scheme suggest that an independent assessment of outlet drainage, or channelization, projects could increase the sensitivity of excavation practices, prevent needless environmental impairment, and raise the social utility of such undertakings. This paper begins with an assessment of the literature concerning impacts of outlet drainage in Ontario. This is followed by a description of the study area and an analysis of the engineers' reports which constitute the technical rationale for the project. Finally, conclusions concerning the social merit of the undertaking are presented based on benefit-cost analyses, field observation and local residents' perceptions of the project merit. Extreme discrimination in the allocation of benefits among basin residents, the undesirable ecological consequences, and the enormous economic losses associated with this project point to an immediate need in Ontario for an independent body to assess the full range of outlet drainage consequences. (Bell-Cornell)
W78-03640

ECONOMIC ANALYSIS OF WATER-SAVING TECHNIQUES IN IRAN,
Florida Univ. Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 3F.
W78-03644

OWNERSHIP AND WATER SYSTEM OPERATION,
West Virginia Univ., Morgantown. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-03647

ECONOMIC FEASIBILITY OF IRRIGATING SOUTHERN PINES,
Wisconsin Univ.-Parkside, Kenosha. Div. of Social Sciences.
For primary bibliographic entry see Field 3F.
W78-03652

CANADA COMMITTEE ON ECOLOGICAL (BIO-PHYSICAL) LAND CLASSIFICATION, WORKING GROUP ON LAND/WATER INTEGRATION, PROCEEDINGS OF THE FIRST MEETING, FEBRUARY 17-18, 1977, FRESHWATER INSTITUTE, WINNIPEG, MANITOBA.
Department of the Environment, Hull (Quebec). Lands Directorate.
For primary bibliographic entry see Field 6G.
W78-03653

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
J. A. Leitch, and D. F. Scott.
Agricultural Economics Miscellaneous Report No. 27, August 1977. 132 p.

Descriptors: *Economics, Evaluation, *Wildlife, *Fish, *Bibliographies, *Wildlife habitat, Wetlands, Recreation, *Wetland economics.

A total of 691 entries are organized into the following categories: (1) wetland economics (111 entries), (2) economics of fish and wildlife and their habitats (215), (3) evaluation techniques with application to fish and wildlife (40), (4) socioeconimic characteristics of hunters and fishermen (43), (5) outdoor recreation economics (138), (6) natural resource economics (55), (7) water resource economics related to fish and wildlife (68), (8) bibliographies (21). (Stihler-Mass)
W78-03660

IMPORTANCE, PRESERVATION AND MANAGEMENT OF RIPARIAN HABITAT: A SYMPOSIUM, TUCSON, ARIZONA, JULY 9, 1977.
For primary bibliographic entry see Field 4C.
W78-03661

COASTAL RECREATION RESOURCES IN AN URBANIZING ENVIRONMENT, SYMPOSIUM, HYANNIS, MASSACHUSETTS, APRIL 12-14, 1976.
Extension Service, University of Massachusetts, Amherst, August 1977. 129 p. $3.00.

Descriptors: *Wetlands, *Recreation, *Water quality, *Water injury, *Water policy, *Environmental effects, *Recreation wastes, *Social aspects, *Recreation demand, *Water resources development, *Shores, Coastal marshes, Land reclamation, Wildlife conservation, Fish management, Fishing, Boating, Beaches, Sport fishing, Recreation facilities, Marinas, Waste disposal, Cities, Urban sociology, Aesthetics, Commercial fishing, Coastal recreation, Coastal zone management.

This monograph emphasizes coastal resource values and examines the public and private roles, including special interest groups, in coastal recreation management; utilization of living resources--finfish, shellfish and wildlife; and utilization of physical resources--tidal water, wetlands and shorelines. Papers examine these resource descriptions, with regard to defining uses and values, problems of descriptions, and identifying conflicts, management and research needs. A broad array of coastal resources and their attendant values are the focus of a growing local, state, and natioal interest in preserving the nation's coasts. Many of these resources and values are unique, fragile and are subject to ever increasing pressures for use and modification. However, once coastal resources are altered or destroyed, the loss is generally irreparable for coastal communities and the people who benefit from the resources. (Steiner-Mass)
W78-03662

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA.
Corps of Engineers, Cincinnati, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 332, Price codes: A06 in paper copy, A01 in microfiche. WRA Main Report, Part I, Volume 2, Map Folio, 1969. 63 p.

Descriptors: *Maps, Water resources, *Water resources development, *Appalachian mountain region, Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, Bodies of water, Projects.

Maps illustrating existing water development to 1980 and future plan elements for water resources in Appalachian areas of the United States are presented. The maps show all existing bodies of water (creeks, lakes, reservoirs, and rivers) and recommended projects (including watersheds, flood plains, locks and dams, channel improvements, and impoundments). The map illustrate such data for Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennesse, Virginia, and West Virginia. (Wares-IPA)
W78-03675

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC ANALYSIS OF INDUSTRIAL INCENTIVES FOR POLLUTION CONTROL: IMPLICATIONS FOR WATER QUALITY.
ABT Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03328

FINANCING AND COST SHARING MUNICIPAL WATER SUPPLY SYSTEMS,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 662, Price codes: A03 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 06-77, June, 1977. 32 p, 8 tab, 5 ref. OWRT B-092-GA(1), 14-31-0001-4149.

Descriptors: *Financing, *Cost sharing, Financial feasibility, Economic feasibility, Cities, *Municipal water, Benefit pricing, *Water supply systems.

The sources of financing for municipal water supply come largely from the private sector but the proportions are shifting heavily to Federal loans and grants, especially for small systems. These small systems have excellent abilities to amortize capital costs of most water supply systems by charging reasonable service fees or prices. Selected municipalities may sometimes benefit from direct Federal investments in multiple purpose water control projects by purchasing water supply rights from Federal impoundments. However, this is not a major source of financing generally available to municipalities. When Federal programs and projects are considered independently of those municipal water supply systems financed without any Federal involvement, the Federal contribution to total project cost is 36 percent Nationally but only 14 percent in the South Atlantic Gulf Region. However, all municipalities--those receiving Federal sources of financing and those financing in the private capital markets--must generate repayment funds from pricing the water services to users by levying special assessments or by including provisions in general taxing authority sufficient to amortize loans and bonded indebtedness over appropriate periods of time. In general, municipalities of all sizes in Georgia were found to have an opportunity to sell water supply services for moderate prices and generate sufficient revenue to amortize all investment costs. Such communities are in great need of pricing and other technical assistance to acquire private sector funds for their water supply systems.
W78-03419

A STUDY OF FEASIBILITY OF STATE WATER USER FEES FOR FINANCING WATER DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
D. H. Hoggan, O. W. Asplund, J. C. Andersen, and D. G. Houston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 702, Price codes: A05 in paper copy, A01 in microfiche. Utah Water Research Laboratory Publication PRWG162-2, September 1977. 94 p, 12 fig, 17 tab, 50 ref, 7 append. OWRT B-122-UTAH(2), 14-31-0001-5121.

Descriptors: Water resource development, *Pricing, *Financing, State governments, *Feasibility studies, Water utilization, *Water users, *Use rates, Costs, Water costs, *Utah.

Water user fees imposed by a state on major water uses is a possible new alternative source of state water development funds. Only in the area of water based recreation have states extensively employed user fees to defray management and operating expenses. The 'user pay' theory indicates that user fees would be an economically more efficient and equitable source for financing water development than general tax revenues. In the design of fee structures for major water uses, several characteristics of fees are appropriate to consider. Five which were identified in this study are: equity, economic efficiency, allocational effectiveness, administrative simplicity, and revenue generating potential. These rate design considerations may relate only indirectly to a state system of user fees since the state fees envisioned in this study in many cases may be only an add-on or surcharge to a basic charge imposed by a local entity, such as a municipality or an irrigation district. Revenue generating potential was of primary interest in this study. Estimates of revenue potential for four major water uses--irrigation, municipal, industry, and recreation--were made with a formula developed for this purpose. Results indicate that some fee alternatives probably could be implemented by administrative action; others would require legislative approval. Constitutional issues related to some alternatives would have to be resolved by the state supreme court.
W78-03425

ECONOMIC ANALYSIS OF WATER-SAVING TECHNIQUES IN IRAN,
Florida Univ. Gainesville. Dept. of Food and Resource Economics.

For primary bibliographic entry see Field 3F.
W78-03644

INCOME AND PRICE ELASTICITIES OF DEMAND FOR WATER IN DEVELOPING COUNTRIES,
Harvard Univ., Cambridge, MA. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6D.
W78-03645

OWNERSHIP AND WATER SYSTEM OPERATION,
West Virginia Univ., Morgantown. Dept. of Economics.
P. C. Mann, and J. L. Mikesell.
Water Resources Bulletin, Vol. 12, No. 5, p 995-1004, October 1976. 3 tab, 9 ref.

Descriptors: *Water costs, *Regulation, *Regression analysis, *Cost analysis, Governments, Operating costs, Water supply, Equations, *Water utilities regulation, Private ownership, Municipal ownership, Literature review, Empirical analysis.

Two types of organizational systems provide most of the water service in the United States. The investor-owned firm operates on a profit basis generally subject to state commission regulation. The government-owned firm is generally confronted by local control. The comparative efficiency of private versus government firm provision of water services is essentially an empirical issue. Unit costs and other operating statistics are examined for water firms of each ownership form. This analysis shows that private firms tend to have higher operating costs than do government firms, possibly attributable to wage-salary differentials. Indicated also is that capital investment in large government firms may result in diseconomies. The analysis creates serious doubt as to whether or not efficient provision of water services can be better facilitated by large mergers of either ownership form. (Bell-Cornell)
W78-03647

INEQUITIES FOR SMALL FOOD PROCESSING PLANTS RESULTING FROM LIQUID WASTE TREATMENT REGULATIONS,
Teepak, Inc., Danville, IL.
For primary bibliographic entry see Field 5G.
W78-03648

6D. Water Demand

OPTIMAL SCHEDULING OF WATER SUPPLY PROJECTS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 4A.
W78-03241

INCOME AND PRICE ELASTICITIES OF DEMAND FOR WATER IN DEVELOPING COUNTRIES,
Harvard Univ., Cambridge, MA. Dept. of City and Regional Planning.
M. T. Katzman.
Water Resources Bulletin, Vol. 13, No. 1, p 47-55, February 1977. 6 tab, 20 ref.

Descriptors: *Water demand, *Pricing, *Investment, Income analysis, Domestic water, Forecasting, Estimating, Time series analysis, Mathematical models, Households, Linear model, Economic analysis, Developing countries, *Malaysia(Penang Island).

The income and price elasticity of demand for domestic water is estimated for Penang Island, Malaysia. A cross-sectional analysis of a random sample of 1400 households indicates an income-elasticity of zero for low-income families (per capita income less than U.S. $300) and an elasticity of 0.2-0.4 for higher-income families. A time-series analysis of a subsample of individuals of varying income levels suggests a short-run price elasticity of -0.1 to -0.2. The implications of these results for demand forecasting are discussed. It is concluded that demand projections which take into account income and price elasticities are more sensitive to changes in policy, such as pricing, than traditional engineering approaches. (Bell-Cornell)
W78-03645

WATER CONSUMPTION IN SMALL COMMUNITIES OF NORTHEAST THAILAND,
Asian Inst. of Tech., Bangkok, Thailand.
R. J. Frankel, and P. Shouvanavirakul.
Water Resources Research, Vol. 9, No. 5, p 1196-1207, October 1973. 6 fig, 5 tab, 3 ref.

Descriptors: *Water demand, *Design criteria, *Rural areas, Water requirements, Water distribution(Policy), Pricing, Daily, Seasonal, Effects, Water quality, Water policy, *Water consumption, *Thailand, Developing countries, Rainwater, Water availability, Socioeconomic status.

Water consumption in 14 rural communities of northeast Thailand was studied to determine water needs and to delineate the factors that affect water use. For 13 of these communities, average daily water consumption ranged from 10 to 90 l/cap/day (liters per capita per day). In one village with free water distributed through house connections 24 hr/day, water usage ranged from 115 to 160 l/cap/day. Water consumption was significantly influenced by the season of the year, limited hours of availability of water through the distribution system, type of water service connection, and by price of water for metered house connections only. Design criteria for maximum daily and maximum hourly water demands were found to be 1.5 and 4 times the average daily water consumption, respectively. The data collected reflect initial water use values in villages where water systems are only a few years old. (Bell-Cornell)
W78-03651

DEVELOPMENT OF WATER RESOURCES IN APPALACHIA.
Corps of Engineers, Cincinnati, OH.
For primary bibliographic entry see Field 6B.
W78-03675

6E. Water Law and Institutions

THE COMING WATER FAMINE,
House, Washington, DC.
For primary bibliographic entry see Field 3B.
W78-03324

POLLUTION AND INDUSTRIAL WASTE.
For primary bibliographic entry see Field 5G.
W78-03325

DEATH OF THE SWEET WATERS,
For primary bibliographic entry see Field 5G.
W78-03326

THE INDUSTRY/EPA CONFRONTATION (LIVING TODAY WITH THE WPCA AMENDMENTS OF 1972),
Centec Consultants, Inc., Reston, VA.
For primary bibliographic entry see Field 5G.
W78-03327

ECONOMIC ANALYSIS OF INDUSTRIAL INCENTIVES FOR POLLUTION CONTROL: IMPLICATIONS FOR WATER QUALITY.
ABT Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03328

WATER QUALITY MANAGEMENT PLANNING: THE FATE OF 208,
Cook Coll., New Brunswick, NJ. Environmental Law.
For primary bibliographic entry see Field 5G.
W78-03330

EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE FOR NEW SOURCES.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5G.
W78-03331

EMERGING RIGHTS FOR OWNERS OF SUBSIDED LANDS (COMMENT ON COASTAL INDUSTRIAL WATER AUTHORITY V. YORK),
A. H. Conlan.
Southwestern Law Journal, Vol 30, No 5, p 943-50, Winter 1976.

Descriptors: *Navigable waters, *Riparian land, *Riparian rights, *Subsidence, *Erosion, Water table, Gulf of Mexico, Legal aspects, Judicial decisions, Legal review, Accretion(Legal aspects), Avulsion, Submergence, Land subsidence, Groundwater, Soil water movement, Water levels, Sea level, Sea water, Gulf Coastal Plain.

The first reported case to consider the effect of subsidence upon riparian boundaries determined that a riparian landowner does not lose title to portions of his land which, in the absence of any evidence of erosion, have gradually subsided beneath navigable coastal waters. By this decision the court limited the applications of the doctrines of avulsion, accretion, erosion, and reliction and extended the rule of submergence in situations involving subsidence of coastal land. The result implicitly recognizes the hazards of ownership of coastal property and is significant in that it makes clear that changes in riparian boundaries caused by third parties over which the riparian owner has no control will be viewed in the same light as changes resulting from natural phenomena. The court noted that the holding may not apply to land adjacent to waters affected by tides, thus leaving its application to the Gulf Coast region uncertain. The author concludes that the decision creates a new standard for riparian boundaries and suggests a potential for future conflict in its application to submerged lands actually used for public navigation. (Mulligan-Florida)
W78-03332

EFFECTIVE NATIONAL REGULATION OF POINT SOURCES UNDER THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: THE DOUBLE BURDEN OF LEGISLATIVE DRAFTMANSHIP AND JUDICIAL REVIEW,
For primary bibliographic entry see Field 5G.
W78-03333

LIABILITY, COMPENSATION AND PREVENTION OF OIL SPILLS: A NORTH AMERICAN PERSPECTIVE,
Lewis and Clark Co., Portland, OR. Northwestern School of Law.
For primary bibliographic entry see Field 5G.
W78-03335

THE UNITED NATIONS ENVIRONMENT PROGRAM: THE MEDITERRANEAN CONFERENCES,
D. DeHoyos.
Harvard International Law Journal, Vol. 17, No. 3, p. 639-49, Summer 1976.

Descriptors: *United Nations, *Planning, *Oceans, *Water pollution control, Foreign projects, Marine biology, Oil pollution, Project planning, Political aspects, International waters, Foreign countries, Foreign waters, Governments, Sea water, Water quality control, Water resources development, International law, Research and development, Ships, Europe, Africa, Coasts, Water disposal, International commissions, Monitoring.

Under the sponsorship of the United National Environmental Program (UNEP), the states bordering the Mediterranean have formulated an action plan, a convention, and two protocols to combat the problem of pollution of the Mediterranean Sea. The expansion of population and economic activities in coastal areas has significantly aggravated Mediterranean pollution. UNEP has given regional ocean pollution a high priority holding regional conferences for the Mediterranean in Barcelona in 1975 and 1976 to draft pollution control agreements. The author discusses the Barcelona agreements and evaluates them as a means of protecting the marine environment and as example of functional cooperation. The 1975 Conference Action Plan provided for scientific research through a coordinated pollution monitoring and research program consisting of seven marine pollution pilot research projects. In addition, a program was initiated to reconcile controversies between proponents of economic progress and environmental protection. The 1976 conference adopted a convention and two protocols to control pollution of the Mediterranean. If national policies and practices can be adapted to regional standards, the Mediterranean may become a model of regional cooperation with regional pollution control a viable alternative to national or global pollution control. (Yawn-Florida)
W78-03336

ENVIRONMENTAL REGULATION OF OFFSHORE EXPLORATION, PRODUCTION, AND DEVELOPMENT,
Atlantic Richfield Company, Anchorage, AK.
For primary bibliographic entry see Field 5G.
W78-03337

ENVIRONMENTAL PROBLEMS ONSHORE,
Shell Oil Co., Houston, TX. Corporate Law Dept.
For primary bibliographic entry see Field 5G.
W78-03338

ALASKA PIPELINE--FINANCIAL RESPONSIBILITY FOR OIL SPILLS.
Federal Maritime Commission, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03340

SHORE AND BEACH MANAGEMENT IN LOUISIANA,
Louisiana Coastal Commission, Layfayette.
For primary bibliographic entry see Field 2L.
W78-03341

NORTH CAROLINA COASTAL ZONE MANAGEMENT ACT,
North Carolina State Dept. of Administration, Raleigh. Office of Marine Affairs.
For primary bibliographic entry see Field 2L.
W78-03342

OIL POLLUTION LIABILITY LEGISLATION TRANSMITTED TO THE CONGRESS,
For primary bibliographic entry see Field 5G.
W78-03343

THE URBAN WATERFRONT: OPPORTUNITIES FOR RENEWAL,
New York Univ., NY. Graduate School of Public Administration.
For primary bibliographic entry see Field 2L.
W78-03344

PETROLEUM REFINING POINT SOURCE CATEGORY PRETREATMENT STANDARDS FOR EXISTING SOURCES EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03346

TEXTILE INDUSTRY POINT SOURCE CATEGORY EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03347

ISSUES INVOLVED IN UNITED STATES BEACH PRESERVATION AND PROTECTION PROGRAMS,
Cook Coll., New Brunswick, NJ.
For primary bibliographic entry see Field 2L.
W78-03348

NORTHERN ST. JOHNS COUNTY COASTAL MANAGEMENT PLAN,
Florida Coastal Engineers, Inc., Jacksonville.
For primary bibliographic entry see Field 6F.
W78-03349

CHANNEL MODIFICATION GUIDELINES.
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4A.
W78-03350

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION, ALASKA PIPELINE.
Federal Maritime Commission, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03351

WATER RESOURCE POLICY STUDY.
Water Resources Council, Washington, DC.
Federal Register, Vol. 42, No. 136, p. 36788-95, July 15, 1977. 1 tab.

Descriptors: *Federal government, *Interagency cooperation, *Water quality, *Water conservation, *Water supply development, Administrative agencies, Natural resources, Water allocation(Policy), Water control, Water costs, Water distribution(Applied), Water law, Water management(Applied), Water resources, Water reuse, Water rights, Water utilization.

President Carter has directed the Secretary of the Interior, as Chairman of the Water Resource Council, together with the Office of Management and Budget and the Council on Environmental Quality, to conduct a comprehensive review of federal water resources policy. The review is to be completed within six months and will lead to the establishment of a national resources policy emphasizing sensitive and cost efficient management. Eight regional hearings have been scheduled and four papers have been published to facilitate comments and ideas. The first paper deals with revision of the planning and evaluation criteria of the federal departments and independent agencies concerned with water resource planning. The second paper studies the existing policies governing federal and non-federal cost sharing arrangements, and suggests how they may be made consistent with each other. The third paper examines existing and alternative water resources related institution, and promotes more efficient and equitable water use. The fourth paper concerns the adverse effect upon conservation of: a lower-than-cost price for water, inadequate watershed management practices, the limited recycling of water and inefficient use of water. (Jordan-Florida)
W78-03352

RESERVED WATER RIGHTS - A SOLUTION IS NEEDED,
Idaho Dept. of Water Resources, Boise.
R. K. Higginson.
Journal of the American Water Works Association, Vol. 68, No. 3, p. 129-31, March 1976. 11 ref.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Water rights, *Prior appropriation, Federal jurisdiction, National forests, Legal aspects, Jurisdiction, Boundary disputes, Natural resources, Water law, Riparian rights, Indian reservations, Competing uses, Natural use, Rivers, Preferences(Water rights), Legislation, Navigable waters.

Although it is indisputable that the federal government has prior appropriation rights to water within the country, the nature and extent of these rights is a source of controversy. It is unclear whether the federal claim is limited to the uses contemplated when the reservation was created or if the claim can encompass present day considerations. The federal government claims its reserved water rights include all of the water within the exterior boundary of the reservation and that, in addition to those uses specifically detailed in the Forest Organic Act of 1897, the uses for which the water was set aside include fish passage, aesthetic beauty, wildlife protection and recreation. The author believes that a careful reading of the Act shows the government's rights to be much narrower than this claim. He also questions the Indian's rights to water. In an attempt to end the controversy, the Department of Justice has drafted a bill for quantification, identification and adjudication of federal reserved and other water rights. The author discusses the objections to this bill and outlines the elements necessary in any bill which seeks the states' support. (Maass-Florida)
W78-03353

THE FIGHT TO SAVE HAWAII'S SHORELINES,
For primary bibliographic entry see Field 2L.
W78-03354

FEDERAL-STATE WATER RIGHTS CONFLICTS,
Arizona Univ., Tucson. School of Law.
R. E. Clark.
Journal of the American Water Works Association, Vol. 68, No. 3, p. 123-28, March 1976. 90 ref.

Descriptors: *Federal-state water rights, *Water rights, *Water allocation(Policy), *Prior appropriation, *Reservation doctrine, Water policy, Water demand, Judicial decisions, Legislation, Water resources development, Federal project policy, Water resources, Water supply, Groundwater resources, Water supply development, Water utilization, State jurisdiction, Federal jurisdiction, Withdrawn lands, Federal reservations, Indian reservations.

The federal-state water rights conflict in the Western states affects federal programs such as reclamation, Indian rights, water augmentation, and flood control. The author traces the historical development of water rights with frequent references to case law and legislation. The Western prior appropriation system views water supply as a public resource. Private rights are acquired by actual beneficial use and are separate from land ownership. Although Western states unanimously recognize appropriative rights to surface water, groundwater law is unclear. Federal claims to implied reserved water rights arise from Indian reservations and from land withdrawn by

the federal government for forest, oil, and military reserves. Legislation is annually proposed but unsuccessful in providing for the superiority of state water rights over any except Indian implied reserved rights. Three approaches suggested for resolving the conflict are: (1) a Congressional bill subordinating federal water rights to state law; (2) an inventory of federal water rights to be related to private rights under state law; and (3) maintaining the status quo, continuing water adjudication on a case by case basis. (Mulligan-Florida)
W78-03355

JUDICIAL MAELSTROM IN FEDERAL WATERS: A COMPOSITE INTERPRETATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
For primary bibliographic entry see Field 5G.
W78-03356

INDIAN CLAIMS IN THE BEDS OF OKLAHOMA WATERCOURSES,
M. M. Gibson.
American Indian Law Review, Vol. 4, No. 1, p. 83-90, Summer, 1976.

Descriptors: *Oklahoma, *River beds, *Indian reservations, *Ownership of beds, Banks, Navigable rivers, Legal aspects, Federal government, Beds under water, Boundaries(Property), Riparian rights, State governments, Judicial decisions, Legal review, Boundary disputes, Adjacent land owners, Water law, Streambeds, Land tenure, Treaties, Watercourses(Legal aspects).

Four main Supreme Court cases provide the principles under which Indian claims in the beds of Oklahoma watercourses are to be determined. First, treaties with Indians are to be construed in their favor. Second, the fact that a river is navigable does not necessarily deny Indian ownership of the bed provided the Indians had a possessory interest in the river before Oklahoma became a state. Third, the language of the treaty placing the Indians on a particular tract controls. Fourth, the words 'up', 'down' and 'main channel' are words of art and have specific meanings. Fifth, the phrase 'to and along the bank' clearly implies no intent to transfer any ownership in the bed. Sixth, the ownership in fee of land bordering a watercourse is not a requisite of a legitimate claim to the river bed. Finally, mineral ownership to the upland carries with it mineral rights in the river bed. (Moorhouse-Florida)
W78-03357

ONSHORE IMPACT OF OFFSHORE DRILLING: THE POLICE POWER ALTERNATIVE,
For primary bibliographic entry see Field 5G.
W78-03358

WATER RIGHTS IN THE COAL FIELDS OF THE YELLOWSTONE RIVER BASIN,
Bureau of Indian Affairs, (Washington, DC.).
W. H. Veeder.
Law and Contemporary Problems, Vol. 40, No. 1, p. 77-96, Winter, 1976.

Descriptors: *Water rights, *Water supply, *Water sources, *Coals, *Strip mines, Indian reservations, Montana, Wyoming, Reservation doctrine, Prior appropriation, State governments, Federal government, Legal aspects, Public lands, Planning, Future planning(Projected), Project planning, Legislation, Regional development, River basin development, Social aspects, Water allocation(Policy), Governmental interrelations, Federal-state water rights conflicts.

The Yellowstone River Basin contains thirty-four billion tons of strippable coal deposits. However, its accessibility depends upon proper resolution to conflicting federal, state and Indian claims regarding the distribution of water resources in the area. Indian claims to the water resources stem from treaties entered into with the early European explorers and subsequently ratified by treaties with the United States. Montana and Wyoming, the states composing the Yellowstone River Basin, adhere to the Western Water Law theory that one may appropriate all water passing upon his property provided beneficial use is made of it. State and federal government conflicts center around whether the federal government has delegated to the states the power to regulate the use of water on federal and Indian lands by virtue of statutes permitting appropriations according to state laws and, absent specific delegation, to what extent states may exercise regulatory control over waters that pass through their jurisdictions. Plans for developing coal-related industries in the Yellowstone River Basin should take into account the highly fluctuating water supplies and the needs of those already holding vested water rights. Mistakes in these estimates may prove disastrous for residents. (Moorhouse-Florida)
W78-03359

UPPER MISSOURI REGION, FISCAL YEAR 1974.
Bureau of Reclamation, Washington, D.C.
1975, 26 p.

Descriptors: *Reclamation states, *Reclamation, *Irrigation programs, *Dam construction, Recreation, Wyoming, Soil erosion, Recreation facilities, Agriculture, Irrigation districts, South Dakota, North Dakota, Montana, Irrigation, Irrigation design, Irrigation engineering, Irrigation systems, Dams, Flood control, Drainage, Drainage systems.

The Bureau of Reclamation has numerous reclamation projects underway in the Upper Missouri Region. These projects are summarized along with reports on construction, progress, land acquisition activity, power system operations, water and land operations and planning for future projects. Major projects in North and South Dakota and Wyoming consist of dams and reservoirs to aid irrigation and to supply energy and recreational benefits. A dust abatement program has been developed in Montana. The Bureau's progress in the areas of water delivery systems, safety of dams, irrigation management, drainage, flood control, soil and moisture conservation, recreation, fish and wildlife management, industrial water marketing, crip values, and cultural resource surveys including archaeological and historical work is also discussed. Proper reclamation planning for the conservation and development of water involves consideration of the environmental and economic objectives, and also of the effects on regional development and public welfare. (Denker-Florida)
W78-03360

PRETREATMENT STANDARDS FOR EXISTING SOURCES AND NEW SOURCES OF POLLUTION (PROPOSED REGULATIONS FOR 21 INDUSTRIES).
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03361

THE TOWN DILEMMA (P.C.B.'S IN BLOOMINGTON, INDIANA),
For primary bibliographic entry see Field 5G.
W78-03362

STATE BOARD ADOPTS COMPREHENSIVE ACTION PLAN (WASTEWATER RECLAMATION),
For primary bibliographic entry see Field 5G.
W78-03363

STATE UNDERGROUND INJECTION CONTROL PROGRAMS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03364

WATER PROGRAMS: SECONDARY TREATMENT INFORMATION (PROPOSED RULES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03365

BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS AND PH (SECONDARY TREATMENT INFORMATION).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03366

THE DEVELOPMENT OF THE CALIFORNIA AND FEDERAL WATER POLLUTION CONTROL PROGRAMS,
For primary bibliographic entry see Field 5G.
W78-03367

BALANCING OF INTEREST AND INTERNATIONAL LIABILITY FOR THE POLLUTION OF INTERNATIONAL WATERCOURSES: CUSTOMARY PRINCIPLES OF LAW REVISITED,
Yale Univ., New Haven, CT. Yale Law School.
For primary bibliographic entry see Field 5G.
W78-03368

FINAL REVISION OF REGULATIONS AND CRITERIA FOR OCEAN DUMPING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W78-03369

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR NEW SOURCE NPDES PERMITS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-03370

WATER RESOURCE PLANNING AND RURAL WATER SYSTEMS,
W. Ellingson, and R. Oostra.
South Dakota Law Review, Vol. 19, No. 3, p. 622-640 (Summer 1974). 50 ref.

Descriptors: *Water allocation(Policy), *Water resources development, *Iowa, *South Dakota, *Comprehensive planning, Planning, Long-term planning, Administration, Decision making, Forecasting, Governments, State governments, Administrative agencies, Legislation, Governmental interrelations, Management, Regional development, Social aspects, Water management(Applied), Competing uses, Future planning(Projected).

The majority of this nation's water resource problems do not stem from an overall lack of water but rather a lack of accommodation between natural water distribution patterns and man's need patterns. Consequently, water resource planning on a regional and statewide basis is of utmost importance. The authors examine the development of a rural water distribution system in northwest Iowa. Special emphasis is placed on the lack of regional or statewide water resource planning at all decision making levels. The federal, state and local laws and regulations applicable to the system are outlined. Iowa and South Dakota statutory provi-

sions for water resource planning and control are compared and analyzed in relation to the Model Water Code for comprehensive water resource planning. The case study demonstrates problems encountered at both the state and federal levels due to the absence of set procedures and general resource development plans. Indeed, the sum result of the procedures examined was delay and lack of knowledge concerning environmental impact. Existing state statutes merely encourage water use planning rather than demand it. What is needed is mandatory water use planning as outlined in the Model Water Code. (Moorhouse-Florida)
W78-03371

EXISTING REMEDIES FOR WATER POLLUTION,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W78-03372

SALT WATER INTRUSION IN FLORIDA (LEGAL APPROACHES TO PREVENTION AND CONTROL),
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 5G.
W78-03373

THE RIGHT OF AN INDIVIDUAL TO COMPENSATION FOR DAMAGES DONE TO HIS RIGHT OF ACCESS IN NAVIGABLE WATERS BY AN ACT OF THE SOVEREIGN,
Florida Univ., Gainesville. School of Law.
T. G. Morton, Jr.
Available from Eastern Water Law Center, 358 Holland Law Center, University of Florida, Gainesville, Florida 32611, for $1.55. May 1970, 21 p.

Descriptors: *Riparian rights, *Navigable waters, *Compensation, *Damages, Common law, River beds, River basins, River regulation, Rivers, Lake shores, Lake beds, Lake basins, Lakes, Land, Water resources, Water users, Access routes, Riparian waters, Riparian land, Navigation.

Riparian rights of access and navigation present distinct legal concepts. If the sovereign interferes with riparian access, the land owner should be compensated under the fifth amendment of the Constitution. However, if the interference does not affect access, but only impairs the riparian owner's opportunity to navigate in sovereign waters, compensation may not be required because there is no actual encroachment on the riparian owner's land. Courts today are tending to limit compensable rights strictly to cases involving an actual interference with riparian land resulting in a deprivation of access to the navigable water body. (Josepher-Florida)
W78-03374

LANGE V. TOWN OF NORWAY (MUNICIPAL LIABILITY FOR NEGLIGENT FLOODING).
253 N.W. 2d 240-45 (Wis. 1977).

Descriptors: *Wisconsin, *Dams, *Floods, *Negligence, Water control, Water injury, Water law, Water storage, Flood control, Flood damage, Water levels, Safety, Floodgates, Cities, Judicial decisions, Legal aspects, Crops, Dam construction, Cultivated lands, Runoff, Operation and maintenance, Structures.

Plaintiff landowner sought damages for crops ruined by flooding resulting from the negligent maintenance of a dam by a municipality. The municipality purchased the dam from a private owner. The state agency order granting transfer of ownership indicated that a long-term change in the runoff conditions of the area rendered the dam inadequate to control flood waters and mandated the construction of a new dam by September 1972. However, the new dam had not been constructed when the flood occurred in September 1972. The Wisconsin Supreme Court found the plaintiff's complaint to be insufficient since the basis for liability was unclear. The court held that the plaintiff could amend and replead his complaint since there was a possible cause of action in negligence. The court reviewed the circumstances under which a municipality could not claim sovereign immunity from civil suit. Wisconsin statutes allow suit against a municipality only where the municipality has negligently caused damage while performing its legislative function. The court indicated that if the municipality had implemented changes in the dam's physical condition or operation, it would be liable for any inadvertently ensuing damages. (Yawn-Florida).
W78-03375

MISSISSIPPI STATE HIGHWAY COMMISSION V. TYNER (OWNERS OF LAND BORDERING NATURAL WATERCOURSES MAY INCREASE AND ACCELERATE SURFACE WATER DRAINAGE WITHOUT LIABILITY).
345 So.2d 1050-51 (Miss. 1977).

Descriptors: *Mississippi, *Riparian land, *Surface drainage, *Culverts, Surface waters, Drainage water, Drainage, Highways, Legal aspects, Judicial decisions, Riparian rights, State governments, Surface runoff, Average runoff, Rain water, Drainage effects, Drainage practices, Ditches, Water conveyance,Damages.

Plaintiff landowner brought suit against the Mississippi State Highway Commission for damage to her property and for a mandatory injunction requiring the installation of culverts to carry water under her driveway. Highway construction had caused plaintiff's driveway to wash out due to increased volume and velocity of drainage water. The trial court granted plaintiff's request for the injunction only. The Supreme Court of Mississippi reversed and held that owners of land along the border of a natural watercourse may accumulate surface waters and cast them into the natural drainage or watercourse without liability to the lower riparian owner. The above principal holds true even though the flow of the water is accelerated and the volume increased. The Court said the responsibility to install a sufficient culvert lay with the plaintiff. (Moorhouse-Florida)
W78-03376

PORTER COUNTY CHAPTER OF IZAAK WALTON LEAGUE OF AMERICA, INCORPORATED V. TRAIN (PROCEDURAL RULES FOR INTERVENORS IN ENVIRONMENTAL PROTECTION AGENCY ADMINISTRATIVE HEARINGS).
548 F2d 1298-1302 (7th Cir. 1977).

Descriptors: *Indiana, *Lake Michigan, *Discharge(Water), *Permits, Legal review, Administrative agencies, Administration, Administrative decisions, Effluents, Water pollution, Waste water(Pollution), Water pollution sources, Regulation, Water quality, Legal aspects, Steel, Industries.

Petitioner environmental group concerned with the pollution of Lake Michigan by a steel company wished to intervene in a regulations adjudicatory hearing of the regional Environmental Protection Agency (EPA). Discharge permits for the polluting steel company were to be discussed at this hearing. The steel company had already been granted a permit to discharge effluents and the petitioner wished to challenge the permit issuance. EPA has explicit procedural rules governing adjudicatory hearings which the petitioner failed to follow. Consequently, the petitioner's motion to intervene was desmissed. Petitioner sought review of the dismissal. The Court of Appeals found no error in the dismissal and affirmed, concluding that the administrative law judge had reasonably complied with the EPA's procedural orders and had acted in good faith as evidenced by the numerous continuances he had granted the petitioner prior to dismissal for non-compliance. The merits of the petitioner's claim against the steel company were never dealt with because the petitioner failed to state its objections to the permit issuance as required by EPA rules. (Denker-Florida)
W78-03377

SAVE THE BAY, INCORPORATED V. MISSISSIPPI AIR AND WATER POLLUTION CONTROL COMMISSION (HEARING REQUIREMENTS FOR DISCHARGE PERMITS UNDER NPDES).
341 So.2d 98-100 (Miss. Sup. Ct. 1977).

Descriptors: *Mississippi, *Waste water disposal, *Discharge(Water), *Permits, Legal review, Chemical wastes, Administration, Administrative agencies, Administrative decisions, Effluents, Water pollution, Water pollution control, Water quality control, Bays, Waste water(Pollution), Water pollution sources, Water quality, Legal aspects, Titanium.

Mississippi law requires that any person or interested party aggrieved by any order of the pollution permit commission shall have a right to a hearing of the matter involved provided that no hearing on the same subject has already been held. DuPont Corporation had filed an application to discharge waste water into St. Louis Bay in accordance with the National Pollutant Discharge Elimination System (NPDES). After the DuPont application was filed, the pollution permit commission conducted an investigation which included an open public hearing. Later, appellant citizens' organization petitioned the commission for a new hearing on the question of the permit issuance based on concern over proposed discharges of titanium dioxide. Upon the failure of the commission to act on its request, the appellant sought relief in chancery court. The commission contended that appellant had already had an opportunity for a hearing as required by Mississippi law. The Mississippi Supreme Court held that appellant had been denied due process because the initial hearing was solely for the purpose of permitting interested parties to express their views and did not satisfy the hearing requirements contemplated by the statute. (Denker-Florida)
W78-03378

WATER SAVED OR WATER LOST: THE CONSEQUENCES OF INDIVIDUAL CONSERVATION MEASURES IN THE APPROPRIATION STATES,
For primary bibliographic entry see Field 3B.
W78-03379

APPALACHIAN POWER COMPANY V. TRAIN (REVIEW OF EPA REGULATIONS GOVERNING DISCHARGE OF HEAT).
545 F.2d 1351-81 (4th Cir. 1976).

Descriptors: *Electric powerplants, *Heated water, *Discharge(Water), *Thermal pollution, *Regulation, Fly ash, Cooling water, Runoff, Effluents, Thermal water, Heat, Heating, Heat flow, Costs, Cost-benefit analysis, Cost-benefit ratio, Cost-benefit theory, Legal aspects, Coolants, Cooling towers, Limiting factors, Federal government.

Petitioner power companies sought review of Environmental Protection Agency (EPA) regulations limiting heat discharges into navigable waters. The petitioners contended that heat should not be treated as other pollutants since thermal discharges may sometines be beneficial. The petitioners further contended that they were entitled to a variance and that, in considering their applicaton for a variance, economic impact should be taken into consideration, instead of only techni-

cal and engineering factors exclusive of cost. The court held that economic factors could be considered and therefore it was proper to examine the cost of technology necessary to achieve effluent reduction. The court also held that the EPA needed to review its regulatons concerning thermal backfit requirements, its prohibition on cooling lakes as an acceptable form of closed-cycle cooling, its regulations concerning runoff limitations from material storage and construction site runoff, and its regulations concerning a no-discharge limitation for fly ash transport water. The court directed the EPA to reassess and clarify its regulations. (Denker-Florida)
W78-03380

DUPONT DE NEMOURS COMPANY V. TRAIN (EFFLUENT LIMITATIONS BASED UPON INDUSTRY-WIDE REGULATIONS PERMISSIBLE UNDER SECTION 301).
97 S. Ct. 965-80 (1977).

Descriptors: *Effluents, Chemical industry, *Chemical wastes, *Inorganic compounds, Judicial decisions, Water pollution, Water pollution sources, Wastes, Discharge(Water), Industrial wastes, Liquid wastes, Waste water(Pollution), Waste water disposal, Legal aspects, Legal review, Water law, Administrative agencies, Pollutants, Pollution abatement.

Petitioners, companies engaged in the production of inorganic chemicals, challenged the Environmental Protection Agency's (EPA) authority under the Federal Water Pollution Control Act Amendments of 1972 to issue effluent limitations for existing point sources by regulation rather than on an individual basis. Petitioner's claim was based on an interpretation of Section 301 which views that section as a mere description of possible limitations and not an independent source of authority to issue effluent limitations by regulation. Under this view, Section 402 provides the only authority for the issuance of enforceable limitations. The United States Supreme Court disagreed and held the EPA has authority under Section 301 to limit discharges by existing plants through industry-wide regulations provided some allowance is made for variations in individual plants. The Supreme Court found that both the language of Section 301 and the legislative history supported this interpretation. The Court also determined that the courts of appeals had exclusive jurisdiction for review of EPA actions promulgating effluent limitations and that variances for individual plants unable to comply with the new source standards issued under Section 306 are not authorized. (Moorhouse-Florida)
W78-03381

CARLOTTO LIMITED V. COUNTY OF VENTURA (APPORTIONMENT OF FLOOD DAMAGE CAUSED BY NEGLIGENCE).
121 Cal. Rptr. 171-77 (Cal. App. 1975).

Descriptors: *Negligence, *Flood control, *California, *Dam failure, *Flood damage, Drainage systems, Judicial decisions, Legal aspects, Water law, Reservoir operation, Dams, Reservoirs, Runoff, Spillways, Diversion structures, Conveyance structures, Overflow, Administrative agencies, Silt, Damages.

Plaintiff property owner brought suit against the flood control district to recover damages incurred when the flood control system overflowed. The defendant government unit admitted negligence in maintenance of the flood control system, but contended there was no evidence that its negligence caused any part of the damage to plaintiff's property. The trial court found that defendants' negligence had been the cause of part of the damages to plaintiff's property, and apportioned the award on a formula based on the amount of debris the defendants had allowed to accumulate in the drainage system in proportion to the amount of silt which had been deposited over the plaintiff's factory. The plaintiff appealed, alleging the apportionment had not been pleaded by the defendants as an affirmative defense and should not have been injected by the trial judge. The California Second District Court of Appeal held that injection of apportionment was proper, but that the trial court had not used a rational basis to assess the defendants' contribution. The case was remanded with directions that the defendants must bear the burden of proof of the extent to which the damages should be apportioned. (Sloan-Florida)
W78-03382

LANE V. CITY OF REDONDO BEACH (MUNICIPALITY PROHIBITED FROM INTERFERING WITH PUBLIC ACCESS TO TIDELANDS OR NAVIGABLE WATERS).
122 Cal. Rptr. 189-94 (Cal. App. 1975).

Descriptors: *California, *Access routes, *Public access, *Beaches, *Navigable waters, Right-of-way, Local governments, State governments, Navigation, Fishing, Oceans, Structures, Buildings, Real property, Coasts, Water law, Legal aspects, Judicial decisions.

Plaintiff residents brought an action for declaratory judgement against defendant city alleging that the city had interfered with their right of free access to tidelands and navigable waters thus violating their constitutional and statutory rights. The defendant city, situated on the Pacific Coast, had been granted all tidelands adjacent to its coastline by the state which holds tidelands in trust for the public for navigation, fishery, and commerce. The city adopted a redevelopment plan which provided for the acquisition of all land, the demolition of all buildings, and the vacation of all streets in a prescribed area. The defendant then constructed buildings on the acquired land over former right-of-ways cutting off easy access to the ocean. The trial court dismissed the complaint. The Second District Court of Appeal reversed finding that there was a strong public policy favoring public access to the coast. The basic purpose of entrusting the tidelands to municipalities was to insure such access. To allow a municipality to deprive the public of its right of access to tidelands or navigable waters by the exercise of its admitted municipal power to vacate streets would destroy the trust. (Petruff-Florida)
W78-03383

REA ENTERPRISES V. CALIFORNIA COASTAL ZONE COMMISSION (CALIFORNIA COASTAL ZONE COMMISSION REVIEW OF REGIONAL PERMITS).
125 Cal. Rptr. 201-20 (Cal. App. 1975).

Descriptors: *California, *State governments, *Coasts, *Land development, *Permits, State jurisdiction, Regulation, Zoning, Legal review, Legislation, Land use, Ecosystems, Administration, Regions, Legal aspects, Administrative decisions, Judicial decisions.

Under the California Coastal Zone Conservation Act, developers who want to build in coastal zones must obtain permits from a regional coastal zone commission. Regional permit decisions are appealable to the state coastal zone commission. Respondent developer was granted a permit to construct condominiums in a coastal zone in Southern California and an appeal was taken. The state commission refused to approve the issuance of the permit after a tie vote by its members and the respondent sought a writ of mandamus to secure the permit. The respondent argued that a tie vote constituted an affirmation of the regional commission's decision because the state commission was unable to obtain a majority against the permit. The California Second District Court of Appeal upheld the denial saying legislative intent was to create a state commission with enlarged appellate powers including the power to conduct a de novo hearing in which the commission could exercise its independent judgement on the record and reviewing evidence unavailable at the regional hearing. Therefore, the state commission has the ultimate power over permits, making a tie vote sufficient to deny the permit. (Denker-Florida)
W78-03384

NO OIL, INCORPORATED V. OCCIDENTAL PETROLEUM CORPORATION (EXEMPTIONS FROM PERMIT REQUIREMENTS UNDER THE CALIFORNIA COASTAL ZONE CONSERVATION ACT).
123 Cal. Rptr. 589-605 (Cal. App. 1975).

Descriptors: *California, *Drilling, *Permits, *Oil industry, Legal aspects, State governments, Regional development, Coasts, Drill holes, Application methods, Environment, Environmental effects, Oil, Exploration, Oil wells, Legal review, Water law, Oil fields.

Plaintiff conservation group brought an action against defendant oil company to enjoin the defendant from exploratory drilling in a Southern California coastal zone without a permit from the coastal zone commission. The defendant claimed that its drilling operation was exempt from the permit requirement because it had begun its drilling prior to the enactment of the Coastal Zone Conservation Act requiring such permits and it had acted in good faith in commencing its activities. The plaintiff sought a declaratory judgment on the issue of whether defendant's drilling operation was exempt from the act's permit requirement. The trial court found for defendant oil company but the Second District Court of Appeal reversed. The court held that the defendant could not conduct exploratory drilling without obtaining a permit because both good faith and lawfulness were prerequisites to exemption. The court found that the lawfulness requirement was not met because the drilling district ordinances on which defendant based its actions had been found void by the California Supreme Court in other litigation. (Denker-Florida)
W78-03385

BUCHANAN V. CITY OF NEWPORT BEACH (MUNICIPAL RESPONSIBILITY FOR SURFING INJURIES INDIRECTLY RELATED TO CONSTRUCTION OF JETTY).
123 Cal. Rptr. 338-42 (Cal. App. 1975).

Descriptors: *California, *Jetties, *Wave action, *Surf-boarding, *Hazards, Water sports, Sands, Dredging, Beaches, Public lands, Flow, Oceans, Ocean waves, Shores, Waves(Water), Surf, Slopes, Construction, Accidents, Harbors, Sand spits, Safety, Cities.

Plaintiff surfer brought suit against defendant city for injuries sustained as a result of wave action caused by the construction of a jetty and the dredging and deposit of sand at a beach. The complaint alleged that the injury resulted from the defendant's failure to give warning of a dangerous condition. The beach in question was created through the construction of a jetty when sand dredged from the channel of the harbor entrance adjacent to the jetty was deposited on submerged sand spits. This raised the beach level twenty-seven feet causing a steep slope from the shoreline into the water. This condition when added to the action of the ocean swells against the jetty produced a dangerous surfing condition. The trial court granted a nonsuit finding that the plaintiff's injury was caused by a natural condition of unimproved public property with no liability on the part of the defendant. The California Fourth District Court of Appeal reversed holding that there was sufficient evidence to demonstrate both that the defendant exercised control over the beach which was an exceedingly dangerous surfing area and that the improvements were the cause of the injury. (Petruff-Florida)
W78-03386

GLEGHORN V. CITY OF WICHITA FALLS (IMPROPER JURY INSTRUCTIONS IN CONDEMNATION SUIT).
545 S.W.2d 446-48 (Tex. Sup. Ct. 1976).

Descriptors: *Texas, *Damages, *Condemnation, *Condemnation value, Judicial decisions, Legal aspects, Easements, Compensation, Value, Water districts, Flood discharge, Flow, Flooding, Submergence, Discharge(Water), Backwater, Surges, Water control.

In a condemnation suit, plaintiff water improvement district sought to enlarge an existing flowage easement over the defendant's land. The defendant was awarded substantial damages and the plaintiff appealed. At issue were the contents of the jury instructions. The appellate court reversed and remanded finding a portion of the jury instructions objectionable. The Texas Supreme Court affirmed the holding of the appellate court but disagreed with its reasoning. The appellate court found that an impermissible comment was made on the weight of the evidence when the jury was told that plaintiff 'can' exercise the rights acquired to the fullest extent. The state supreme court disagreed, stating that use of the word 'can' did not imply the property would be put to its most damaging use. The supreme court, however, objected to the statements which advised the jury that the easement being taken was to be used for the purpose of submerging the land. The court found that the plaintiff sought only an additional flowage easement not the right to totally submerge the property as stated in the jury instruction. A new trial was granted with orders to correct the jury instructions. (Petruff-Florida)
W78-03387

SMITH-SOUTHWEST INDUSTRIES V. FRIENDSWOOD DEVELOPMENT COMPANY (LIABILITY OF PERCOLATING WATER USER FOR SUBSIDENCE OF LAND).
546 SW2d 890-99 (Tex. Civ. App. 1977).

Descriptors: *Water rights, *Texas, *Land subsidence, *Percolating water, Wells, Legal aspects, Judicial decisions, Subsidence, Negligence, Groundwater, Pumps, Water law, Relative rights, Subsurface water, Percolation, Well regulations, Water resources, Damages, Water table, Reasonable use, Withdrawal.

Plaintiff landowners brought a class action suit against defendant landowners seeking recovery of subsidence of land allegedly caused by the defendant's withdrawal of percolating underground water. The plaintiffs based their action on four theories: nuisance, negligence, intentional interference with their property, and wrongful taking and conversion of their property. The defendants contended that Texas law allows no right to recover for damages resulting from withdrawal of underground water regardless of damage sustained by neighboring lands. The trial court granted summary judgment against the plaintiffs. The Texas Court of Civil Appeals reversed holding that the plaintiffs could base their cause of action on theories of negligence and nuisance in fact. The court stated that, with respect to a landowners' right to use percolating water beneath his land, Texas adheres to the English rule of absolute ownership rather than the American rule of reasonable use. In Texas, however, the English rule is modified by the requirement that a person must use his property so as to avoid harm to others. The court also found that the defendant's third-party action against other groundwater users for indemnity and contribution was proper. (Capehart-Florida)
W78-03388

PLEASANT VIEW UTILITY DISTRICT V. VRADENBURG (RECOVERY FOR TAKING OF FLOWAGE EASEMENT BARRED BY STATUTE OF LIMITATIONS).
545 S.W.2d 733-36 (Tenn. Sup. Ct. 1977).

Descriptors: *Tennessee, *Discharge(Water), *Drainage water, *Easements, *Public utility districts, Waste water treatment, Eminent domain, Water treatment, Flow, Dispersion, Legal aspects, Water purification, Water storage, Chlorination, Treatment, Filters, Waste water disposal, Drainage effects, Utilities.

Respondend landowners, having purchased property in 1974, sought to enjoin petitioner utility district from discharging waste water onto that land. The respondents charged that since 1964 the petitioner under its power of eminent domain had intentionally, regularly, and necessarily discharged a large volume of water from a water treatment facility onto their land. The respondents alleged that this action by the petitioner constituted a flowage easement. The petitioner moved to dismiss the action claiming that the action was barred by the statute of limitations. The Tennessee Supreme Court found that in 1964 petitioner constructed a water purification and chlorination facility and a water storage tank on land adjoining the respondents' property. The operation of the facility required that the petitioner flush the filtration system at least once every three days. From the outset, the flushing water was discharged across respondents' land. Although there was no question that petitioner took a flowage easement, the inverse condemnation statute required that the action be filed in circuit court within twelve months of the taking. The Supreme Court affirmed the lower court's dismissal of the action. (Petruff-Florida)
W78-03389

FLORIDA SAFE DRINKING WATER ACT (PROPOSED LEGISLATION).
Florida House Bill 1262 (1977).

Descriptors: *Water quality, *Water quality standards, *Potable water, *Regulation, *Florida, Water purification, Water quality control, Administrative agencies, Inspection, Public health, Legal aspects, Water treatment, Water supply, Water utilization, Standards, Domestic water, Water analysis, Facilities, Pre-treatment(Water), Public utilities, Sampling, Legislation.

The Florida House of Representatives is considering a bill relating to safe drinking water. The bill would require the Department of Environmental Regulation to adopt primary and secondary drinking water regulations. It would also require the department to adopt a plan for emergency provision of drinking water as well as granting the discretionary power to deal with other imminent hazards. The department would have the responsibility for inspecting public water systems and the power to impose penalties for noncompliance with its regulations. With the passage of the bill, a state public water supply laboratory certification program would go into effect, as well as a public water supply accounting program. The bill would amend current Florida law by providing for the regulation of operators of water purification and waste-water treatment plants. The bill provides the Department of Health and Rehabilitative Services with supervisory duties and enforcement powers over water systems not covered by this bill. The powers and duties of the Division of Health are deleted as they relate to water supply systems, methods of water purification, and drainage disposal. (Denker-Florida)
W78-03390

BUCHANAN V. LOS ANGELES COUNTY FLOOD CONTROL DISTRICT (RESPONSIBILITY OF FLOOD DISTRICT FOR CONTROLLING WATER FLOW).
128 Cal. Rptr. 770-73 (Cal. App. 1976).

Descriptors: *Dams, *Drainage systems, *Discharge(Water), *California, Negligence, Diversion dams, Diversion, Flow, Floods, Flood damages, Erosion, Reservoirs, Flood control, Flow control, Water control, Ditches, Water spreading, Water levels, Riparian rights, Safety, Hazards.

Plaintiff landowner brought an action for wrongful death against defendant flood control district. The plaintiff alleged that the defendant's negligence in the operation and maintenance of the flood control system resulted in the drowning death of his son. The jury found for the defendant and the plaintiff appealed. The flood control system consisted of four dams which were controlled manually. Water was regularly diverted from these dams into several washes. Plaintiff owned property which abutted one of these washes. Prior to January, 1969, the custom of the defendant had been to warn residents when the rate of discharge equaled 300 cfs. In January 1969, heavy rains necessitated a diversion of water from one watershed to another. Without warning, the defendant began releasing water into the wash at a rate exceeding 900 cfs. The release of this large quantity of water eroded a hole below the fence revertment along plaintiff's property. The plaintiff's son fell through this hole and drowned in the deep water of the wash. The appellate court in reversing the jury verdict found that certain jury instructions were prejudicial to the plaintiff's theories of recovery. (Petruff-Florida)
W78-03391

SWANSON V. MARIN MUNICIPAL WATER DISTRICT (WATER DISTRICTS EMPOWERED TO REGULATE WATER USE IN EMERGENCIES).
128 Cal. Rptr. 485-93 (Cal. App. 1976).

Descriptors: *California, *Water districts, *Water shortage, *Water consumption, Water yield, Pipelines, Water users, Legal aspects, Water supply, Water distribution(Applied), Regulation, Administrative agencies, Water demand, Water policy, Water allocation(Policy), Safe yield, Water utilization.

Plaintiff landowner sought and obtained a peremptory writ of mandate compelling defendant water district to grant plaintiff a pipeline extension and to provide water service to the plaintiff's real property. The defendant had rejected the plaintiff's initial petition pursuant to its finding that the estimated water consumption in the district would exceed the expected water yield. Since the ordinary demands of consumers could not be met without depleting the water supply to the district to the extent that there would be insufficient water for human consumption, sanitation, and fire protection, the defendant concluded that a water shortage emergency condition prevailed in the area. The defendant then imposed a moratorium on the granting of new water services. The First District Court of Appeal reversed the lower court order finding that the defendant was empowered to anticipate a future water shortage and to impose appropriate regulations and restrictions to control its water supply. The court held that the moratorium on new service was neither unreasonable nor an invasion of the plaintiff's constitutional rights when actual water consumption was already in excess of the net safe water yield. (Petruff-Florida)
W78-03392

CARMEL VALLEY VIEW, LIMITED V. BOARD OF SUPERVISORS, IN AND FOR COUNTY OF MONTEREY (DENIAL OF USE OF SEPTIC TANKS IN PROPOSED SUBDIVISION).
130 Cal. Rptr. 249-53 (Cal. App. 1976).

Descriptors: *California, *Waste disposal, *Septic tanks, *Seepage, *Land development, Regulation, Standards, Mapping, Legal aspects, Sewage, Effluents, Maps, Sewage disposal, Sewage effluents, Water pollution control, Wastes, Water pollution, Pollutants, Environmental effects.

Plaintiff developer brought suit to require the planning commission and board of supervisors of Monterey County to approve a tentative subdivision map. The planning commission had denied approval after a finding that the development site was not physically suitable for the type of sewage disposal system planned by the plaintiff. The plaintiff claimed that the planned septic tanks were a safe means of disposal and that the commission's denial did not rest on the evidence. The California First District Court of Appeal reversed the lower court's decision in favor of the plaintiff. The court held that the environmental impact report on which the county had based its denial was sufficient to sustain that denial. The report indicated that seepage of waste effluent from the proposed septic tanks might eventually reach a nearby river because the property was on a steep slope and the thin topsoil and limited permeability of the underlying shale might allow direct infiltration of underground water by untreated effluents. (Denker-Florida)
W78-03393

ELLISON V CITY OF SAN BUENAVENTURA (NO CAUSE OF ACTION FOR LOWER RIPARIAN OWNER UNDER REASONABLE USE DOCTRINE).
131 Cal. Rptr. 433-38 (Cal. App. 1976).

Descriptors: *California, *Settling basins, *Sediment transport, *Riparian rights, *Dredging, *Natural flow doctrine, *Reasonable use, Easements, Silts, Legal aspects, Water rights, Canal construction, Canals, Drainage systems, Drainage, Riparian land, Natural flow, Natural use, Local governments, Surface waters.

Plaintiff landowner sued the city and county for injunctive relief and damages in class action suit on behalf of other property owners, boat owners and taxpayers within the county port district. The plaintiff's land abutted a barranca, a natural drainageway to the ocean. Formerly the water drained directly into the ocean but city and county dredging operations created a series of canals that rerouted the waterflow, resulting in the creation of a settling basin for particulate matter on its way to the ocean. Silt and debris once carried to the ocean settled in the barranca. The plaintiff claimed damages because his taxes had increased due to higher costs for dredging and maintenance of the waterways. He also claimed that the defendant had taken his easement rights and reduced his property values. The Second District Court of Appeal affirmed the lower court's dismissal holding that, under the natural water-course rule, an improvement such as drainage does not give a lower riparian owner a cause of action due to increased flow and its incidents. The court further found no cause of action using the higher standard of reasonable use because defendant's actions were reasonable. (Denker-Florida)
W78-03394

TRI-CHEM, INCORPORATED V LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, COUNTY OF LOS ANGELES (DUTIES OF MUNICIPALITIES TO PROVIDE WATER RUNOFF PROTECTION FOR PRIVATE LANDOWNERS).
132 Cal. Rptr. 142-48 (Cal. App. 1976).

Descriptors: *California, *Flood damage, *Drainage water, *Negligence, *Ditches, Flood flow, Rainfall, Natural flow, Legal aspects, Runoff, Drainage systems, Water levels, Water level fluctuations, Floods, Flood discharge, Damages, Rainfall-runoff relationships.

Plaintiff landowners property that formed a natural sump. During an unusually heavy rainfall, flood overflow damaged the plaintiffs' property. Suing on theories of negligence and inverse condemnation, the plaintiffs contended that defendant county and city were negligent because the flood control facilities provided by them were inadequate to deal with water runoff. The plaintiffs further contended that the defendants had a duty to maintain drainage ditches capable of handling the increased waterflow. The defendants argued that the proximate cause of the plaintiffs' damages was not due to any negligence in maintaining the ditch or drain and that the flood control project had reduced the natural flooding of the plaintiffs' property. The California Second District Court of Appeal held that without the defendants' flood control project, the plaintiffs' damages would have been worse. The court said the defendants were under no duty to provide flood control services to meet all climatic contingencies. The plaintiffs' recovery would require proof that the defendants' actions had resulted in increased waterflow on their land. (Denker-Florida)
W78-03395

CITY OF GRAND JUNCTION V. KANNAH CREEK ASSOCIATION (RIGHT TO CHANGE BENEFICIAL USE OF APPROPRIATED WATERS).
557 P.2d 1169-72 (Colo. 1976).

Descriptors: *Colorado, *Water distribution(Applied), *Water storage, *Prior appropriation, Irrigation water, Local governments, Rivers, Diversion, Municipal water, Flow, Appropriation, Conjunctive use, Streams, Regulation, River flow, Cities, Return flow, Beneficial use, Consumptive use, Preferences(Water rights).

Defendant city purchased direct flow rights to a river. It later petitioned the District Court for a change in the point of diversion, and a change to municipal use in addition to the previously designated irrigation use. Plaintiff water user's association protested this action on the ground that the municipal use precluded return flow to others. The city was also appealing an order enjoining it from storing water not immediately required for municipal purposes. The Supreme Court of Colorado held that purchase of water rights includes the right to change the appropriation to another beneficial use; however, the right to change the use to one involving storage is conditional. All appropriators, including those whose rights are junior, have a right to the continuance of the conditions existing on the stream at, and subsequent to, the time they made their appropriations, unless a change can be made without injury to those rights. Since the issue of rights of junior appropriators and the necessity of imposing conditions to protect the objectors had not been tried, the case was remanded to determine these issues. (Rieck-Florida)
W78-03396

CITY OF GRAND JUNCTION V. KANNAH CREEK ASSOCIATION (THE SCOPE OF PERMISSIBLE WATER USE ACQUIRED BY A CONDEMNATION JUDGMENT).
557 P2d 1173-80 (Colo. 1976).

Descriptors: *Colorado, *Appropriation, *Water storage, *Condemnation, Cities, Eminent domain, Legal aspects, Relative rights, Water supply, Beneficial use, Water law, Competing uses, Municipal water, Water rights, Compensation, Prior appropriation, Water distribution(Applied), Judicial decisions, Water works, Storage, Reservoirs.

Plaintiff city sought a determination that its water rights acquired in a 1911 eminent domain proceeding would allow it to change the use of such water to include storage thereof. The water referee ruled that the condemnation judgment impliedly gave the city a right to store water as an integral part of its authority to construct water works and distribute water to its inhabitants. The judge rejected the referee's ruling, but the Colorado Supreme Court reversed and adopted the ruling permitting the storage of water. The decision rests on the distinction between condemnation judgments and appropriation decrees. Plaintiff city had obtained a condemnation judgment which concurrently required it to compensate all prior appropriators for damages caused by such condemnation. The judgment vested in the city a paramount right to the water so condemned and allowed the city to use the water in any way reasonably necessary to promote the public welfare of its inhabitants. The dissent contends that storage rights and direct flow rights are significantly different with only the latter acquired by and compensated for in the condemnation action. (Moorhouse-Florida)
W78-03397

CITY OF BOULDER V. BOULDER AND LEFT HAND DITCH COMPANY (RIGHTS OF JUNIOR APPROPRIATORS TO RETURN FLOW).
557 P.2d 1182-86 (Colo. 1976).

Descriptors: *Irrigation water, *Colorado, *Prior appropriation, *Return flow, *Diversion, Judicial decisions, Relative rights, Legal aspects, Water law, Water rights, Appropriation, Priorities, Preferences(Water rights), Diversion loss, Returns, Water reuse, Seepage, Alteration of flow, Cities.

Plaintiff city, a junior appropriator, sought an injunction to prevent defendant ditch companies, senior appropriators, from transporting water for use in another watershed. For nearly one hundred years one defendant's irrigation appropriation had been used on land the return flow of which entered Boulder Creek. In contrast, the other defendant's appropriation was used to irrigate land the return flow of which entered other streams. The second defendant was diverting and transporting some of the water decreed to the first defendant thereby forcing the city to reduce its appropriation from Boulder Creek in order to compensate for the loss of return flow. The water judge dismissed the complaint but the Colorado Supreme Court reversed. The court first noted that the law makes no distinction between change of point of diversion and change of place of use so far as rights of junior appropriators are concerned. It then distinguished the rights of a junior appropriator to return flow from his rights to waste water. As to the latter no permanent right to the discharge can be acquired. But as to the former, junior appropriators have rights to the extent that they may not be injured by a change in the place of use of irrigation water which provided that return flow. (Moorhouse-Florida)
W78-03398

STATE EX REL. BROWN V. BROOKSIDE RECLAMATION, INCORPORATED (EXHAUSTION OF ADMINISTRATIVE REMEDIES REQUIRED BEFORE INSTITUTION OF NUISANCE ACTION).
356 N.E.2d 733-47 (Ohio Ct. App. 1975).

Descriptors: *Ohio, *Water pollution, *Landfills, *Waste disposal, Water law, Abatement, Air pollution, Legal review, Permits, Water pollution control, Legislation, Jurisdiction, Sewage disposal, Solid wastes, Water pollution sources, Judicial decisions, Legal aspects, Waste treatment.

Plaintiff Ohio Attorney General sought to enjoin the operation of a sanitary landfill. The plaintiff alleged that the defendant, a licensed solid waste disposal operator, had diverted underground watercourses depleting local wells, polluted local streams, produced noxious odors, and otherwise maintained a public nuisance. The defendant maintained that the trial court did not have jurisdiction because administrative remedies had not been exhausted. The trial court denied the relief sought and the court of appeals affirmed holding that the prescribed administrative procedures for investigation and enforcement of environmental violations are exclusive. The procedures established to regulate facilities within the scope

of the Ohio Environmental Protection Agency are designed to resolve technical environmental disputes before they reach the courts. The court further held that licensing did not exempt the defendant from prohibitions against water pollution, nor did water and drainage from the site run into a sewerage system when it flowed into the open sewers and ditches of a nearby town. Rather, a sewerage system contemplates the collection of wastes for treatment and not merely the conducting of wastes into lakes and rivers. (Moorhouse-Florida)
W78-03399

BOURGEOIS V. UNITED STATES (TITLE TO ISLANDS IN NON-NAVIGABLE BODIES OF WATER).
545 F2d 727-35 (Ct. Cl. 1976).

Descriptors: *Eminent domain, *Non-navigable waters, *Ownership of beds, *Boundaries(Property), *Islands, Legal aspects, Bodies of water, Beds, Riparian rights, Federal jurisdiction, Water law, Lake beds, Real property, Lake shores, Land tenure, Boundary disputes, Adjacent landowners, Michigan, Judicial decisions, Navigable waters.

Plaintiff landowner sought recover for the value of an island in a non-navigable lake allegedly appropriated by the United States. The original 1846 survey and plat had omitted the island. After the island first appeared on an official plat in 1959, the government posted the island as federal land. The plaintiff, who owned lakeshore lots, claimed nineteenth century patents had transferred the island from the government to private landowners. The defendant asserted no intent to transfer the island could be shown. The United States Court of Claims held that under federal commonlaw, if the intent was ambiguous and the government had granted shoreland along non-navigable waters, it had also passed title to islands according to the state law where the property was located. Since the government had failed to reserve the island, it impliedly patented it. Michigan law gives title to non-navigable water beds to shoreland owners in pie-shaped fashion to the center of the body of water. Applying non-navigable water bed law to the island, the court said if the plaintiff could show her succession to the patentee's ownership interests, she could recover for the government's taking. (Cotcheu-Florida)
W78-03400

TWIN LAKE RESERVOIR AND CANAL COMPANY V. CITY OF ASPEN (INTENT AND PHYSICAL ACT REQUIRED FOR APPROPRIATION).
557 P.2d 825-31 (Colo. 1976).

Descriptors: *Colorado, *Permits, *Water allocation(Policy), *Appropriation, Prior appropriation, Adjudication procedure, Diversion, Water distribution(Applied), Judicial decision, Legal aspects, Administrative, Water policy, Water requirements, Water rights, Water supply, Water law, Canals, Water conveyance, Water control.

Plaintiff, operator of a water diversion system, sought a conditional decree to an additional one hundred cubic feet of water per second from water proceeding from a collection to a reservoir. Colorado law mandates that in order to initiate an appropriation of water there must be a 'first step' consisting of (1) an intent to appropriate and (2) an open physical demonstration indicating that intent. The Supreme Court of Colorado held that the filing of an application for adjudication of a water right was sufficient evidence of the intent requirement. In regard to the necessity of a physical demonstration, the court held that the fact that the plaintiff-operator's physical act of building a canal with sufficient carrying capacity had occurred prior to the formation of his intent to appropriate the additional water should not preclude him from obtaining the conditional decree. The dissenting opinion argued that the purpose of the physical act requirement was to serve notice of the intent to appropriate. The dissenters felt the majority opinion would lead to abuse of the doctrine of conditional water rights. (Rieck-Florida)
W78-03401

SABINE RIVER COMPACT.
Tex. Water Code Ann. 44.001 through .010 (1972).

Descriptors: *Texas, *Interstate compacts, *Project planning, *Interstate rivers, Water law, Legal aspects, Regulation, Administrative agencies, Interstate commissions, Construction, Louisiana, Reservoir storage, Water management(Applied), Water supply, State governments, Beneficial use, Planning, Water policy, Cost sharing, Appropriation, Water rights.

The state of Texas has ratified the Sabine River Compact entered into with Louisiana for the purpose of establishing cooperative planning for the construction, operation and maintenance of projects for water conservation and utilization purposes on parts of the river touching both states. The pact does not deal with pollution abatement or salt water intrusion problems. All free water in the stateline reach shall be divided equally between the states. Since a minimum flow is necessary for the benefit of water users below the stateline in both states, restrictions are agreed on to insure maintenance of a minimum flow. Each state may construct impoundment reservoirs or other improvements on the portion of the river located wholly within its boundaries. Except for jointly stored water, each state must use its apportioned share of the natural stream flows as they occur with no accumulation of credits or debits. All waters used for domestic and stock water uses are excluded from apportionment. Each state may use its share of water in any manner that it deems beneficial. An interstate administrative agency is created to administer the terms of the compact. (Rieck-Florida)
W78-03402

MARL, SAND, GRAVEL, SHELL AND MUDSHELL.
Tex. Parks and Wildlife Code Ann. Sec 86.001 thru .019 (1976).

Descriptors: *Texas, *Sediments, *Commercial shellfish, *Navigable waters, *Dredging, Marl, Soil types, Sands, Gravels, Management, Administrative agencies, Oysters, Aquatic life, Navigation, Local governments, Federal government, Permits, Bodies of water, Financing, Fish hatcheries, Seawalls, Economic impact, Freshwater.

No person may disturb or take marl, sand, gravel, shell or mudshell which is under the management of the state or operate in or disturb any oyster bed or fishing water for any purpose other than that necessary or incidental to navigation or dredging under state or federal authority unless a permit authorizing the activity is acquired first. If no damage will result to oyster beds, bodies of water, or any fish, and if no current affecting navigation will be altered, a permit may be issued. Economic considerations will be weighed in relation to the injurious effect on the beds and fish. The permits are not assignable. No special privileges or exclusive rights will be granted to take sand or shell. Any county, city or town with a permit is not required to purchase the material taken and used for roads and streets or seawalls. Sands and other deposits with no commercial value may be taken from designated locations. Three-fourths of the proceeds from the sale of the materials shall be used for the construction and maintenance of fish hatcheries. Violators of these sections shall be guilty of a misdemeanor. (Rieck-Florida)
W78-03403

KANSAS GROUNDWATER EXPLORATION AND PROTECTION ACT.
Kan. Stat. Ann. secs 82a - 1201 thru -1215 (Supp. 1975).

Descriptors: *Kansas, *Well permits, *Groundwater resources, *Water wells, Groundwater, Groundwater availability, Underground structures, Underground, Geology, Geologic investigations, Water quality control, Water control, Water law, Water supply, Water permits, Well regulations, Wells, Construction, Water quality, Water contracts.

Kansas has enacted legislation providing for the exploration and protection of the state's groundwater. This act requires licensing of water well contractors. The contractors must keep logs containing data reflective of water quality. Well construction standards may be set by the state. Procedures for obtaining well construction licenses are specified. Applicants may be examined as to their familiarity with the state's groundwater laws and their knowledge of well construction and underground geology. Applicants must post surety bonds and meet financial requirements before licenses are issued. Licenses are valid for one year, subject to suspension and revocation. Violations of the act, negligence, incompetence, and fraud in obtaining a license constitute grounds for suspension and revocation of the license. Hearings regarding revocations are held before a state administrative officer and may be appealed to the district court. Willful violation of the act is made a misdemeanor. (Josepher-Florida)
W78-03404

STATE WATER PLAN STORAGE ACT (KANSAS).
Kan. Stat. Ann. secs 82a-1301 thru -1320 (Supp. 1975).

Descriptors: *Kansas, *Conservation, *Water contracts, *Water storage, *Reservoir storage, Hydrologic aspects, Legislation, Storage, Reservoirs, Droughts, Drought tolerance, Drought resistance, Beneficial use, Water control, Water costs, Water demand, Hydrology, Water permits, Water management(Applied), Water rates, Water supply, Water users.

Kansas has enacted a water plan storage act making all waters contained in conservation storage water reservoirs named in the plan the property of the state. The state is authorized to divert and store the waters of all streams flowing into such reservoirs to insure an adequate yield of water for beneficial use through specified drought conditions. The state water resources board shall acquire water reservation rights by filing a notice with the chief engineer. State contracts for withdrawals and use of waters from conservation water supplies must comply with the provisions of this act. Filing procedures, rate of charges, and length of terms of water contracts allowable under the act are specified. In addition, the water resources board is empowered to enforce claims or rights arising out of water contracts. (Josepher-Florida)
W78-03405

REPUBLICAN RIVER COMPACT.
Kan. Stat. Ann. secs 82a-518 (1969).

Descriptors: *Legislation, *Interstate compacts, *River basin development, *Kansas, Nebraska, Colorado, Water contracts, Water policy, Reservoirs, Reservoir construction, Reservoir operation, Water supply development, Water resources, Water management(Applied), River systems, River regulation, Rivers, Federal government, Flood control, Interstate, Interstate rivers, River basin commissions, River basins.

The state of Kansas has ratified the Republican River Compact signed by Colorado, Kansas and

Nebraska in 1942. The compact has for its purposes the promotion of efficient and equitable use of the waters of the Republican River Basin, the achievement of interstate comity, and the encouragement of flood control measures. Beneficial consumptive use is recognized as the most efficient utilization of the waters in the basin. The basin area includes all of that portion within the three states which is naturally drained by the Republican River and its tributaries up to the river's junction with the Smoky Hill River in Kansas. Specific water allocations are computed from the average water supply within the basin. Lower states may participate in the construction and future use of reservoirs in upper states, subject to laws of the upper state. Officials of the three states collaborate with United States officials in the administration of the compact. A map of the Republican River basin is included with the act. (Josepher-Florida)
W78-03406

ARKANSAS RIVER COMPACT.
Kan. Stat. Ann. sec 82a-520 (1969).

Descriptors: *Interstate Compacts, *Colorado, *Kansas, *River regulation, *Interstate rivers, Water contracts, Water policy, Reservoirs, Reservoir construction, Reservoir operation, Water supply development, Water resources, Water management(Applied), River systems, Rivers, Federal government, Interstate, Irrigation programs, Administration, State jurisdiction, State governments.

The legisiature of Kansas has ratified the Arkansas river compact formed by the states of Kansas and Colorado. The Compact was established to eliminate controversies between the two states concerning the control, conservation and utilization of the Arkansas river for irrigation purposes. A second major purpose of the Compact was to allow equitable apportionment of the benefits arising from the John Martin Reservoir Project. The quantity of water available for release from the John Martin Reservoir, and procedures for obtaining such release are detailed, together with the limits of jurisdiction of Kansas and Colorado over waters which originate or flow through the respective states. Also described is the interstate agency known as the Arkansas River Compact Administration which was created to administer the Compact. (Josepher-Florida)
W78-03407

ARKANSAS RIVER BASIN COMPACT, KANSAS-OKLAHOMA.
Kan. Stat. Ann. sec 82a-528 (1969).

Descriptors: *Interstate compacts, *River basin development, *Oklahoma, *Kansas, *River basin commissions, Water policy, Water contracts, Water supply development, Water resources, Water management, River systems, River regulation, Rivers, Interstate, Interstate rivers, River basins, Water importing, Topographic mapping, Pollution abatement, Administration, State jurisdiction, State governments.

The state of Kansas has ratified the Arkansas river basin compact between Kansas and Oklahoma. The major purposes of the compact are: apportion equitably the waters of the Arkansas river basin between the two states and promote their development; promote interstate comity; administer the water apportionment provisions of the compact through the Kansas-Oklahoma Arkansas river commission; encourage the maintenance of active pollution abatement programs in the two states. For apportionment purposes, the Arkansas river basin is divided into five major topographic subdivisions. Subject to certain exceptions, both states shall have free and unrestricted use of the waters of the river basin which are within the respective states. The compact includes provisions for the construction and operation of new conservation storage capacity. The compact also details the rights of the states to import and export water to or from major subbasins within the same state. The compact is to be reviewed for purposes of amendment and supplementation twenty-five years after its effective date. (Josepher-Florida)
W78-03408

BIG BLUE RIVER COMPACT, KANSAS-NEBRASKA.
Kan. Stat. Ann. sec 82a-529 (Supp 1975).

Descriptors: *Interstate compacts, *Kansas, *Nebraska, *River basin development, Low-flow, Low-flow augmentation, Water contracts, Water policy, Reservoirs, Construction, Reservoir operation, Water supply development, Water resources, Water management, River systems, River regulation, Interstate, Interstate rivers, River basin commissions, River basins, Water quality control.

The Kansas-Nebraska Big Blue River Compact was ratified by the state of Kansas. The purposes of the compact are to promote interstate comity, to achieve an equitable apportionment of the waters of the Big Blue river basin, to encourage orderly development of the basin, and to establish an active pollution abatement program in both states. An interstate agency is created to administer the act. The compacting states subscribe to the principle of including storage capacity for low-flow regulation in reservoirs constructed by the federal government. Water released from these reservoirs is to remain available in the stream. Nebraska's use of water from river basins within the state is subject to detailed provisions which seek to maintain minimum mean daily flows. Kansas has unrestricted use of all waters of the basin which flow into the state. Neither state may export water from the basin without approval of the administration. Both states agree to cooperate in maintaining the basin's water quality. Subject to Nebraska law, Kansas has the right to construct or participate in future construction and use of storage reservoirs in the Big Blue and Little Blue basins in Nebraska. (Josepher-Florida)
W78-03409

APPROPRIATION OF WATER FOR BENEFICIAL USE.
Kan. Stat. Ann. secs 82a - 701 thru -725 (1969).

Descriptors: *Water management(Applied), *Kansas, *Prior appropriation, *Beneficial use, *Water permits, Allotments, Preferences(Water rights), Legislation, Adjudication procedure, State governments, State jurisdiction, Water policy, Water rights, Water supply, Water users, Administration, Appropriation, Water control.

Kansas has enacted legislation providing that water within the state is dedicated to the use of the people of the state. Subject to existing vested interests, all waters within the state may be appropriated for beneficial use; however, the approval of the chief engineer, who is charged with the administration of this act, is required to acquire appropriation rights to water for other than domestic uses. Without state agreement, it is unlawful to divert state waters away from a person who has a prior right to use such waters. The date of the appropriation right is determinative of rights to use available water. When conflicting uses for different purposes exist, an order of use-preference must be followed. Water permits are appurtenant to the land for which the permit is granted, but the place of use may be changed with state approval and without a loss of priority. Permit application requirements and procedures for processing the same are detailed. Also covered in the act are actions for compensation to common law claimants with vested rights, abandonment of water rights, and procedures for appealing decisions of the state engineer to the district court. (Josepher-Florida)
W78-03410

STATE WATER PLAN (KANSAS).
Kan. Stat. Ann. secs 82a-901 thru -946 (1969), as amended, (Supp. 1975).

Descriptors: *Water resources development, *Kansas, *Water policy, *Watershed management, *Water supply development, Legislation, Waste dumps, Waste disposal, Sewage disposal, Reservoirs, Flood control, Beneficial use, Water quality standards, Water quality control, Administration, Water law, State governments, Conservation, Water management(Applied), Water supply, Water users, Water control.

Kansas has enacted legislation requiring development of a comprehensive state water resources plan. Under the plan, the state will assist in the development of conservation storage in reservoir projects, help public corporations of the state develop flood control and water conservation projects, encourage payment from persons receiving direct benefit therefrom. Public hearings shall be held to consider the plan. Kansas' long range goals and objectives are outlined, including the number of acre-feet of water which should be developed to meet the state's future water needs. Water quality standards for water in watercourses are proposed. The act includes tables with information about major reservoirs and watershed projects within Kansas. Kansas intends to coordinate state planning with local and national planning and to resolve any conflicts which may arise between state and federal water policies, plans, or projects. (Josepher-Florida)
W78-03411

WATER QUALITY ACT.
N. M. Stat. Ann. secs 75-39-1 thru -12 (1968), as amend, (Supp. 1975).

Descriptors: *Legislation, *Water Quality Act, *New Mexico, *Water permits, *Administrative agencies, Administration, Administrative decisions, Regulation, Pollution abatement, Political aspects, Pollutant identification, Standards, State governments, Water quality standards, Water supply, Pollution abatement, Pollutants, Water rights, Water pollution, Water policy, Water quality, Water quality control.

New Mexico has enacted legislation creating a water quality control commission for the purpose of adopting a comprehensive water pollution prevention and abatement program. Constituent agencies of the state administer regulations of the commission, which is composed of directors of several state departments and a public representative appointed by the governor. Persons who discharge pollutants into state waters may be required to obtain a state permit and to file records reflecting the nature and amount of effluents discharged. Previously issued permits may be terminated or modified. Remedies for violations of New Mexico's Water Quality Act include injunctive relief and fines, with emergency procedures provided to allow for immediate abatement of pollution where necessary. (Josepher-Florida)
W78-03412

HOOKER CHEMICALS AND PLASTICS CORPORATION V. TRAIN (REVIEW OF ENVIRONMENTAL PROTECTION AGENCY'S NEW SOURCE REGULATIONS FOR PHOSPHATE MANUFACTURING INDUSTRY).
537 F2d 639-42 (2d Cir. 1976).

Descriptors: *Industrial wastes, *Chemical industry, *Phosphates, *Federal Water Pollution Control Act, *Effluents, Methodology, Administration, Federal government, Administrative agencies, Technology, Jurisdiction, Industries, Industrial water, Industrial plants, Water quality standards, Water control, Pollutants, Pollution abatement, Regulation, Legal review, Judicial decisions.

Plaintiff chemical companies sought review of Environmental Protection Agency (EPA) guidelines setting effluent limitations for 'new sources' in the phosphate manufacturing industry. The 'New source' regulations for both phosphorus and phosphorus pentasulfide were challenged. 'New sources' are those sources of liquid effluent discharge which are constructed after the EPA's promulgation of applicable regulations. The court of appeals found unsupportable the EPA's post hoc contention that its new source regulations were based upon 'available' or 'demonstrated' technology, as required by the 1972 Federal Water Pollution Control Act Amendments. The court noted that it had previously set aside the 1983 effluent limitation guidelines for phosphorus producers because it had not been sufficiently proven that the technology on which the regulations were based was available. Since the 'new source' regulations had been promulgated with the same data base, the court felt compelled to set them aside also. The court further noted that the record did not reflect a sufficient consideration by the EPA of the cost aspects for the installation of the purportedly available technology. Therefore, the court remanded the guidelines at issue for further proceedings by the EPA. (Josepher-Florida)
W78-03413

HOOKER CHEMICALS AND PLASTICS CORPORATION V. TRAIN (FEDERAL COURT REVIEW OF ENVIRONMENTAL PROTECTION AGENCY GUIDELINES).
537 F2d (2d Cir 1976). 20 p.

Descriptors: *Industrial wastes, *Chemical industry, *Phosphates, *Federal Water Pollution Control Act, *Federal jurisdiction, Effluents, Regulations, Federal government, Methodology, Administration, Administrative agencies, Technology, Industries, Water quality standards, Water pollution, Pollutants, Jurisdiction, Industrial wastes, Water quality control, Judicial decisions, Legal review.

Plaintiff chemical companies sought review of Environmental Protection Agency (EPA) regulations setting effluent limitation guidelines for the phosphate manufacturing industries. The Second Circuit Court of Appeals ruled that it had jurisdiction to review the EPA regulations, denying the plaintiffs' contention that original review of EPA regulations must be in the District Court. The Court approved of the general methodology employed and the factors considered by the EPA in the promulgation of its regulations. It found that tha EPA's notice of proposed rulemaking and subsequent publication of rules was in accord with the Administrative Procedure Act. However, because the EPA had failed to show the feasibility of the technology used in arriving at the specific regulations in question, had failed to consider certain variable weather conditions affecting experimental data, and had not sufficiently justified certain guidelines at the time of their promulgation, the Court set aside the regulations remanding them to the EPA for further consideration. (Josepher-Florida)
W78-03414

ARTESIAN WELLS.
NM Stat Ann secs 75-12-1 thru -12 (1968), as amended, (Supp 1975).

Descriptors: *Reservoir storage, *Artesian wells, *Well permits, *Well regulations, *Water management(Applied), Appropriation, Reservoir leakage, Reservoir operation, Reservoirs, Reservoir design, Wells, Well casings, Pipes, Piping systems, Conduits, Water policy, Water resources, Underflow, Beneficial use, Water conservation, Water supply, Water rights, Ditches.

New Mexico has enacted legislation defining 'artesian wells' to be artificial wells which derive their water supply from any artesian stratum or basin. The drilling, repairing, plugging, and casing of wells are made subject to state regulation. Before proceeding with any such work, a bond must be posted with the state to cover the state's cost of conforming potential breaches of permit provisions. In addition, contractors must file drilling records which reflect the type of casing used, the character of the penetrated strata, the depth of the well, and the amount of flow from the well casing. This article also defines 'waste' as escaping well water which is not being put to a beneficial use. A loss of more than twenty percent of the water being stored or conducted through ditches constitutes waste, which is a public nuisance and a misdemeanor. To further prevent waste, reservoir capacity is limited to the amount of water which can accumulate over a period of forty-eight hours at a continuous maximum flow. Finally, artesian water used to water stock must be controlled to prevent waste from conducting pipes. (Josepher-Florida)
W78-03415

AMERICAN IRON AND STEEL INSTITUTE V ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION FOR JUDICIAL REVIEW OF ENVIRONMENTAL PROTECTION AGENCY REGULATIONS).
543 F.2d 521-29 (3d Cir. 1976).

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Federal jurisdiction, *Administrative agencies, *Industrial wastes, Intakes, Judicial decisions, Water pollution sources, Constitutional law, Permits, Waste water(Pollution), Environmental control, Federal government, Water pollution control, Iron, Water law, Water pollution treatment, Steel, Legal review, Pollutants.

Petitioner trade association sought review of certain Environmental Protection Agency regulations. Although the regulations require effluent limitations to be expressed in gross terms, adjustments may be made for some individual point sources with pollutants in the intake water. The petitioner argued that all effluent limitations should be expressed in net terms, i.e. all pollutants present in the intake water should be substracted from the gross amounts of pollutants discharged after processing, with only the net discharge regulated. Although the Federal Water Pollution Control Act Amendments granted courts jurisdiction to review regulations setting effluent limitations, the Third Circuit Court of Appeals held that the Net Gross Regulations were primarily a permit issuance procedure and were neither effluent limitations nor effluent guidelines subject to judicial review. The court agreed that the Net-Gross Regulations did not prescribe specific number limitations for specific pollutants nor did they list factors to be considered in determining point source control measures. The court said that review of the regulations would be proper as applied to a permit applicant, but the petitioner had not applied for a permit. (Cocheu-Florida)
W78-03416

A STUDY OF FEASIBILITY OF STATE WATER USER FEES FOR FINANCING WATER DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6C.
W78-03425

PROCEDURES FOR REVIEWING ENVIRONMENTAL IMPACT ASSESSMENTS AND STATEMENTS FOR CONSTRUCTION PROJECTS,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 6G.
W78-03444

INTER-STATE WATER DISPUTES: A CASE STUDY OF INDIA,
Methodist Coll., Fayetteville, NC. Dept. of Economics.
S. Gautam.
Water Resources Bulletin, Vol. 12, No. 5, p 1061-1070, October 1976. 4 ref.

Descriptors: Interstate rivers, *Regulation, *Legislation, *Water resources development, Political aspects, Irrigation, *Water rights, *India, Tribunals, River boards, Developing countries, *Interstate water disputes(India).

During the last 27 years of independence, a large number of interstate water disputes developed over the use of rivers. More disputes were born during this short period than in the earlier 200 years of irrigation development, and so far none of the disputes has been permanently solved. The major rivers of India are all interstate, and this is one of the more important reasons why some of them are not yet fully developed for irrigation or power production. The Union Government has thus far set up only three tribunals to adjudicate interstate disputes. But the problems do not end simply by setting up the tribunals; in practice, they have proved to be a delaying process: None of the tribunals has been successful in settling any dispute in the long years of their existence. Also there is no codified law prescribing rights. However, the notion of 'equity' has come to prevail, restraining the upper states from drawing such quantities of water as would injure the interests of the lower states. Though the general principle of equitable apportionment had been advocated many times, each contending state had given this principle an interpretation that suited its own needs. The basic guideline to follow must be to harness the rivers not for the benefit of a particular state, but rather for the maximization of agricultural, industrial, and navigational potential in the areas served by the rivers. (Bell-Cornell)
W78-03646

WATER-ENERGY CONFLICTS IN MONTANA'S YELLOWSTONE RIVER BASIN,
Montana State Dept. of Health and Environmental Sciences, Billings. Bureau of Water Quality.
J. L. Thomas, and R. L. Anderson.
Water Resources Bulletin, Vol. 12, No. 4, p 829-842, August 1976. 2 fig, 14 ref.

Descriptors: *Water resources development, *Energy, *Montana, Planning, Effects, Water quality, Water policy, Strip mines, River basins, Water utilization, Water rights, Water supply, *Federal-state water rights conflicts, *Conflicts, Coal mining, *Yellowstone River basin(Mont).

The abundant, high-quality waters of the Yellowstone River Basin have fostered a strong agricultural-based economy in eastern Montana. The region also contains the nation's largest strippable coal reserves. Numerous conflicts have developed around the mining of coal and in-state conversion of coal into electricity and synthetic fuels--processes that require large volumes of water. Competition for water among industrialists, agriculturalists, and others is a critical state issue. Probable effects of increased water diversions, the nature of water-energy conflicts, and state efforts to control development are discussed. (Bell-Cornell)
W78-03649

THE COMPLETE DRAINAGE PROGRAM--MORE THAN AN ORDINANCE,
Hydrocomp, Inc., Atlanta, GA.
T. N. Debo.
Water Resources Bulletin, Vol. 12, No. 1, p 109-121, February 1976. 4 ref.

Descriptors: *Drainage programs, *Urban drainage, *Flood control, *Regulation, Evaluation, Land use, Erosion control, *Drainage ordinances, Urban planning.

An ever increasing number of communities throughout the nation are being forced by Federal legislation and local pressures to adopt land use and control measures related to drainage and flood protection. In many instances, communities are hastily adopting ordinances and regulations which later prove difficult to administer and enforce. In addition, many of these ordinances and regulations are not producing the results originally anticipated. This paper discusses the basic elements of a drainage ordinance and evaluates the role of the ordinance in a comprehensive drainage program. This evaluation is based on the results of a two year study of drainage programs in five urban areas which produced a model urban drainage ordinance and recommendations on the administration of the oridnance. Personal interviews and local documents are used as the data in formulating conclusions and recommendations. (Bell-Cornell)
W78-03650

A LEGAL ORDER FOR THE OCEANS, II,
A. W. Smith.
National Parks and Conservation Magazine, Vol 51, No 2, p 2, 31, February 1977.

Descriptors: *Water pollution control, *Continental shelf, *Law of the Sea, *International law, *International waters, Water pollution, Oceans, Continental slope, Water law, Oil pollution, Coasts, Bodies of water, Treaties, Foreign waters, Legal aspects, Commercial fishing, Fishing, Conferences, Water quality, Legislation.

The revised single negotiating text presented to the United Nations Conference on the Law of the Sea covers many central issues of international water law. The text must, however, be improved in the areas of living resources of the seas and oceanic pollution. Strong regulation of ocean fisheries would protect them as a food supply. Use of a population test instead of a yield test for the harvesting of food fish would provide protection for associated and dependent species. The problem of oceanic pollution requires international information and cooperation, as well as personnel and money. Pollution from deep seabed mining should be more strictly controlled as should pollution from ships at sea. To avoid unreasonable demands on tankers by a single coastal country, there should be a provision in any treaty against unilateral legislation which is arbitrary, discriminatory or retaliatory in nature; interpretation should be done by an adequate judicial system. The proposed unilateral extension of United states controls to a 200-mile pollution control zone follows the destructive pattern of the 200-mile fishery zone and may reduce the chance of achieving international goals. (Maass-Florida)
W78-03691

HOLLINGS CALLS FOR DEPARTMENT OF ENVIRONMENT AND OCEANS,
Senate, Washington, DC.
E. F. Hollings.
Sea Technology, Vol 17, No 7, p 15-18, July 1976.

Descriptors: *Environmental control, Water resources development, *Planning, *Coordination, *Oceans, Environment, Environmental effects, Government, Legal aspects, Regulation, Administrative agencies, Management, Control, Comprehensive planning, Federal government, Mineral resources, Legislation, Sea water, Shore protection.

The lack of a comprehensive ocean policy in the United States can be attributed to our lateness in recognizing the challenge of the sea due to emphasis placed on the space program, and to our haphazard response once the problem was recognized. Twenty-one ocean activities in the United States are scattered among six departments and five agencies without coordination. The National Oceanic and Atmospheric Administration instituted in 1970 had no policies or specific directives and failed to assume the coordinating role formerly held by the Marine Sciences Council. Senator Hollings supports the creation of a Cabinet-level agency, a Department of Environment and Oceans, offering authority, flexibility and visibility in these matters. The mission of the department would be to promote, regulate and manage ocean resources as part of the total environment. Additionally, the department would encompass the Environmental Protection Agency, the Coast Guard, the Geological Survey, and major National Science Foundation programs. It would coordinate these activities with new regulatory authority. Some programs of the Army Corps of Engineers, the Fish and Wildlife Service, the Bureau of Land Management and the Bureau of Reclamation would also be included. (Mulligan-Florida)
W78-03692

ADMINISTRATION GIVES VIEWS ON PROPOSED LEGISLATION ON DEEP SEABED MINING,
Department of State, Washington, DC. Office of Ambassadors at Large.
E. L. Richardson.
Department of State Bulletin, Vol 76, No 1978, p 524-27, May 23, 1977.

Descriptors: *Law of the Sea, *International law, *International waters, *Treaties, *Mining, Foreign waters, Mineralogy, Exploration, Oceans, Legislation, Governments, Regulation, Environment, Beds, Ownership of beds, Legal aspects, Political aspects, Federal government, United States.

Proposed legislation on deep seabed mining has the potential to affect negotiations at the upcoming Law of the Sea Conference. Consequently, the Administration does not support immediate legislation concerning deep seabed mining. It is felt that such legislation would act as a prior restraint on Administration's efforts to achieve a comprehensive treaty. However, assuming that international agreement is not forthcoming, the Administration does recognize the possible necessity for interim legislation to assure industry that its efforts to mine the deep seabed will not be negated by future international agreements. To that end the Administration proposes that such legislation be subject to a final comprehensive treaty, that it affirm our legal position on deep seabed mining, that it require United states operators to pay reasonable regard to other marine activities and the environment, that it provide for duty-free entry of recovered minerals, and that it provide for harmonizing with other nations' legislation. The Administration does not think the interim legislation should include exploration regulations, obligations to reimburse for losses caused by the treaty, or processing requirements. (Curran-Florida)
W78-03693

UNITED STATES DISCUSSES ITS PREPARATIONS FOR THE UNITED NATIONS WATER CONFERENCE,
Select Committee on Natural Resources (U.S. House), Washington DC.
J. M. Meyerson.
Department of State Bulletin, Vol 76, No 1967, p 203-05, March 7, 1977.

Descriptors: *Water resources development, *International waters, *United Nations, *United States, Resources development, Legal aspects, Resources, Natural resources, Oceans, Shores, Sea water, Governments, Foreign countries, Comprehensive planning, Political aspects, Water allocation(Policy), Water policy, Water supply, Water management(Applied).

Federal and state governments, private industry, and the academic community in this country are involved in preparation for United States participation in the United Nations Water Conference. Their efforts are coordinated by a national committee representing a variety of water interests. The United States has contributed specialists to expert panels convened to address topics of community water supply and food-water relationships, and has submitted 17 thematic papers on topics ranging from integration of water management into national planning to control of toxic substances. Because the global problems of water quantity and water quality are so urgent, it is vital that the conference focus on water resources policies and problems of water resources management, postponing discussion of technical aspects to other available forums. In addition, it is important to insure that this conference is substantively connected to other world conferences devoted to different but related aspects of natural resources management, particularly the United Nations Desertification Conference. The United States representative suggests that introduction of localized political issues into a global conference is counterproductive, and recommends budgetary restraints in conference planning. (Mulligan-Florida)
W78-03694

6F. Nonstructural Alternatives

NORTHERN ST. JOHNS COUNTY COASTAL MANAGEMENT PLAN,
Florida Coastal Engineers, Inc., Jacksonville.
E. J. Olsen.
Shore and Beach, Vol. 42, No. 2, p 29-35, October 1974.

Descriptors: *Florida, *Dunes, *Shore protection, *Beaches, *Zoning, Land management, Water law, Non-structural alternatives, Land use, Land development, Sands, Legislation, Beach erosion, Dune sands, Coastal structures, Seashores, Legal aspects, Coasts, Construction, Regulation.

Florida public policy for long range coastal management plans includes preservation of beach dunes to protect both private land owners and the public. The article focusses on one county's efforts to utilize coastal zoning to protect beach dunes from increased development along the shoreline. The coastal construction setback line was to take into consideration wind and wave action. Since regulation of the type of construction leeward of the setback line was necessary, this was adopted into the Coastal Management Plan. Under this plan three zoning categories were created to protect beach-dune interfaces. No construction is permitted in the Preservation Zone from the crest of the primary dune line to the Mean High Water line. Pole construction, utilizing poles or supports but no excavation, is allowed in the Conservation Zone. Regulation is accomplished through deed restrictions since the state has no jurisdiction landward of the setback line. Development zones permit more relaxed usage, but still require protection of the dune interface as its primary objective. Serving as a model program for the rest of the state, the Construction Setback Line Program benefits the environment while not severely hindering development. (Cocheu-Florida)
W78-03349

RESERVED WATER RIGHTS - A SOLUTION IS NEEDED,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 6E.
W78-03353

AGRICULTURAL BENEFIT ASSESSMENT FROM FLOOD CONTROL,
Illinois State Water Survey, Urbana.
K. P. Singh.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference,

University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N.Y., p 264-277, 1976. 1 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Flood control, *Benefits, *Assessment, *Methodology, *Computer programs, *Flood damage, Agriculture, Dams, Reservoir operation, Land use, Unit costs, Gaging stations, Farming, Operations research, Evaluation, Equations, Programs, Flow, Optimization, Flow release, Crop yield, Production investment, Flood minimization, Benefit maximization.

Needed is a methodology for evaluating flood damages or benefits as an integral part of the overall system, a methodology which is rational, precise, and programmable as an efficient and compact computer subroutine. Three available methods is use for flood control benefit assessment are described as to their advantages and shortcomings: (1) Frequency or Flood Peak-Damage Integration method; (2) Historical Series methods; and the Flood Hydrograph-Damage Integration method. Presented is a methodology which fulfills the aforementioned requirements; it computes flood control benefits that would accrue from individual and recurrent floodings, considering the data on (1) land use and crop yields, (2) sequence of farming operations and their unit costs, (3) loss of direct production investment because of flooding during farming operations, (4) the periods suitable for planting or replanting of crops and substitute crops, (5) crop loss due to flooding during the growing season, (6) partial crop loss during the harvesting season. In its concise and efficient form, the methodology helps greatly in developing an optimal operation scheme. Agricultural benefits can be followed from week to week and system operation parameters modified in view of the information obtained from successive computer runs. This methodology has been used in deriving an optimal joint operation of a two-lake system in south-central Illinois. The expected annual flood control benefit of $462,300 with the present operating policy can be increased to $627,600 with the derived optimal policy. (Bell-Cornell)
W78-03634

6G. Ecologic Impact Of Water Development

'INNOVATIVE' ASSESSMENT TECHNOLOGY ALLOWS MORE ACCURATE PREDICTION.
For primary bibliographic entry see Field 5C.
W78-03209

AN AUTOMATED SYSTEM FOR COLLECTING, PROCESSING, AND DISPLAYING ENVIRONMENTAL BASELINE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 7C.
W78-03256

PRE-SCREENING FOR ENVIRONMENTAL HAZARDS--A SYSTEM FOR SELECTING AND PRIORITIZING CHEMICALS.
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03267

GEOGRAPHIC AREAS OF PARTICULAR CONCERN.
Delaware Coastal Zone Management Program, Dover.
For primary bibliographic entry see Field 2L.
W78-03273

ECOSYSTEMS AND RESOURCES OF THE MASSACHUSETTS COAST,
Massachusetts Office Coastal Zone Management, Boston. Inst. for Man and Environment.
For primary bibliographic entry see Field 2L.
W78-03274

UNIQUE ECOLOGICAL FEATURES OF THE LOUISIANA COAST.
Burk and Associates, Inc., New Orleans, LA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 812, Price codes: A05 in paper copy, A01 in microfiche. Report to the Louisiana State Planning Office, Coastal Resources Program, June 1976, 77 p.

Descriptors: *Louisiana, *Ecology, *Baseline studies, *Resources, Coasts, Habitats, Wetlands, *Resource assessment, Coastal zone management, Environmental units, Nursery ground, Endangered species.

Twenty three categories of unique ecological features of the Louisiana coast are described. These features have been divided into zoological, botanical and geological components. A unique ecological feature is defined as an area or a resource that is either (1) critical habitat for rare or endangered species; (2) of extremely high biological productivity; (3) of vital importance as a nesting, feeding, wintering or spawning area for fish and wildlife; (4) a rare or unusual occurrence for a species that may be near the limits of its range; (5) vital to the maintenance of a coastal ecological process; (6) a unique physiographic feature or (7) of exceptional recreational value. For each feature, the location, number, approximate size or acreage, unique importance and source of information is presented. (Sinha-OEIS)
W78-03284

IMPACTS OF OUTER CONTINENTAL SHELF ACTIVITIES: LAFOURCHE PARISH, LA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-03288

THE UNITED NATIONS ENVIRONMENT PROGRAM: THE MEDITERRANEAN CONFERENCES,
For primary bibliographic entry see Field 6E.
W78-03336

ENVIRONMENTAL REGULATION OF OFFSHORE EXPLORATION, PRODUCTION, AND DEVELOPMENT,
Atlantic Richfield Company, Anchorage, AK.
For primary bibliographic entry see Field 5G.
W78-03337

ENVIRONMENTAL PROBLEMS ONSHORE,
Shell Oil Co., Houston, TX. Corporate Law Dept.
For primary bibliographic entry see Field 5G.
W78-03338

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR NEW SOURCE NPDES PERMITS.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol. 42, No. 7, p. 2450-59, January 11, 1977.

Descriptors: *Permits, *Administrative agencies, *Environmental effects, *Regulation, *Federal Water Pollution Control Act, Legal aspects, Federal government, Administrative decisions, Water law, Project planning, Administration, Governmental interrelations, Alternate planning, Management, Discharge(Water), Effluents, Pollutants, Water pollution control, Water pollution effects.

The Environmental Protection Agency (EPA) has instituted regulations requiring environmental impact statements prior to the issuance of new source National Pollutant Discharge Elimination System (NPDES) permits. The regulation applies only to EPA-issued permits and not to approved state permit programs. Potential new source applicants must submit new source and environmental questionnaires to the responsible EPA official. An initial determination of whether the facility is a new source will be made and, if so, an environmental impact assessment must be submitted. An environmental review of the assessment information follows. If a significant environmental impact may occur and adverse impacts cannot be eliminated by changes in the proposed project, an environmental impact statement (EIS) shall be prepared. If no such impact is anticipated, or if changes can eliminate adverse effects, a negative declaration shall be issued and no EIS is required. The regulations contain explicit guidelines for determining whether an EIS is necessary, procedures and timing deadlines for the preparation of an EIS and standards for the form and content of an EIS. (Moorhouse-Florida)
W78-03370

PROCEDURES FOR REVIEWING ENVIRONMENTAL IMPACT ASSESSMENTS AND STATEMENTS FOR CONSTRUCTION PROJECTS,
Construction Engineering Research Lab. (Army), Champaign, IL.
R. K. Jain, N. L. Drobny, and S. Chatterjee.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 020, Price codes: A02 in paper copy, A01 in microfiche. Technical Report E-73, August 1975. 24 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Projects, *Evaluation, *Analytical techniques, *Environmental effects, Economics, Land appraisals, Analysis, Project planning, Appraisals, Cost analysis, Estimating, Administrative agencies, Forecasting, Federal government, Economic impact, Social impact, Construction, Cost-benefit analysis, Costs, Benefits, Project feasibility.

A comprehensive reviewing procedure has been established to assist administrative and staff personnel in review of environmental impact assessments and statements (EIA/EIS) of construction projects. The procedure allows the reviewer to become familiar with the project, ascertain the completeness of the assessment or statement, and determine the validity and accuracy of the information. The mechanics of the review procedure include four interrelated indices; project screening factors; factor rating criteria; project screening criteria; and EIS review criteria. By assigning point values in relation to the indices, various projects may be rated as ones of small, medium or high impact. The report includes an example illustrating use of the procedure to review an EIS for a military family housing project. The methodology will undoubtedly be expanded and refined as experience is gained from applicaton of this procedure to actual projects. (Moorhouse-Florida)
W78-03444

THE ENVIRONMENTAL EFFECTS OF USING COAL FOR GENERATING ELECTRICITY,
Argonne National Lab., IL.
A. J. Dvorak, C. D. Brown, E. H. Dettman, R. A. Hinchman, and J. D. Jastrow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 237, Price codes: A11 in paper copy, A01 in microfiche. Report No. NUREG-0252, June 1977. 221 p, 33 fig, 63 tab, 639 ref, 7 append. ERDA W-31-109-ENG-38.

Descriptors: *Environmental effects, *Coals, *Electricity, Coal mines, Industrial wastes, Transportation, Storage, Air pollution, Water pollution,

Public health, Toxicity, Pollution abatement, Pollutants, *Emissions, Coal combustion, Pollution control, Occupational health.

Health and ecological effects of the coal cycle are estimated and described as they pertain to generation of electricity by coal combustion. Various operational (siting) and circumstantial (physical and chemical characteristics of coal) assumptions are made to provide a realistic projection of impacts, and the use of a model 1000-MWe coal-fired power plant operating at 70% annual capacity in five major U.S. regions is assumed. The annual coal requirement for each plant is used to quantify impacts and estimates, by region on a yearly basis, are made for land area disturbed by mining, transportation requirements, waste generated from processing, non-airborne wastes produced from coal combustion, by-products from pollution control technology, and airborne emissions with varying pollution control measures. Terrestrial and aquatic impacts associated with each of these estimates are discusses on a regional basis, and occupational and public health impacts are identified and quantitatively estimated, i.e., coal mine accidents, black lung disease, transportation accidents, and toxicity of air pollutants, using worst-case conditions for both short-term and long-term effects where possible. Alternatives to current reclamation and abatement methods are also discussed in light of feasibility and government regulation. Appendices present data on by-products from emission abatement, Federal and State water pollution and reclamation regulations, meteorological dispersion, sulfur dioxide sensitivity groupings for vegetation, and trace element availability, mobility, and toxicity in terrestrial and aquatic ecosystems. (Wares-IPC)
W78-03455

DATA EVALUATIONS AND RECOMMENDATIONS FOR COMPREHENSIVE PLANNING FOR THE YAZOO RIVER BASIN, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-03473

ASSESSMENT OF ENVIRONMENTAL IMPACT ON THE AQUATIC ENVIRONMENT WITH LIMITED DATA,
Howard (Charles) and Associates Ltd., Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W78-03639

OUTLET DRAINAGE - AN ASSESSMENT OF ENVIRONMENTAL EFFECTS,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-03640

CANADA COMMITTEE ON ECOLOGICAL (BIO-PHYSICAL) LAND CLASSIFICATION, WORKING GROUP ON LAND/WATER INTEGRATION, PROCEEDINGS OF THE FIRST MEETING, FEBRUARY 17-18, 1977, FRESHWATER INSTITUTE, WINNIPEG, MANITOBA.
Department of the Environment, Hull (Quebec). Lands Directorate.
Lands Directorate, Environment Canada, Ottawa, (1977), 70 p.

Descriptors: *Wetlands, *Systematics, *Classification, *Evaluation, *Future planning(Projected), *Mapping, Census, Survey, Flooding, Coasts, Streams, Streamflow, Channels, *Canada(British Columbia).

The Working Group advises on the feasibility and necessity of a biophysical classification scheme that integrates water with the classification of the surrounding terrain. Focus is on the needs for inland and coastal land-water classification, and their compatibility with existing ecological classification. Two classification systems are discussed: the British Columbia Aquatic System Inventory for mapping stream characteristics and the Churchill-Nelson Shoreline Inventory used to describe and map shorelines in terms of response to flooding by use of profiles showing land zonation (i.e., offshore, beach, backshore slope, uplands) and the significant parameters (plant species, slope) occurrence within each zone. Comparisons and needs of inventory methods for ecological land classification are discussed as well as the need for the exchange of information between active and interested resource survey groups. (Steiner-Mass)
W78-03653

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-03660

COASTAL RECREATION RESOURCES IN AN URBANIZING ENVIRONMENT, SYMPOSIUM, HYANNIS, MASSACHUSETTS, APRIL 12-14, 1976.
For primary bibliographic entry see Field 6B.
W78-03662

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03685

HOLLINGS CALLS FOR DEPARTMENT OF ENVIRONMENT AND OCEANS,
Senate, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-03692

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATIONS - VOL. 2: SURRY POWER PLANT UNITS 1 AND 2,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-03697

7. RESOURCES DATA

7B. Data Acquisition

USE OF REMOTE SENSING IN EVALUATING TURBIDITY PLUMES,
Texas A and M Univ., College Station. Coastal, Hydraulic and Ocean Engineering Group.
For primary bibliographic entry see Field 2L.
W78-03232

FEASIBILITY OF ELECTROMAGNETIC STREAMFLOW MEASUREMENTS USING THE EARTH'S FIELD,
Petro Canada Engineering Ltd., Calgary (Alberta). Dept. of Transportations and Operations.
For primary bibliographic entry see Field 2E.
W78-03242

AN AUTOMATED SYSTEM FOR COLLECTING, PROCESSING, AND DISPLAYING ENVIRONMENTAL BASELINE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 7C.
W78-03256

A LABORATORY TECHNIQUE FOR APPRAISING IN SITU SALINITY OF SOIL,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W78-03462

A NEW MODEL OF PLANKTON DREDGE FOR COLLECTING SAMPLES OF WATER AND PLANKTONIC ORGANISMS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
P. M. Voronov.
Gidrobiol Zh 12(6), p 92-94, 1976.

Descriptors: Aquatic animals, Artemia-salina, *Trapping capacity, *Ukraine, USSR(Lake Dzharylgach), *Plankton dredge sampling, *Model studies, Monitoring.

The new plankton dredge is distinguished from others by its air-tightness and simplicity of use. Tests in the collection of Artemia salina in the saline Lake Dzharylgach in the Crimesa (Ukrainian SSR, USSR) showed that the trapping capacity of the new dredge was 1/3 greater than that of Vovk's dredge, but 1.3% less than that of a control net. The new model is recommended for the collection of samples of water and aquatic organisms from different horizons and bodies of water.--Copyright 1978, Biological Abstracts, Inc.
W78-03524

WATER SAMPLER DEVICE,
S. J. Niskin.
U.S. Patent No. 4,037,477, 11 p, 25 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 960, No 4, p 1521, July 26, 1977.

Descriptors: *Patents, *Sampling, *Water sampling, Water analysis, Valves, Water samplers.

A water sampler device has a cylindrical container open at each end with a ball valve mounted at the openings. The valves are adapted to rotate about their axis from an initially closed position when the device is launched into a body of water to prevent the contamination of the container by the surface waters. Upon descending, a water pressure operated valve opens to equalize the pressure inside the container with that of the outside water pressure and causes the simultaneous rotation of the valves to an open predetermined depth at which the sample to be obtained when the valves are rotated again to a closed position. As the sampler device is being brought up to the surface, a further pressure operated valve permits the bleeding of water from within the device to equalize the pressure within the device with that of the surrounding area. (Sinha-OEIS)
W78-03596

CRYOGENIC SEDIMENT SAMPLER,
Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).
For primary bibliographic entry see Field 2J.
W78-03601

TRACKING POLLUTANTS FROM A DISTANCE,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-03670

PHOTOGRAMMETRY, WATER QUALITY, SAFETY APPURTENANCES, AND SHOULDER DESIGN.
Transportation Research Board, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03676

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME I,
Kansas Univ./Center for Research, Inc., Lawrence.
R. K. Moore, J. P. Claassen, R. L. Erickson, R. K. T. Fong, and B. C. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA-CR-5246(Vol 1), N77-16421, Price codes: A06 in paper copy, A01 in microfiche. Report No. RSL TR 295-3, Vol. I, June 1976. 92 p, 61 fig, 6 tab, 25 ref. NAS 5-22384.

Descriptors: *Radar, *Remote sensing, *Water resources, Soil water, Hydrologic cycle, Snow, Lakes, Surface waters, Rivers, Running waters, Ice, Data processing, *Reviews.

Objectives were the determination of the state-of-the-art for radar measurement of soil moisture, snow, standing and flowing water, and lake and river ice; determination of required spacecraft radar parameters; study of synthetic aperture radar systems to meet these parametric requirements; and study of techniques for on board processing of the radar data. Significant new concepts included: scanning synthetic aperture radar (SCANSAR) to achieve wide swath coverage; single sideboard radar; and comb filter range sequential, range offset synthetic aperture radar processing. The state-of-the-art is good for measurement of soil moisture and standing water, fair for measurement of lake ice, and meager for measurement of snow, river ice, and flowing water. The feasibility for immediate development of a spacecraft water resources SCANSAR has been established, and numerous candidates for the on-board processor have been examined with no conclusive selection. Volume I provides a summary of the program and study elements, a summary of the state-of-the-art of radar capabilities, and an outline of water resources mission requirements. (See W78-03683 and W78-03684) (Wares-IPA)
W78-03682

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME II,
Kansas Univ./Center for Research, Inc., Lawrence.
R. K. Moore, J. P. Claassen, R. L. Erickson, R. K. T. Fong, and B. C. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA-CR-5246(Vol II), N77-16422, Price codes: A06 in paper copy, A01 in microfiche. Report RSL TR 295-3, Vol. II, June 1976. 110 p, 47 fig, 16 tab, 19 ref. NAS 5-22384.

Descriptors: *Radar, *Remote sensing, *Water resources, Soil water, Hydrologic cycle, Snow, Lakes, Surface waters, Rivers, Running waters, Ice, Data processing, *Reviews.

Objectives were the determination of the state-of-the-art for radar measurement of soil moisture, snow, standing and flowing water, and lake and river ice, determination of required spacecraft radar parameters; study of synthetic aperture radar systems to meet these parametric requirements; and study of techniques for on board processing of the radar data. Significant new concepts included: scanning synthetic aperture radar (SCANSAR) to achieve wide swath coverage; single sideboard radar; and comb filter range sequential, range offset synthetic aperture radar processing. The feasibility for immediate development of a spacecraft water resources SCANSAR has been established, and numerous candidates for the on-board processor have been examined with no conclusive selection. Volume II contains an explanation of synthetic radar analysis and processor techniques, with a detailed description of the SCANSAR concept, parameters, system requirements, processor requirements, motion compensation, power, and size. (See also W78-03682) (Wares-IPA)
W78-03683

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME III,
Kansas Univ./Center for Research, Inc., Lawrence.
R. K. Moore, J. P. Claassen, R. L. Erickson, R. K. T. Fong, and B. C. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16423(Vol III), Price codes: A05 in paper copy, A01 in microfiche. Report RSL TR 295-3, Vol. III, June 1976. Contains RSL TM 295-11, RSL TM 295-5, and RSL TM 291-4. 98 p, 31 fig, 5 tab, 81 ref, 4 append. NAS 5-22384.

Descriptors: *Radar, *Remote sensing, *Water resources, Soil water, Hydrologic cycle, Snow, Lakes, Surface waters, Rivers, Running waters, Ice, Data processing, *Reviews.

Objectives were the determination of the state-of-the-art for radar measurement of soil moisture, snow, standing and flowing water, and lake and river ice; determination of required spacecraft radar parameters; study of synthetic aperture radar systems to meet these parametric requirements; and study of techniques for on board processing of the radar data. The state-of-the-art is good for measurement of soil moisture and standing water, fair for measurement of lake ice, and meager for measurement of snow, river ice, and flowing water. Volume III contains four appendices which are technical reports on state-of-the-art of: radar and radio-meter measurement of soil moisture (RSL TM 295-6), radar measurement of snow (RSL TM 295-11), radar detection of water bodies (RSL TM 295-5), and radar monitoring of lake/river ice (RSL TM 291-4). (See also W78-03682) (Wares-IPA)
W78-03684

7C. Evaluation, Processing and Publication

AN AUTOMATED SYSTEM FOR COLLECTING, PROCESSING, AND DISPLAYING ENVIRONMENTAL BASELINE DATA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
H. W. West, and H. M. Floyd.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 359, Price codes: A05 in paper copy, A01 in microfiche. Technical Report M-76-11, November 1976. 94 p, 40 fig, 4 tab, 1 append.

Descriptors: *Instrumentation, *Sampling, *Equipment, *Environment, Automation, Data collections, Data processing, Information retrieval, Air temperature, Water temperature, Solar radiation, Winds, Rainfall, Evaporation, Water levels, Hydrogen ion concentration, Soil temperature, Turbidity, Dissolved oxygen, Gages, Gaging stations, Water quality.

A system for automated collecting, processing, and displaying of environmental baseline data was described. The functions of the system, consisting of data collections with an automated field station, data processing, and data display options, were discussed. Also included were descriptions of the environmental sensors that are being used with the field station. Data that were obtained with the sytem at 15-, 30-, and 60-min sampling intervals over a period of several months at Pine Bluff Arsenal, Arkansas; Fort Carson, Colorado; Fort McClellan, Alabama; Upper Blakely Island near Mobile, Alabama; and Satartia, Mississippi, were analyzed. Example environmental data were presented in computer formats available with the system. An estimated cost (1976) of the automated field station and selected array of sensors was provided (Appendix A). (Sims-ISWS)
W78-03256

THE IMPACT OF LAND USE CHANGE ON THE GROUND WATER RESOURCES OF THE BOZEMAN, MONTANA AREA,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4B.
W78-03427

USER HANDBOOK FOR THE ALLOCATION OF COMPLIANCE MONITORING RESOURCES,
Systems Control, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 5G.
W78-03458

OBJECTIVE ANALYSIS AND CLASSIFICATION OF OCEANOGRAPHIC DATA,
National Oceanic and Atmospheric Administration, Washington, DC. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 2L.
W78-03470

DATA EVALUATIONS AND RECOMMENDATIONS FOR COMPREHENSIVE PLANNING FOR THE YAZOO RIVER BASIN, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-03473

LAKE ONTARIO BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 2H.
W78-03474

WINTER SNOW-COVER MAPS OF NORTH AMERICA AND EURASIA FROM SATELLITE RECORDS, 1966-1976,
National Environmental Satellite Service, Washington, DC.
M. Matson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 393, Price codes: A03 in paper copy, A01 in microfiche. Report No. NOAA-TM-NESS-84, March 1977. 31 p, 43 fig, 3 tab, 2 ref.

Descriptors: *Snow cover, *Mapping, *Remote sensing, *Satellites(Artificial), Monthly, Snow, Ice, Data collections, *Maps, Climatology, *Northern Hemisphere.

Weekly snow and ice cover charts of the Northern Hemisphere based on satellite data were averaged to create monthly mean snow cover maps of North American and Eurasia for the months of December through March 1966-76. A 10 year mean snow cover map for each winter month also was prepared. Included on each monthly mean winter snow cover map was a month-by-month analysis of all 10 years of data. (Sims-ISWS)
W78-03482

WATER TABLE MAPPING USER'S MANUAL,
Nevada Univ., Reno. Desert Research Inst.
C. L. Carnahan.
Available from the National Technical Information Service, Springfield, VA 22161 as NVO-1253-8, Price codes: A05 in paper copy, A01 in microfiche. Report No. NVO-1253-8, January 1976. 90 p, 2 fig, 3 ref, 1 append. ERDA AT(29-2)-1253.

Descriptors: *Water table, *Mapping, *Model studies, *Computer programs, Computer models,

Input-output analysis, Publications, Computers, Input parameters.

Procedures were given for use of an empirical water table mapping routine utilizing the CDC 6400 digital computer located at the University of Nevada System's Computer Center. Detailed instructions were provided for the program sequences to be used in initial simulation of a water table and in updating an existing simulation. (Visocky-ISWS)
W78-03484

AGRICULTURAL BENEFIT ASSESSMENT FROM FLOOD CONTROL,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6F.
W78-03634

MODELS FOR SCHEDULING RELEASES FROM MULTIRESERVOIR SYSTEMS: A STATE-OF-THE-ART REVIEW,
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 4A.
W78-03637

CANADA COMMITTEE ON ECOLOGICAL (BIO-PHYSICAL) LAND CLASSIFICATION, WORKING GROUP ON LAND/WATER INTEGRATION, PROCEEDINGS OF THE FIRST MEETING, FEBRUARY 17-18, 1977, FRESHWATER INSTITUTE, WINNIPEG, MANITOBA.
Department of the Environment, Hull (Quebec). Lands Directorate.
For primary bibliographic entry see Field 6G.
W78-03653

PROBLEM DEFINITION STUDIES ON POTENTIAL ENVIRONMENTAL POLLUTANTS II. PHYSICAL, CHEMICAL, TOXICOLOGICAL, AND BIOLOGICAL PROPERTIES OF 16 SUBSTANCES.
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-03672

ASSESSMENT OF WATER RESOURCES FOR NUCLEAR ENERGY CENTERS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 3E.
W78-03673

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, 1976 EDITION.
National Inst. for Ocupational Safety and Health, Rockville, MD.
For primary bibliographic entry see Field 5A.
W78-03679

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME I,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03682

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME II,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03683

RADAR SYSTEMS FOR THE WATER RESOURCES MISSION. FINAL REPORT, VOLUME III,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 7B.
W78-03684

8. ENGINEERING WORKS

8A. Structures

DESIGN OF ARCH DAMS, DESIGN MANUAL FOR CONCRETE ARCH DAMS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. A Water Resources Technical Publication, Denver, Colorado, 1977, 924 p.

Descriptors: *Arch dams, *Dam design, *Concrete dams, *Spillways, *Analytical techniques, Dam foundations, Hydraulic structures, Design data, Design criteria, Hydraulics, Outlet works, Foundation investigations, Concretes, Concrete control, Analysis, Structural analysis, Diversion, Ecology, Environmental effects, Hydraulic design, Inflow, Flood forecasting, Specifications, Streamflow, Floods, Hydrology.

Instructions, examples, procedures, and standards were presented for use in the design of concrete arch dams. This information is intended to serve as a guide to sound engineering with specialized and technical information that can be readily used in the design of concrete arch dams. Discussions were limited to dams on rock foundations. Subjects discussed in detail included design considerations, design data and criteria, layout and analysis, river diversion, foundation treatment, temperature control of concrete, joints in structures, spillways, outlet works and power outlets, galleries and adits, miscellaneous appurtenances, structural behavior measurements, concrete construction, and ecological and environmental considerations. The manual should be of service to all concerned with the planning and designing of water storage projects, but it cannot relieve the agency or person using it of the responsibility for a safe and adequate design. The limitations stated in the design procedures should be heeded. (See also W74-01058 thru W74-01070, and W77-07151) (Humphreys-ISWS)
W78-03491

CAST-IN-PLACE PIPE USES TRENCH AS FORM.
For primary bibliographic entry see Field 8F.
W78-03494

THE TWIN-TUNNEL CONCEPT.
Civil Engineering, p 45, 47, November, 1977.

Descriptors: *Construction materials, *Sewers, *Conveyance structures, *Operation and maintenance, Linings, Pipes, Sewerage, Corrosion, Flow control, Waste water treatment.

England's National Water Council Standing Committee on Sewers and Water Mains has examined several methods of sewer design and installation with respect to costs for operation and maintenance. The twin-tunnel design concept has been recommended for alleviating problems associated with inspection, cleaning, and renovation of larger-diameter sewers. Although twin tunnels provide hydraulic capacities equivalent to a single, larger diameter sewer, self-cleansing characteristics are increased by the overall reduced radius of the smaller line. Gates can be used to divert waste water flows to a single tunnel if demands are not exceptional, creating a flushing effect in the single tunnel. The ability to divert flows also aids in general maintenance operations. A lower ground cover and gradient is generally possible with the smaller, twin-tunnel design. Disposable linings can be incorporated into twin-tunnel designs to insure water-tightness and inhibit corrosion. Although capital costs may be higher than for a conventional large diameter system, a net overall savings can be realized through reduced maintenance and replacement requirements. (Schulz-FIRL)
W78-03496

8B. Hydraulics

ROUTING OF FLOODS IN RIVER CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-03240

ONE-DIMENSIONAL WAVE-PROPAGATION ANALYSIS, NEWBURGH LOCKS AND DAM, OHIO RIVER, INDIANA AND KENTUCKY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavement Lab.
W. R. Marcuson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 326, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper S-76-25, December 1976. 40 p, 22 fig, 3 tab, 12 ref.

Descriptors: *Seismic waves, *Cohesionless soils, *Soil dynamics, *Ohio River, *Foundation investigations, *Dam foundations, Earthquakes, Soil mechanics, Soil tests, Foundations, Dynamics, Soil liquefaction, Wave propagation, Dynamic response.

The site of the Newburgh Locks and Dam, located on the Ohio River near Evansville, Indiana, was investigated with regard to liquefaction potential. Cyclic triaxial compression tests were performed on remolded specimens of the foundation material at various densities. A one-dimensional wave-propagation analysis was performed for two typical soil profiles under the fixed-weir portion of the structure. As a result of the analysis, it was recommended that a study be initiated to determine the cost and benefits of: (1) removing the top 20 ft of sand below and downstream of the toe of the rock berm and replacing this material with nonliquefiable material; and (2) extending the existing rock berm in the downstream direction. It is believed that such modifications might render the structure stable under earthquake excitation. (Adams-ISWS)
W78-03260

KINEMATICS OF BREAKING WAVES IN THE SURF ZONE: EMPHASIZING ANALYSIS OF IDENTIFIED AND CLASSIFIED BREAKERS,
Naval Postgraduate School, Monterey, CA.
V. S. Hultstrand.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 353, Price codes: A04 in paper copy, A01 in microfiche. Thesis for Master of Science in Meteorology and Oceanography, March 1977. 67 p, 22 fig, 2 tab, 20 ref, 3 append. ONR - NR 388-114.

Descriptors: *Water level fluctuations, *Surf, Ocean waves, Coasts, *Wave profiles, *Breakers, Reflected waves, Breaking waves, Kinematics.

Measurements were made of the water level fluctuations and horizontal water particle velocities in breaking waves. The breaking waves were identified and classified. The mean value of the height of breaking to depth of breaking was calculated and found to be 0.86 for a composite of the

waves measured; the mean ratio values for collapsing, plunging and spilling were 0.84, 0.87 and 0.90, respectively. Probabiltiy distributions were plotted for wave heights and horizontal velocities and qualitatively compared with Rayleigh distributions; the wave distributions fit well but velocity did not. The spectra of wave profile and horizontal velocity were calculated and indicated a narrow banded data set. The coherence values between horizontal water particle velocities and wave profile were generally high, indicating that the horizontal particle velocities measured were highly wave-induced. The phase shift at the peak energy frequency was about 40 degrees which suggested the presence of reflected waves. (Sinha-OEIS)
W78-03279

FINITE ELEMENT SIMULATION OF OVERLAND AND CHANNEL FLOW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-03449

MODEL STUDY OF THE LAKE CHICOT PUMPING PLANT,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. Nakato, and J. F. Kennedy.
Available from the National Technical Information Service, Springfield VA 22161 as PB-261 272, Price codes: A07 in paper copy, A01 in microfiche. IIHR Report No. 188, August 1976. 134 p, 51 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Pumping plants, *Forebays, *Flow characteristics, *Trash racks, *Arkansas, *Surges, Hydraulics, Hydraulic models, Outlet works, Velocity, Erosion control, Hydraulic structures, Vortices, Flow separation.

A 1:24-scale laboratory model was constructed of the trapezoidal approach channel, upstream weir, forebay, pump bays and sumps, pump bells, and gravity flow section of the Proposed Lake Chicot Pumping Plant. During pumping operation, the forebay flows approaching the closed gravity bays located in the center of the pumping station are diverted laterally and enter the pump bays with a strong transverse component of velocity. This leads to separation, large captive eddies, and strong lateral nonuniformities in the pump-approach flows in the pump bays. Modified trash-racks, with 12-in deep bars on 6-in centers were found to serve as effective turning vanes and, under most pump operating combinations, to produce pump-approach flows that are acceptably uniform. Those cases were identified in which the pump bay flows in some bays are unacceptable, even with the trash-racks present. Scale effects on the model trash-racks were investigated in 2 idealized model pump bays with scales of 1:10 and 1:24. It was concluded that no undesirable scale effects were present in the 1:24 scale trash-racks in the complete model. Under certain gravity flow conditions, standing waves, were produced in the forebay. Surges did not occur if all gravity sections were open or if the closed sectionswere blocked with stop-logs. Velocity measurements in the forebay delineated the area which should be protected with a concrete apron to avoid scour of the rip rap. It was discovered that scour can occur downstream from the upstream weir when the forebay is bing filled. It was concluded that a protective apron should be installed downstream from the weir. (Adams-ISWS)
W78-03479

SHOALING CHARACTERISTICS OF THE GULF INTRACOASTAL WATERWAY IN TEXAS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-03485

HYDRAULICS AND DYNAMICS OF NORTH INLET, SOUTH CAROLINA, 1974-75,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W78-03489

DESIGN OF ARCH DAMS, DESIGN MANUAL FOR CONCRETE ARCH DAMS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W78-03491

STOCHASTIC MODELS FOR RESERVOIR DESIGN,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W78-03631

8C. Hydraulic Machinery

MODEL STUDY OF THE LAKE CHICOT PUMPING PLANT,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-03479

VARIABLE SPEED PUMPING FOR PROCESS AND MAIN WATER BOOSTING WITH ACCURATE CONTROL.
Water Services, Vol. 81, No. 978, p 488, 493, August, 1977.

Descriptors: *Pumping, *Pumps, *Hydraulic equipment, *Water conveyance, *Flow rates, Flow profiles, Food processing, Municipal wastes, Water treatment, Power operation and maintenance, Waste water treatment.

Fluctuations in fluid pressure in a water or waste water system can be accommodated with variable-speed pumping accomplished with variable-speed motors or multipump additive systems. Applications of variable-speed pumping in England are described. The Peerless Hydroconstant System is used by the brewing industry to compensate for pressure loss as filters clog. The system is also used in water heating systems to compensate for vapor pressure when the water is above the boiling point. Surges in flow which may upset biological treatment processes in a sewage treatment plant can be controlled with the Peerless system. Variable-speed pumping is also used to meet varying demands on water supplies in primary pumping from reservoirs and to augment existing pressure. Power savings resulting from the use of variable-speed pumping are proportional to the amount of time the pump is running at low speeds. (Schulz-FIRL)
W78-03503

BALL VALVES OFFER AN ALTERNATIVE FOR PUMP CHECK DUTY,
Hendon (Harry) and Associates, Birmingham, AL.
A. B. Jowers.
Water and Sewage Works, Vol 124, No 11, p 97-98, November, 1977. 1 fig.

Descriptors: *Pumping, *Valves, *Hydraulic equipment, *Pumps, *Hydraulic valves, Sewage treatment, Monitoring, Operation and maintenance, Municipal wastes, Waste water treatment.

A valve on the discharge side of the pump in a sewage treatment plant is normally provided to isolate the pump when it is not in service, to control pumping during start-up and shutdown, and to provide pump-check service in case of pump failure. Changes in fluid velocity within the system can lead to problems associated with water hammer, hydraulic shock, or reverse flow. Problems associated with a cone, check, or metal-seat ball valve normally used for pump-checking have led to the use of rubber-seated ball valves. The rubber ball valves are less costly than cone valves, can provide bubble-tight shutoff in both directions, and are resilient for operation at lower torque. Two applications of the use of rubber-seated ball valves in Tuscaloosa, Alabama, are described. A pump check system is used at the 15.5-mgd waste water treatment plant to prevent primary effluent effluent in the aeration basins from draining back into the wet well. A 30 inch rubber-seat ball valve is provided for each pump and operated by a low-pressure, hydraulic control system which contains a cylinder operator, a differential pressure switch, and a four-way hydraulic valve circuit. Rapid closure of the valves in the event of an emergency power failure is accomplished by a simultaneous de-energizing of all circuits. Pump check systems at the Love water treatment plant in Tuscaloosa are described. (Schulz-FIRL)
W78-03518

TURBINE STANDBY FOR WATER AND SEWAGE PLANTS.
North American Diesel and Gas Turbine Progress, Vol 43, No 11, p 33-34, November, 1977.

Descriptors: *Turbines, *Equipment, *Power operation and maintenance, *Electric power production, Design data, Fuels, Axial flow turbines, Generators, Sewage treatment, Treatment facilities, Waste water treatment.

Standby generator sets have been installed in municipal water and sewage treatment plants to provide adequate power during emergency situations when normal electric power service is interrupted. Solar Turbines International manufactures a range of standby generator sets rated from 900-8600 kW, which are in use at a wide variety of sewage and water treatment facilities in the United States. Four Solar Centaur-turbine-driven sets rated at 3000 kW have been installed at sewage treatment facilities in West Palm Beach, Florida. Provisions were made in the new facility for a fifth standby unit as the plant's capacity incredases. The Centaur turbine consists of a simple-cycle single-shaft engine in a 'cold-end-drive' configuration with an 11-stage axial-flow compressor, single annular combustor, and three-stage rotor assembly. The structural steel base of each turbine, gearbox, and generator and of the package's operating systems allows movement of the complete unit in a single lift. The Quincy sewage treatment plant in Illinois has begun using two Saturn turbine-driven 800-kW sets which use low BTU sludge gas as fuel. Solar standby units are also in operation at facilities within the Los Angeles County Sanitation District. (Schulz-FIRL)
W78-03520

RECESSED IMPELLER PUMP.
Water and Waste Treatment, Vol 20, No 9, p 62, September, 1977.

Descriptors: *Pumps, *Impellers, *Equipment, *Slurries, *Hydraulic transportation, Hydraulic equipment, Design data, Waste water treatment.

Durco Europe has produced a new recessed impeller pump for handling solid, stringy, of fibrous slurries or other materials with high concentrations of suspended solids. The chemical process pump can effectively transport particles as large as 7 cm without clogging. The special design of the Mark II pump includes a recessed impeller vane housed in a single-stage casing. The impeller is out of the main flow of the solids, and back vanes control the stuffing box pressure to keep solids out of the critical seal areas. Problems with shaft deflection and radial bearing loads are eliminated and

uniform hydraulic radial loads are created by the close clearance symmetrical chamber which houses the recessed impeller. A back pull-out design allows removal of the entire rotating assembly without disturbing the motor, casing, and piping. Available capacities range up to 160 cu m/hr with heads up to 100 m and operation at temperatures ranging from -30 to 250C. (Schulz-FIRL)
W78-03529

INCREASE IN STANDBY GENERATION.
Water and Waste Treatment, Vol 20, No 9, p 14-15, September, 1977.

Descriptors: *Pumping, *Power operation and maintenance, *Equipment, *Generators, Electrical equipment, Sewerage, Sewage treatment, Waste water treatment.

Since interruptions in the operation of a sewage pumping station can result in problems at the waste water treatment plant and in possible pollution of the surrounding waterways, standby power generators are coming into more widespread use. Auto Diesels Braby Ltd. has supplied 23 standby power generators to the Thames Water Authority in England as static and mobile sets with power outputs ranging from 20-480 kVA. Automatic operation can be supplied to provide standby power to the pumps within 20 sec of power supply loss. The mobile sets which are being used in situations where power loss is not so critical can be towed to the emergency area and plugged into the main control panel. The static sets are rated to provide the high initial currents required for pump startup, with an alternator frame size chosen for the particular load of the station. Modifications to the existing distribution switchboard and to the busbar connections were made to prevent inadvertent parallelling of the standby generator sets to the main supply. (Schulz-FIRL)
W78-03531

MODEL TESTING AIDS SUCTION CHAMBER DESIGN,
Crown Zellerbach Corp., Seattle, WA.
I. W. Best, Jr.
Water and Wastes Engineering, Vol. 14, No. 9, p 86-87, 91-93, September, 1977. 10 fig.

Descriptors: *Hydraulic equipment, *Prototype tests, *Pumping, *Pump testing, Design criteria, Water conveyance, Operation and maintenance, Equipment, Pumps, Waste water treatment.

Model testing is suggested for the evaluation of alternate suction chamber designs for axial and mixed flow pumps. Problems encountered during the operation of the high specific speed pump for condenser circulating service, water filtration plants, and other systems requiring large quantities of water at relatively low heads have been related to inherent characteristics of the pump type. Since these can be influenced by suction chamber characteristics, proper design can also reduce operating costs and required floor space of the pumping system. Cavitation, air entrainment, overloading of the pump impeller, lowered capacity and efficiency, and bearing misalignment and vibration can all occur because of improper suction chamber design. The advantages of designing suction chambers with separate chambers for each pump are described. Adjustments in the bell-to-floor clearance and submergence are discussed with respect to pump performance. Techniques in model testing of hydraulic structures such as suction chambers are based on maintaining a geometric similarity and scale in the prototype so that problems can be anticipated and various modifications can be made in the design stage at relatively low cost, instead of after the full-scale model is in operation. (Schulz-FIRL)
W78-03584

UNDERWATER THERMAL ENERGY CONVERSION UNIT,
D. Spector.
U.S. Patent No. 4,041,707, 8 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 3, p 1016, August 16, 1977.

Descriptors: *Patents, *Energy conversion, *Energy transfer, Electric power production, Thermodynamics, Thermal properties, Temperature, Underwater, Heat exchangers.

An underwater thermal energy conversion unit is adapted to exploit the temperature differential between the surface temperature and the water temperature at the depth of submersion to generate useful power. The unit includes a cylinder divided by a piston assembly into a variable-temperature (VT) air-filled chamber and a constant-temperature (CT) air-filled chamber, both chambers being in heat exchange relationship with the relatively cold water at the depth of the submerged cylinder. The air in the CT chamber is always at the cold water temperature, whereas the air in the BT chamber communicates through a thermally-insulated duct with ambient air above the water body, so that when a control valve is open, the air temperature within the VT chamber rises above the cold water temperature, and when the valve is closed to isolate the VT chamber from ambient air, the air temperature falls again to the cold water temperature. A sensing system causes the valve to open when the temperatures in both chambers are at about the same level. As a consequence, the temperature in the VT chamber proceeds to rise to create an air pressure difference between the chambers, causing the piston assembly to move in the direction of the CT chamber to compress the air therein. When the temperature in the VT chamber reaches a level close to that of the ambient air, the sensing system then acts to close the valve, and the temperature in the VT chamber then proceeds to fall. As this occurs, the pressurized air in the CT chamber forces the piston assembly in the direction of the VT chamber to a point of equilibrium to complete the cycle. The reciprocation of the piston assembly is converted into output power. (Sinha - OEIS)
W78-03614

VALVES FOR THE WATER INDUSTRY.
Water Services, Vol. 81, No. 978, p 476-481, August, 1977.

Descriptors: *Construction materials, *Valves, *Elastomers, *Steel, *Iron alloys, Corrosion, Butterfly valves, Hydraulic valves, Equipment, Flow control, Conveyance structures, Waste water treatment.

Recent developments in valve design and construction for industrial, municipal, and water-related operations are described. The use of ductile iron in valves because of its resistance to mechanical and thermal shock and to corrosion is described. Ease of pouring, the ability to cast light sections of very high strength, and the high quality surface finish are cited as advantages of using ductile iron castings for valve components, gear box casings, combustion engine parts, and other products. The use of elastomers instead of natural rubber for valve components alleviates problems associated with absorption, swelling, aging, and attack by ozone, hydrocarbons, and acids. Applications of elastomers for butterfly valves and resilient sealing gate valves are discussed. Research into the use of stainless steel for valve components, to allow more compact designs and to resist corrosion by ionized waters, is discussed. (Schulz-FIRL)
W78-03624

8D. Soil Mechanics

DREDGING OPERATIONS IN THE GALVESTON DISTRICT,
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 5G.
W78-03229

DREDGE MATERIAL CONTAINMENT IN NYLON BAGS IN THE CONSTRUCTION OF MINI-PROJECTS FOR BEACH STABILIZATION,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-03230

THE NATIONAL DREDGING STUDY,
Office of the Chief of Engineers (Army), Washington, DC.
For primary bibliographic entry see Field 5G.
W78-03231

HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE DREDGE DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5E.
W78-03233

ONE-DIMENSIONAL WAVE-PROPAGATION ANALYSIS, NEWBURGH LOCKS AND DAM, OHIO RIVER, INDIANA AND KENTUCKY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavement Lab.
For primary bibliographic entry see Field 8B.
W78-03260

LANDSCAPE CONCEPT DEVELOPMENT FOR CONFINED DREDGED MATERIAL SITES,
Mann (Roy) Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5E.
W78-03478

8F. Concrete

DESIGN OF ARCH DAMS, DESIGN MANUAL FOR CONCRETE ARCH DAMS.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8A.
W78-03491

CAST-IN-PLACE PIPE USES TRENCH AS FORM.
The American City and County, Vol 92, No 11, p 59-60, November, 1977.

Descriptors: *Concrete pipes, *Sewers, *Construction materials, *Concrete technology, *Pipes, Earth handling equipment, Formwork(Construction), Sewerage, Conveyance structures, Waste water treatment.

Cast-in-place concrete pipes have been recommended for fast construction at low cost in large diameter pipeline projects. The method is particularly suggested for situations where the soils are stable, no groundwater flows into the trench, a steady supply of ready-mix concrete is available, and where construction of several hundred feet of large diameter pipe is required. Current cast-in-place methods utilize both the sides and bottom of the pipe trench as the exterior form for the pipe to provide a strong bond between the pipe walls and trench. The Fullerform system, patented by Lomar Corporation of Santa, Ana, California, has been used in the construction of low-pressure piping for irrigation and storm sewer lines. The con-

tinuous, jointless structure eliminates problems associated with joint leaks and reduces the chance of clogging. Cast-in-place pipe projects have generally been bid below the engineering estimates for reinforced concrete or metal pipe. Installation crews as small as four people have been used and backfill can be completed after 72 hours curing time. Cylindrical steel forms are used for the exterior of the pipe and a variation of the slipforming technique which requires a heavy fabric inflatable tube is used for the interior walls. An anchor truck equipped with a compressor and generator is used to emplace and inflate the slipformer, while ready-mix concrete trucks feed concrete to the trench. Circular or square forms are used in pouring of the cast-in-place manholes. (Schulz-RIRL)
W78-03494

GLASS REINFORCED CONCRETE PIPES.
Water and Waste Treatment, Vol. 20, No. 8, p 26, August, 1977.

Descriptors: *Pipes, *Construction materials, *Sewerage, *Concrete pipes, *Conveyance structures, Corrosion, Sewage treatment, Waste water treatment.

'Slimline' glass reinforced concrete pipes are being produced commercially by ARC Concrete's factory at St. Ives, Cambridgeshire, in England. the pipes are reinforces with Pilkington's Cem-Fil glass fiber instead of the traditional steel and are useful in sewage treatment and surface water conveyance. The initial capacity of the factory was set at 10,000 tons/yr with allowances for later expansion via modular unit additions to increase the capacity to 50,000 tons/yr. The glass reinforced pipes are currently available in diameters of 600-1,200 mm. Current research at ARC Concrete is directed toward developing piping material which is resistant to attack by hydrogen sulfide or corrosive soils such as those which occur in the Middle East and other hot regions. (Schulz-FIRL)
W78-03497

CONCRETE STAVE TANKS.
Water and Waste Treatment, Vol 20, No 8, p 44, August, 1977.

Descriptors: *Concrete technology, *Construction materials, *Storage tanks, *Equipment, *Filters, Settling basins, Waste storage, Waste water treatment.

The 'Prestave' line of circular tanks, filter barrels and silos are manufactured by Tower Silos Ltd. for use in liquid storage, biological filters, and chemical storage. The units are constructed of hydraulically-formed high density concrete staves which are prestressed with external high strength steel hoops during erection. The 760-mm long by 320-mm wide staves are available in thicknesses of 64 and 76 mm. Filter barrel capacities range up to 4,000 cu m with diameters of 3.04-26 m. Silo capacities range up to 1,500 cu m with diameters of 3-30 m and heights up to 30 m. Storage tank capacities range up to 1,400 cu m with heights up to 9.15 m and diameters of 3.04-18.3 m. Specialized linings which are suitable to various applications are available. Auxiliary equipment can be supported on the top of the tank or along the walls of the tank itself, presenting an advantage in biological filtration with conventional stone or plastic media. (Schulz-FIRL)
W78-03552

REHABILITATION OF FILTER BED WALLS.
Water and Waste Treatment, Vol 20, No 8, p 18, August, 1977.

Descriptors: *Filters, *Construction materials, *Construction joints, *Concrete technology, *Equipment, Rehabilitation, Treatment facilities, Expansion, Sewage treatment, Waste water treatment.

The cracked and collapsing walls of the biological filter at Wessex Water Authority's Bruton sewage works in England were repaired in three days using a patented pre-cast concrete wall unit developed by Jan Brobowski and Partners in conjunction with ECC Quarries Limited. Temperature variations in the area had resulted in expansion of the wall, settling of the media, and cracking of the filter walls as construction was resisted by passive pressure. Post-tensioned cables had been initially wrapped around the walls, but they were not effective in preventing further expansion of the cracks. The number of additional cables required to alleviate the problem was prohibitive and backfilling to minimize temperature fluctuations would have been difficult. The last option under consideration was reconstruction of the filter. The ECC units which were finally installed did not require removal of the existing wall. Cooling contraction within the bolted joints of the ECC units prevents passive resistance failure via thin neoprene washers which absorb temperature movements and transmit ring forces. Steel dowels are grouted into the filter base slab to limit outward movement of the base of the filter wall. At Bruton the new wall was constructed as closely as possible to the existing wall. The remaining space between the two concentric walls was filled with pea-sized gravel to transmit expansion forces. (Schulz-FIRL)
W78-03556

8G. Materials

PRE-INSULATED PIPING SYSTEM USED FOR WATER AND TAILINGS AT CANADA'S FIRST ARCTIC MINE.
Water and Pollution Control, Vol. 115, No. 10, p 17, October, 1977. 3 fig.

Descriptors: *Mine wastes, *Plastic pipes, *Mine water, *Treatment facilities, *Construction materials, *Canada, Industrial wastes, Thermal insulation, Pipelines, Waste water treatment, Waste water disposal, Piping systems(Mechanical).

At Strathcona Sound, in northern Baffin Island, 450 mi north of the Arctic Circle, a lead-zinc mine and townsite are being developed by Nanisvik Ltd. Special insulated piping, designed for northern climates by Du Pont Ltd., of Canada was installed for water and mine tailings. This pre-insulated piping was selected because of its virtually trouble-free performance elsewhere in northern Canada, its cold weather durability, excellent resistance to abrasion, ease of handling, and speed of installation. The core of the system is Sclairpipe polyethylene pipe, which will not crack during fluid freeze-up. It is covered by factory-applied, polyurethane foam insulation. Galvanized steel protects the insulation from mechanical damage. Three pipelines were installed for the mine and town: a tailings line, water reclaim line, and water supply line. The 13,000 ft. tailings line is flanged for rotation and conveys tailings which are pumped uphill to the tailings pond. Another line carries reclaim water from the pond to the mill. (Snyder-FIRL)
W78-03214

NONPOINT SOURCE CONTROL GUIDANCE CONSTRUCTION ACTIVITIES,
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5G.
W78-03268

EXPERIMENTAL BOILER PROMOTES DEVELOPMENT OF FUEL-SAVING WATER TREATMENT PROGRAMS.
For primary bibliographic entry see Field 5G.
W78-03294

A GUIDE TO SPECIFICATION OF GLASS LINED PIPE,
L. M. Williams.
Water and Sewage Works, Vol 124, No 10, p 76-77, October, 1977.

Descriptors: *Pipes, *Construction materials, *Linings, *Corrosion, *Sewers, *Design criteria, Operation and maintenance, Specifications, Materials engineering, Conveyance structures, Waste water treatment.

Since the use of glass-line pipe in sewage treatment plants has been increasing, a series of guidelines or specifications for glass linings is presented to aid the potential user in selecting a product which will provide years of service and trouble-free installation. Although there are no measurement references for lubricity or resistance to friction, the lining should have a vitreous appearance equivalent to that of opaque window glass. A hardness of 5.5 or higher on the MOHS hardness scale is required. In addition, the glass lining-to-metal bond should be able to withstand a strain of 0.001 in/in. The glass lining should also be free of pinholes, crazing, and fish scale and be able to withstand thermal shock of 350 F. Additional specifications which are related to the quality of casting and are not contained in any current specifications are recommended. Cast pipes with obvious flaws or roughness hould not be lined and cast iron is recommeded over ductile iron for glass lining. In terms of warpage, the finished glass lined pipe should not deviate more than 0.0125' per foot of length from a centerline perpendicular to the flange face or square end of the pipe. (Schulz-FIRL)
W78-03492

PIPEWORK FLEXIBILITY,
R. Bryce.
Chartered Mechanical Engineer, p 47-50, December, 1977. 1 tab.

Descriptors: *Structural analysis, *Pipelines, Analytical techniques, *Sewers, *Strength of materials, Flexibility, Mechanical properties, Mathematical models, Conveyance structures.

A technique of structural analysis is presented for the examination of pipeline flexibility where deflections due to shear can be neglected. The pipe is aligned with respect to a system of right-hand coordinates and the displacements which occur when the pipe is subjected to external moments are examined. When the pipe is constrained to lie in a single plane, all deflections must lie in that plane and there is no torsional moment acting on the system. One end of the pipe is assumed fixed while the other is free to move under the action of external moments. Equations are presented for the displacement of the unfixed end due to the moment. Rotational parameters are incorporated into equations which describe the deflection of the complete pipe length. A three-plane system which allows for torsional effects is described. Components of displacement occurring at the unfixed end due to twisting and bending moments in the three-place system are defined for a three-section pipe. Angular rotations in the three-plane system are defined. (Schulz-FIRL)
W78-03495

GLASS REINFORCED CONCRETE PIPES.
For primary bibliographic entry see Field 8F.
W78-03497

TANK ACCESSORIES IN PLASTIC.
Water and Waste Treatment, Vol 20, No 9, p 66, September, 1977.

Descriptors: *Settling basins, *Plastics, *Construction materials, *Equipment, Corrosion, Sewage treatment, Design data, Industrial wastes, Municipal wastes, Waste water treatment.

Armshire-Sherville Plastics Ltd. of Biggleswade, England, has begun using glass reinforced polyester resin in equipment for water and sewage treatment, including settling tank weir plates and scum boards. The glass reinforced plastic poses advantages because of its corrosion resistance, strength, light weight, and stability over the temperature range -50 to 90C. Armshire-Sherville's special press molding process gives an easily-cleaned, algae-resistant, smooth finish to both sides of the polyester resin and also produces greater rigidity and flexural strength, which allow thinner wall sections and require less material. Air voids are also eliminated in the press molding process. Dimensions available in Armfibre weir plates and scum boards include thicknesses of 4 and 6 mm, a 2-m length, and depths of 200-500 mm. (Schulz-FIRL)
W78-03528

ELASTOMERIC MEMBRANES,
Dunlop Ltd., Skelmersdale (England). GRG Div.
E. R. Noble.
Water Services, Vol 81, No 978, p 481-483, August, 1977.

Descriptors: *Elastomers, *Linings, *Synthetic rubber, *Sealants, Equipment, Rubber, Construction materials, Storage tanks, Water treatment, Waste water treatment.

Applications of elastomeric membranes to water and waste treatment are described. Membranes have been used in effluent management to contain waste water for subsequent treatment or removal, as well as to line dumping sites or landfills for prevention of underground contamination by surface seepage. One use in India involved the lining of an irrigation canal. Natural rubber membranes have been used to reduce water loss from cracked concrete reservoirs. Common elastomeric membrane materials include Butyl, Epdm, chlorosulfonated polyethylene, and nitrile pvc. Butyl, the first synthetic rubber material offered commercially, is highly impermeable and offers a great deal of chemical resistance. Epdm (Ethylene propylene diene monomer) has a slightly higher resistance to high temperatures and ultraviolet radiation. Chlorosulfonated polyethylene (TM Hypalon) is coming into more widespread use because of its lower temperature tolerance and ease of fabrication. Nitrile pvc offers resistance to prolonged contact with hydrocarbon solvents. (Schulz-FIRL)
W78-03536

FIBRE MATS FOR LANDSCAPE ENGINEERING.
Waste and Waste Treatment, Vol 20, No 8, p 24, August, 1977.

Descriptors: *Construction materials, *Sewage lagoons, *Erosion control, *Infiltration, *Vegetation establishment, Runoff, Soil stabilization, Waste water treatment, Landscaping.

Enka Glanzstoff of Germany has developed a series nylon fiber mats for use in erosion control, riverbed linings, and sewage system canals, and for a variety of landscaping applications. The Enkamat technical mats consist of several layers of looped, nylon-6 threads in a bulky three-dimensional mat that can be filled with soil, sand or gravel. The mats exert a braking effect on surface water and winds and stabilize the loose or granular material which they contain. Water permeability is increased and root growth promoted to enhance the load-bearing capacity of the soil. Enkamat is available in 10- and 20-mm thicknesses in rolls of 1-m width and 100-150-m length. (Schulz-FIRL)
W78-03551

GLASS LINED TANKS GAIN POPULARITY.
Water and Waste Treatment, Vol 20, No 8, p 20, August, 1977.

Descriptors: *Construction materials, *Linings, *Equipment, *Basins, *Storage tanks, Industries, Waste water treatment, Water treatment.

Glass-lined tanks have come into use in the water and waste treatment industries and in a variety of industrial applications, including storage facilities for fertilizer, fuel oils, fruit pulp, salt solutions, adhesives, sludge, and chemicals. Tristorage Ltd. of Maidstone, Kent, England, produces a wide range of tanks constructed from pre-drilled and radiused sheets to allow easy transport and construction. A strong glass-to-steel bond and a smooth glass surface are created by a process which involves firing at 845C. The tanks are resistant to corrosion, designed for storing liquids of a wide pH range, and are available in sizes of 800-373,000 gal. They can set on steel supports, installed at ground level, or submerged. The prefabricated sheets are manufactured in 4 ft 6 inch standard heights which are then bolted together. Flat sheet roofs, cast aluminum roof hatches, steel ladders, platforms, cages, and handrails are also available as tank accessories from Tristorage. All seams are sealed with a bituminous or polyurethane compound. (Schulz-FIRL)
W78-03555

LEAK TESTING WITH DYED LIQUID TRACERS,
Shannon-Glow Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-03580

VALVES FOR THE WATER INDUSTRY.
For primary bibliographic entry see Field 8C.
W78-03624

8I. Fisheries Engineering

ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. VOL II - ROCKY MOUNTAIN REGION CASE STUDIES,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5C.
W78-03459

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982, (FINAL DRAFT).
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
For primary bibliographic entry see Field 6B.
W78-03428

9C. Research Facilities

ENVIRONMENTAL RESEARCH OUTLOOK (FY 1977 THROUGH FY 1981).
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W78-03695

9D. Grants, Contracts, and Research Act Allotments

DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982, (FINAL DRAFT).
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
For primary bibliographic entry see Field 6B.
W78-03428

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

ANAEROBIC PROCESSES, (LITERATURE REVIEW),
Institute of Gas Technology, Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-03218

RESEARCH PROGRAM ON HAZARD PRIORITY RANKING OF MANUFACTURED CHEMICALS, PHASE II - FINAL REPORT (APPENDIX, LISTING OF REFERENCES),
Stanford Research Inst. Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-03456

WATER RECLAMATION AND REUSE, (LITERATURE REVIEW),
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W78-03537

MARSH MANAGEMENT FOR WILDLIFE: A BIBLIOGRAPHY WITH ABSTRACTS,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-03656

A SELECTED ANNOTATED BIBLIOGRAPHY OF ECONOMIC VALUES OF FISH AND WILDLIFE AND THEIR HABITATS,
North Dakota State Univ., Fargo. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-03660

BASELINE STUDY PROGRAM, NORTH PUGET SOUND BIOLOGICAL OIL IMPACT LITERATURE REVIEW: VOL. II BIBLIOGRAPHY,
Beak Consultants Inc., Portland, OR.
For primary bibliographic entry see Field 05B.
W78-03698

10F. Preparation Of Reviews

WATER RECLAMATION AND REUSE, (LITERATURE REVIEW),
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 05D.
W78-03537

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